Procedure for Participating in Tender

Tender Enquiry No.	Work Description	Tender Fee All Incl. (Rs.)	Last date and time for Payment of Tender Participation Fee
TPWODL/MK/O/ SITC/056	Rate Contract for SITC of 11KV & 33KV Capacitor Bank in TPWODL.	Non-MSME-5,900/- Odisha MSME-1,000/-	20.03.2024 ,15.00 Hrs.

Please note that corresponding details mentioned in this document will supersede any other details mentioned anywhere else in the Tender Document.

Procedure to Participate in Tender.

Following steps to be done before "Last date and time for Payment of Tender Participation Fee" as mentioned above

1.
   a. **For Regular Bidders**- Non-Refundable Tender Participation Fee, as indicated in table above, to be submitted in the form of direct deposit in the following bank account and submit the receipt along with a covering letter clearly indicating the Tender Reference number –

   Beneficiary Name : TPWODL Expenditure Account
   Bank Name : Union Bank of India
   Branch Name : Sambalpur Naya Para
   Address : At/P.O.- Sambalpur, Dt: Sambalpur, Odisha-768 001
   Branch Code : 536521
   Account No. : 365201010033244
   Account Type : Current
   IFSC Code : UBIN0536521

   b. Local MSME Registered in the State of Odisha refer to Annexure-VII **(Norms for procurement from MSMEs registered in the state of Odisha**) for details of tender participation.

   Interested MSME bidders are required to submit undertaking with valid registration certificate before last date and time of tender purchase.

2. **Authorization letter**- Eligible and Interested Bidders to submit duly signed and stamped letter on Bidder's letterhead indicating
   a. Tender Enquiry number
   b. Name & Address of the Bidder
   c. Name of authorized person

d. Contact number

e. e-mail id

f. Details of submission of Tender Participation Fee

g. GST Registration No

E-mail with necessary attachment of 1 and 2 above shall be sent to mrinal.kumar@tpwesternodisha.com with a copy to sambit.sahoo@tpwesternodisha.com before last date and time for payment of Tender Participation Fee.

Interested bidders to submit Tender Participation Fee and Authorization Letter before Last date and time as indicated above after which link from TPWODL E-Tender system (Ariba) will be shared for further communication and bid submission.

Please note all future correspondence regarding the tender, bid submission, bid submission date extension, Pre-bid query etc. will happen only through TPWODL E-Tender system (Ariba). User manual to guide the bidders to submit the bid through E-Tender system (Ariba) is also enclosed.

No e-mail or verbal correspondence will be responded. All communication will be done strictly with the bidders who have done the above step to participate in the Tender.

Also, it may be strictly noted that once date of “Last date and time for Payment of Tender Participation Fee” is lapsed no Bidder will be sent link from TPWODL E-Tender System (Ariba). Without this link BA will not be able to participate in the tender. Any last moment request to participate in tender will not be entertained.

Any payment of Tender Participation Fee by Bidder who have not done the prerequisite will not be refunded.

Also, all future corrigenda to the said tender will be informed on Tender section on website https://www.tpwesternodisha.com.

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Tender Ref No. TPWODL/MK/O/SITC/056

TENDER DOCUMENTS

OPEN TENDER NOTIFICATION

FOR

RATE CONTRACT FOR SITC OF 11KV & 33KV CAPACITOR BANK IN TPWODL.

Tender Enquiry No.: TPWODL/MK/O/SITC/056

Due Date for Bid Submission: 04.04.2024 [15:00 Hrs.]

TP WESTERN ODISHA DISTRIBUTION LIMITED

(A TPWODL and Odisha Government Joint Venture)
Procurement & Stores Department

Corporate office: Burla-768017

TP WESTERN ODISHA DISTRIBUTION LIMITED
(A Tata Power and Odisha Government Joint Venture)
Regd./Corp Office : Burla, Dist-Sambalpur, Odisha -768 017
Website : www.tpwesternodisha.com, Email : tpwodl@tpwesternodisha.com
Corporate Identification Number (CIN) : U40109OR2020PLC035230, Telephone No. 0663-2431984, Fax No : 0663-2432113

CONTENTS OF THE ENQUIRY

1.0 Event Information

1.1 Scope of work

Open Tenders are invited in through e-tender bidding process from interested and eligible Bidders for entering a Rate Contract valid for a period of **12 months** as defined below:

Line-Item no.	Description	EMD Amount (Rs.)	Tender Fee (Rs.)
1	Rate Contract for SITC of 11KV & 33KV Capacitor Bank in TPWODL.	2,00,000/-	5,900/-

1.2 Availability of Tender Documents

Non-transferable tender documents may be purchased by interested eligible bidders from address given below on submission of written application to the under mentioned and upon payment of non-refundable Tender fee. **Chief (Procurement & Stores)**

TP WESTERN ODISHA DISTRIBUTION LIMITED

Corporate Office, Burla-768017

Tender documents may be downloaded by interested eligible bidders from TP Western Odisha Distribution Ltd. website www.tpwesternodisha.com In the event detailed tender documents are downloaded from TP Western Odisha Distribution Ltd. website or are received through email from TP Western Odisha Distribution Ltd., the Tender Fee shall be compulsorily submitted either online through NEFT/ RTGS or demand draft/ Banker's cheque drawn in favor of "TP Western Odisha Distribution Ltd.", payable at BURLA only. Any such bid submitted without this Fee shall be rejected. Bidders are requested to visit TP Western Odisha Distribution Ltd. website www.tpwesternodisha.com regularly for any modification/ clarification to the bid documents**.**

To participate in the tender, MSMEs registered in the State of Odisha shall pay Rs.1,000/- including GST towards cost of tender paper. Other terms and conditions will be same for that.

1.3 Calendar of Events

(a)	Date of sale/ availability of tender documents from TPWODL Website	From 13th March 2024 onwards
(b)	Date by which interested and eligible vendors to pay tender fee and confirm participation in accordance with "Procedure for participating in tender"	20th March 2024, 15:00 Hrs.
(c)	Date & Time of Pre-Bid Meeting (If any)	If required, will be communicated later
(d)	Last Date of receipt of pre-bid queries, if any	22nd March 2024 up to 15:00 Hours
(e)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	28th March 2024 up to 15:00 Hours
(f)	Last date and time of receipt of Bids	4th April 2024 up to 15:00 Hours
(g)	Date & Time of opening technical bids & EMD (Envelope-1 & 2)	Participating Bidders will get mail intimation from TPWODL, Burla E Tender system (Ariba) when their Techno-commercial Bids are opened.

(h)	Date & Time of opening for Price of qualified bids	Bidders will get mail intimation from TPWODL, Burla E-Tender system (Ariba) when the Price Bids of Techno commercially qualified bidders are opened.

Note: - In the event of extension of last date of submission of bids, same shall be intimated to the participating bidders through e-tender system.

1.4 Mandatory documents required along with the Bid

1.4.1 EMD of requisite value and validity
1.4.2 Tender Fee in case the tender is downloaded from the website.
1.4.3 Requisite Documents for compliance to Qualification Criteria mentioned in Clause 1.7.
1.4.4 Duly signed and stamped 'Schedule of Deviations' as per Annexure III on bidder's letter head.
1.4.5 Duly signed and stamped 'Schedule of Commercial Specifications' as per Annexure IV on bidder's letter head.
1.4.6 Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.
1.4.7 Copy of PAN, GST, PF and ESI Registration (In case any of these documents is not available with the bidder, same to be explicitly mentioned in the 'Schedule of Deviations')

Please note that in the absence of any of the above documents, the bid submitted by a bidder shall be liable for rejection.

1.5 Deviation from Tender

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

1.6 Right of Acceptance/ Rejection

Bids are liable for rejection in absence of following documents: -

1.6.1 EMD of requisite value and validity
1.6.2 Tender fee of requisite value
1.6.3 Price Bid as per the Price Schedule mentioned in Annexure-I
1.6.4 Necessary documents against compliance to Qualification Requirements mentioned at Clause 1.7 of this Tender Document.
1.6.5 Filled in Schedule of Deviations as per Annexure III
1.6.6 Filled in Schedule of Commercial Specifications as per Annexure IV
1.6.7 Receipt of Bid within the due date and time

TPWODL reserves the right to accept/reject any or all the bids without assigning any reason thereof.

1.7 Qualification Criteria

1.7.1 The bidder should have minimum average annual turnover of Rs. 2 crore in last three financial years. Copy of audited Balance Sheet and P&L Account to be submitted in this regard.

1.7.2 The bidder should have done SITC of at least 5 Nos of 11 KV or Higher rating of Capacitor Banks in last 5 years. Copy of work order / completion certificate to be submitted in this regard.

1.7.3 The bidder/OEM should have performance certificates for similar works for 1year satisfactory performance from at least one reputed companies for same or higher voltage rating. The work against these issued certificates should be completed in last seven years from the date of bid submission. In case the bidder has a previous association with Tata Power for similar products and services, the performance feedback for that bidder by Tata Power User Group shall only be considered irrespective of performance certificates issued by any third organization.

1.7.4 The bidder/OEM should have In-house testing facilities for acceptance test as per TPWODL specification. Bidder must submit undertaking in this regard.

1.7.5 The bidder should procure material/equipment/services from the manufacturers Approved/ authorized by TPWODL.

1.7.6 In case of supplier/traders (not having manufacturing facility of their own) shall be consider eligible provided they submit an undertaking to facilitate testing for offered material in an accredited laboratory. Provide a valid authorization from concerned manufacturer for dealing with offered material.

1.7.7 The Service Provider should not have ever been under a declaration of ineligibility/ fraud/ banned/ blacklisted by any PSU/State or Central Government institutions in India for any reason. (Self-Declaration).

1.7.8 Special terms and conditions for ***MSME registered in the State of Odisha are as below: -***

- Qualification Requirement of Financial Turnover for MSME registered in the State of Odisha shall be reduced to 20% of the existing criteria.
- MSMEs registered in the State of Odisha shall pay Rs.1,000/- including GST towards cost of tender paper.
- EMD shall be exempted for MSME registered in the State of Odisha. However, Bidder shall be barred to participate in the tendering process for a period of 2 years in case it backs out post award of the contract.

1.8 Marketing 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, TPWODL 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 General Condition of Contracts. A bidder who violates the marketplace rules or engages in behavior that disrupts the fair execution of the marketplace, may result in restriction of a bidder from further participation in the marketplace 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 terms as published in TENDER/NIT

1.9 Supplier Confidentiality

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

information submitted to TPWODL. All tender documents remain the property of TPWODL and all suppliers are required to return these documents to TPWODL upon request. Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

2.0 Evaluation Criteria

- The bids will be evaluated technically on the compliance to tender terms and conditions.
- The bids will be evaluated commercially at **the lowest cost** as calculated in Schedule of Items *[Annexure I]. TPWODL* reserves the right to split the contract / order among more than one Bidder. Hence all bidders are advised to quote their most competitive rates against each line item.
- The bids will be evaluated on Safety Parameters. Bidders have to submit all the documents related to safety bid.
- TPWODL may prefer to split the overall contract. The decision on allocation of Circle/Division shall be taken based on the best cost optimized option available with TPWODL. The decision of TPWODL in this regard shall be final and binding on the successful bidders.
- **Bidder has to mandatorily quote against each item as mentioned in schedule of Items *[Annexure I - Price Bid].* Failing to do so, TPWODL may reject the bids**.

2.1 Price Variation Clause: The prices for all items shall remain **firm** during the entire period of the contract.

3.0 Submission of Bid Documents

3.1 Bid Submission

Bidders are requested to submit their offer in line with this Tender document.

All correspondence regarding the tender, bid submission, bid submission date extension, Pre-bid query etc. will happen only through TPWODL E-Tender system (Ariba).

No e-mail or verbal correspondence will be responded. All communication will be done strictly with the bidders who have participated in the Tender as elaborated in procedure for participating in tender.

Bids shall be submitted in 3 (Three) parts:

FIRST PART: "EMD" as applicable shall be submitted by the bidder in the form of cash deposit in the account below. In case the EMD is not submitted by the bidder then the bid as submitted shall be liable for rejection.

EMD shall be strictly in the format of BG / Online Transfer only. Bidder should submit a covering letter mentioning the Online Transaction Number, Tender Number, Name of Tender for the same.

TPWODL Bank Details for transferring Tender Fee is as below:

Beneficiary Name: TPWODL Expenditure Account

Bank Name: Union Bank of India

Branch Name: Sambalpur Naya Para

Address: At/Po: Sambalpur, Dt: Sambalpur, Odisha-768 001

Branch Code: 536521

Account No.: 365201010033244

Account Type: Current

IFSC Code: UBIN0536521

TPWODL Bank Details for EMD is as below:

EARNEST MONEY DEPOSIT (EMD):

Beneficiary Name: TPWESTERNODISHA DISTRIBUTION LTD.

Bank Name: UNION BANK OF INDIA

Branch Name: Burla (Andhra Bank)

Address: AT/PO: Burla

District: SAMBALPUR, ODISHA

PIN: 768 017

Account No.: 005511100001556

Type of Account: CURRENT CUM FLEXI ACCOUNT

IFSC Code: UBIN0800554

SECOND PART: "TECHNICAL BID" shall contain the following documents:

a) Documentary evidence in support of qualifying criteria
b) Qualified manpower
c) List of Tools & Tackles
d) Work completion certificates for civil / fabrication works.
e) Undertaking on Vendors letter head for meeting the Pre-Qualification Criteria
f) No Deviation Certificate as per the Annexure III – Schedule of Deviations
g) Acceptance to Commercial Terms and Conditions viz Delivery schedule/period, payment terms etc. as per the Annexure IV – Schedule of Commercial Specifications.
h) The bidder shall mention the details as required in the safety bid form. The bidder also has to submit the relevant documents for the same as required by TPWODL.

The technical bid shall be properly indexed and is to be submitted in TP Western Odisha Distribution Ltd. e-procurement portal.

THIRD PART: "PRICE BID" shall contain only the price details and strictly in format as mentioned in Annexure I along with explicit break up of basic prices, Taxes & duties, Freight etc. In case any discrepancy is observed between the item description stated in Schedule of Items mentioned in the tender and the price bid submitted by the bidder, the item description as mentioned in the tender document (to the extent modified through Corrigendum issued if any) shall prevail.

Price Bid is to be submitted in soft copy through TPWODL E-Tendering system (Ariba) only. Hard copy of Price Bid not to be submitted.

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

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

SIGNING OF BID DOCUMENTS:

The bid must contain the name, residence, and place of business of the person or person making the bid and must be signed and sealed by the Bidder with his usual signature. The names of all persons signing should also be typed or printed below the signature.

The Bid being submitted must be signed by a person holding a Power of Attorney authorizing him to do so, certified copies of which shall be enclosed.

The Bid submitted on behalf of companies registered with the Indian Companies Act, for the time being in force, shall be signed by persons duly authorized to submit the Bid on behalf of the Company and shall be accompanied by certified true copies of the resolutions, extracts of Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the Bid on behalf of the Company. Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with the bid.

A bid by a person who affixes to his signature the word 'President', 'Managing Director', 'Secretary', 'Agent' or other designation without disclosing his principal will be rejected.

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

3.2 Contact Information

Please note all correspondence regarding the tender, bid submission, bid submission date extension, Pre-bid query etc. will happen only through TPWODL E-Tender system (Ariba).

No e-mail or verbal correspondence will be responded. All communication will be done strictly with the bidders who have participated in the Tender as elaborated in procedure for participating in tender.

Communication Details:
Package Owner: Mrinal Kumar
Contact No: 7879541493
Email ID: Mrinal.kumar@tpwesternodisha.com

Mr. Sambit Ku. Sahoo
Contact No: 9250008873
Email ID: Sambit.Sahoo@tpwesternodisha.com

Chief Contract & Stores
Name: Mr. Rahul Kumar
E-Mail ID: rahul.kumar@tpwesternodisha.com

Bidders are strictly advised to communicate with Package Owner through TPWODL E-tender System (Ariba) only. They need to pay Tender Participation Fee and receive the Ariba log-in. The above contact details are for reference purpose only.

3.3 Bid Prices

Bidders shall quote for the entire Scope of Supply / work with a breakup of prices for individual items and Taxes & duties. The bidder shall complete the appropriate Price Schedules included

herein, stating the Unit Price for each item & total price with taxes, duties & freight up to destination at various sites of TPWODL. The all-inclusive prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during the execution of the supply work, breakup of price constituents.

The quantity breakup shown else-where other than Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any items not indicated in the price schedule, but which are required to complete the job as per the Technical Specifications / Scope of Work mentioned in the tender, shall be deemed to be included in prices quoted.

3.4 Bid Currencies

Prices shall be quoted in Indian Rupees Only.

3.5 Period of Validity of Bids

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

Notwithstanding clause above, the TPWODL may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and responses thereto shall be made in writing.

3.6 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.

3.7 Modifications and Withdrawal of Bids

The bidder is not allowed to modify or withdraw its bid after the Bid's submission. The EMD as submitted along with the bid shall be liable for forfeiture in such event.

3.8 Earnest Money Deposit (EMD)

The bidder shall furnish, as part of its bid, an EMD amounting as specified in the tender. The EMD is required to protect the TPWODL against the risk of bidder's conduct which would warrant forfeiture.
The EMD shall be forfeited in case of:

a) The bidder withdraws its bid during the period of specified bid validity.

Or

b) The case of a successful bidder if the Bidder does not
i) accept the purchase order, or
ii) furnish the required performance security BG.

3.9 Type Tests (if applicable)

The type tests specified in TPWODL specifications should have been carried out within five years prior to the date of opening of technical bids and test reports are to be submitted along with the bids. If type tests carried out are not within the five years prior to the date of bidding, the bidder will arrange to carry out type tests specified, at his cost. The decision to accept/ reject such bids rests with TPWODL.

4.0 Bid Opening & Evaluation Process

4.1 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 TPWODL's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

4.2 Technical Bid Opening The bids shall be opened internally by TPWODL. First the envelope marked "EMD" will be opened. Bids without EMD/ cost of tender (if applicable) of required amount/ validity in prescribed format, shall be rejected.

Next, technical bids of bidders who have submitted EMD shall be opened. Participating Bidders will get mail intimation from TPWODL E-Tender system (Ariba) when their Technical Bids are opened.

4.3 Preliminary Examination of Bids/ Responsiveness

TPWODL 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. TPWODL may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

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.

Prior to the detailed evaluation, TPWODL 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.

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

4.4 Techno Commercial Clarifications

Bidders need to ensure that the bids submitted by them are complete in all respects. To assist in the examination, evaluation, and comparison of Bids, TPWODL may, at its discretion, ask the Bidder for a clarification on its Bid for any deviations with respect to the TPWODL specifications and attempt will be made to bring all bids on a common footing. 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 owing to any clarifications sought by TPWODL.

4.5 Price Bid Opening

Price Bid of only Technically and / or Safety Qualitied Bidders shall be considered and open internally by TPWODL. Bidders will get mail intimation from TPWODL E-Tender system (Ariba) when their Price Bids are opened. The EMD of the bidder withdrawing or substantially altering his offer at any stage after the technical bid opening will be forfeited at the sole discretion of TPWODL without any further correspondence in this regard.

4.6 Reverse Auctions

TPWODL reserves the right to conduct the reverse auction for the products/ services being asked for in the tender. The terms and conditions for such reverse auction events shall be as per the Acceptance Form attached as Annexure VI of this document. The bidders along with the tender document shall mandatorily submit a duly signed copy of the Acceptance Form attached as Annexure VI as a token of acceptance for the same.

Reverse Auction shall be as per the below approach:

No of bidders to be allowed in RA process shall be: Total No of bidders on whom tender would be split PLUS 2 more bidders.
Illustrative example: Total no of qualified bidders is 10 & tender needs to split amongst 4 bidders.

PLUS 2 means (04 + 02 = 06) means lowest 6 bidders i.e., L1 to L6 bidders would be allowed in the RA process. Balance, H1 to H4 bidders would not be allowed in the RA process.

In case – Total no of qualified bidders is equal to or less than the PLUS 2 number, all qualified bidders shall be allowed in the RA process.

Illustrative example: Total no of qualified bidders is 4 & tender needs to split amongst 2 bidders. PLUS 2 means (02 + 02 = 04), so all 4 qualified bidders would be allowed in the RA process.

Illustrative example: Total no of qualified bidders is 3 & tender would be awarded to single party only. PLUS 2 means (01 + 02 = 03), so all 3 qualified bidders would be allowed in the RA process.

5.0 Award Decision

TPWODL will award the contract to the successful bidder whose bid has been determined to be the lowest-evaluated responsive bid as per the Evaluation Criterion mentioned at Clause 2.0. The Cost for the said calculation shall be taken as the all-inclusive cost quoted by bidder in Annexure I (Schedule of Items) subject to any corrections required in line with Clause 4.3 above. The decision to place purchase order/LOI solely depends on TPWODL on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that TPWODL may deem relevant.

TPWODL reserves all the rights to award the contract to one or more bidders so as to meet the delivery requirement or nullify the award decision without assigning any reason thereof.

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

NOTE: Please note that Intimation of Price Bid Opening will go only to those bidders who are Technically Acceptable and whose price bid are opened. Bidders who are not successful in technical or commercial part of the process will be intimated to collect EMD only after end of process.

It is informed that TPWODL shall not provide status updates or give explanation of process followed for bidder selection criteria whatsoever, to any participating bidder.

6.0 Order of Preference/Contradiction:

In case of contradiction in any part of various documents in tender, following shall prevail in order of preference:

1. Schedule of Items (Annexure I)
2. Post Award Contract Administration (Clause 7.0)
3. Submission of Bid Documents (Clause 3.0)
4. Scope of Work and SLA (if any) (Annexure VII)
5. Technical Specifications/Make List (Annexure II)
6. Inspection Test Plan (if any)
7. Acceptance Form for Participation in Reverse Auction (Annexure VI)
8. Commercial Terms & Conditions (if any)
9. General Conditions of Contract (Annexure VIII)

7.0 Post Award Contract Administration

7.1 Other Terms & Conditions: -

1. Rate Contract shall be valid for a period of One Years from the placement of the Rate Contract. Release Order (RO) shall be placed as per the requirement of TPWODL. Rates shall remain firm throughout the RC period.

2. Prices shall be on FOR Basis, inclusive of Transit Insurance/ Packing & Forwarding & ITC charges and shall be inclusive of unloading & stacking at TPWODL site / store locations.

3. BA shall submit applicable PBG as per GCC within 15 days of issuance of RC. PBG applicable shall be 5% of contract value. PBG submitted, shall be released after completion of applicable guarantee period plus one month. **Performance Bank Guarantee for MSME registered in the State of Odisha shall be 25% of the value normally prescribed.**

4. Guarantee period shall be as per the technical specification of this tender.

5. BA shall submit GTP/ Drawing within 07 days from issuance of the Rate Contract. If drawing is not approved by competent authority due to document shortfall or any changes are suggested, vendor has to resubmit new drawing/GTP/documents within 03 days of such intimation. BA shall offer for prototype inspection within 15 days of issuance of approved Drawings/GTP (if applicable). In case BA does not get necessary approvals for issuance of manufacturing clearances /CAT-A within mentioned / mutually agreed timelines, then TPWODL reserve the right to cancel issued rate contract / release order and also reserve the right to forfeit EMD/PBG.

LD: In the event that the works are delayed beyond the interim milestone completion date / contractual completion date, Liquidated damage to the extent of 1% of the contract value per week of delay or part thereof shall be levied, subject to a maximum of 10 % of the total contract value. TPWODL shall short close the issued Release Order / Rate contract, in case of any quality issues, front issue, non-mobilization from vendor for taking up the works / not completing works in time.

Any change in statutory taxes, duties and levies shall be borne by TPWODL.

All other terms and conditions of TPWODL GCC shall be applicable.

7.2 Drawing Submission and Approval: - The relevant drawings and GTPs need to be submitted within two weeks of receipt of firm purchase order by the successful bidder to TPWODL for approval. In case, re-submission of drawings is required on request of TPWODL, same needs to be submitted back to TPWODL within 5 days of such request.

7.3 Delivery Terms:- Release Orders shall be placed against the awarded Rate Contract by TPWODL as and when the requirements arise. Delivery shall be completed within 45 days from the date of RO and installation and commissioning shall be completed within 30 days thereafter or as mutually agreed with our Project/Operations team.

7.4 Guarantee Period:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract, whichever is earlier, bidder shall be liable to undertake to replace/rectify such defects at his own costs, within mutually agreed timeframe, and to the entire satisfaction of TPWODL, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus, the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.
Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company.

7.4 Payment Terms:

80% Payment shall be made within 60 days of submission of error free & certified invoice upon successful delivery of the equipment.

20% payment shall be released within 30 days of submission of error free invoice upon successful integration and commissioning of the equipment. Commissioning certificate duly signed by TPWODL representative will be provided by BA along with invoice.

7.5 Climate Change:

Significant quantities of waste are generated during the execution of project and an integrated approach for effective handling, storage, transportation, and disposal of the same shall be adopted. This would ensure the minimization of environmental and social impact in order to combat the climate change.

7.6 Ethics

- TPWODL is an ethical organization and as a policy TPWODL lays emphasis on ethical practices across its entire domain. Bidder should ensure that they should abide by all the ethical norms and in no form either directly or indirectly be involved in unethical practice.
- TPWODL work practices are governed by the Tata Code of Conduct which emphasizes on the following:
- We shall select our suppliers and service providers fairly and transparently.
- We seek to work with suppliers and service providers who can demonstrate that they share similar values. We expect them to adopt ethical standards comparable to our own.

- Our suppliers and service providers shall represent our company only with duly authorized written permission from our company. They are expected to abide by the Code in their interactions with, and on behalf of us, including respecting the confidentiality of information shared with them.
- We shall ensure that any gifts or hospitality received from, or given to, our suppliers or service providers comply with our company's gifts and hospitality policy.
- We respect our obligations on the use of third-party intellectual property and data.

The bidder is advised to refer GCC attached at Annexure for more information.

Any ethical concerns with respect to this tender can be reported to the following email ID: sunilk.sharma@tpwesternodisha.com.

8 Not Used

9 General Condition of Contract

Any condition not mentioned above shall be applicable as per GCC attached along with this tender.

10 Safety

Safety related requirements as mentioned in our safety Manual put in the Company's website which can be accessed by: http://www.tpwesternodisha.com

All Associates shall strictly abide by the guidelines provided in the safety manual at all relevant stages during the contract period.

ANNEXURE I
Schedule for Items

TENTATIVE BOQ FOR 11KV CAPACITOR BANK FOR EACH SITE					
Sr. No.	**Detailed Item Description**	**Unit**	**Qty**	**UNIT PRICE (Rs.)**	**Amount (Rs.)**
1	SITC LA 33KV/11KV as per TS	NO	15.00		
2	SITC Isolator 33KV/11KV as per TS	SET	5.00		
3	SITC VCB 33/11KV as per TS	SET	5.00		
4	SITC O/D CRP 33/11KV AS PER TS	SET	5.00		
5	SITC 1Ph CT 33/11kv with Connector as per TS	NO	15.00		
6	SITC 3 Ph PT 33/11kv with Connector as per TS	SET	5.00		
7	SITC NCT Connector as per TS	SET	5.00		
8	SITC Reactor & acces& Connector as per TS	SET	5.00		
9	SITC HT Cap & access &Connector as per TS	SET	5.00		
10	SITC Disc Insulator Polymer 33/11kv as per TS	SET	15.00		
11	SITC post insulator 33/11kv as per TS	SET	15.00		
12	SITC AAAC 33/11KV Cond,Clamps and connector as per TS	LUM	5.00		
13	SITC 3Cx 300 AL XLPE armoured Power Cable as per TS	LUM	5.00		
14	SITC JT kits 3C X 300 AL XLPE cable as per TS	SET	10.00		
15	SITC Cu XLPE arm Control cables, ter mat AS PER TS	LUM	5.00		
16	SITC CT Console Box	NO	5.00		
17	SITC 300mm/150mm width GI Perforated cable tray with accessories for control cable AS PER TS	LUM	5.00		
18	SITC 450mm/300mm GI Ladder type cable tray with accessories for power cable AS PER TS	LUM	5.00		
19	SITC Earthing Pipe with clamp, funnel & mesh as per TS	LUM	5.00		
20	SITC GI Flat for earthing of equipment's and earth grid 50x 6 mm AS PER TS	LUM	5.00		
21	SITC Cage for complete package including top & entry gate with lock	SET	5.00		
22	SITC Structure for Isolator , VCB, CT, PT, LA, Reactor, Capacitor Bank etc.	LUM	5.00		
23	SITC Civil Foundation for the above structure & Panels etc.	LUM	5.00		
24	SITC RCC Cable Trench for control and power cables with insert plates & cable tray supports etc.	LUM	5.00		
25	SITC Earth pit Chamber for earth pits etc	LUM	5.00		
				TOTAL	
				GST 18%	
				Total Inclusive of GST 18%	

TENTATIVE BOQ FOR 33KV CAPACITOR BANK FOR EACH SITE					
Sr. No.	**Detailed Item Description**	**Unit**	**Qty**	**UNIT PRICE (Rs.)**	**Amount (Rs.)**
1	SITC LA 33KV/11KV as per TS	NO	3.00		
2	SITC Isolator 33KV/11KV as per TS	SET	1.00		
3	SITC VCB 33/11KV as per TS	SET	1.00		
4	SITC O/D CRP 33/11KV AS PER TS	SET	1.00		
5	SITC 1Ph CT 33/11kv with Connector as per TS	NO	3.00		
6	SITC 3 Ph PT 33/11kv with Connector as per TS	SET	1.00		
7	SITC NCT Connector as per TS	SET	1.00		
8	SITC Reactor & acces& Connector as per TS	SET	1.00		
9	SITC HT Cap & access &Connector as per TS	SET	1.00		
10	SITC Disc Insulator Polymer 33/11kv as per TS	SET	3.00		
11	SITC post insulator 33/11kv as per TS	SET	3.00		
12	SITC AAAC 33/11KV Cond,Clamps and connector as per TS	LUM	1.00		
13	SITC 3Cx 300 AL XLPE armoured Power Cable as per TS	LUM	1.00		
14	SITC JT kits 3C X 300 AL XLPE cable as per TS	SET	2.00		
15	SITC Cu XLPE arm Control cables, ter mat AS PER TS	LUM	1.00		
16	SITC CT Console Box	NO	1.00		
17	SITC 300mm/150mm width GI Perforated cable tray with accessories for control cable AS PER TS	LUM	1.00		
18	SITC 450mm/300mm GI Ladder type cable tray with accessories for power cable AS PER TS	LUM	1.00		
19	SITC Earthing Pipe with clamp, funnel & mesh as per TS	LUM	1.00		
20	SITC GI Flat for earthing of equipment's and earth grid 50x 6 mm AS PER TS	LUM	1.00		
21	SITC Cage for complete package including top & entry gate with lock	SET	1.00		
22	SITC Structure for Isolator , VCB, CT, PT, LA, Reactor, Capacitor Bank etc.	LUM	1.00		
23	SITC Civil Foundation for the above structure & Panels etc.	LUM	1.00		
24	SITC RCC Cable Trench for control and power cables with insert plates & cable tray supports etc.	LUM	1.00		
25	SITC Earth pit Chamber for earth pits etc	LUM	1.00		
				TOTAL	
				GST 18%	
				Total Inclusive of GST 18%	

PROPOSED LOCATIONS for 11KV & 33KV CAPACITOR BANK INSTALLATION								
Sr. No.	**Circle**	**Location**	**Voltage Rating**	**Tapping Point**	**Station DC Voltage**	**Existing Relay Model**	**Civil Inputs**	**Cable Length**
1	Bargarh	Paikmal PSS	33kV	OH conductoring from 33kV Bus	24V	No VCB in incomer	Civil related activities like land levelling back filling etc. to be considered as per actual site condition.	PC 150 Meter CC 100 meter
2	Bargarh	Kundakhai PSS	11kV	From Transformer 11kV side through cable	48V	SIEMENS 7SR2244		PC 150 Meter CC 100 meter
3	Kalahandi	Chalna PSS	11kV	From Transformer 11kV side through cable	48V	SIEMENS 7SR2244		PC 100 meter CC 100 meter
4	Bolangir	Salebhata PSS	11kV	From Transformer 11kV side through cable	48V	SIEMENS 7SR2244		PC 150 meter CC 100 meter
5	Bolangir	Cheruapali PSS	11kV	From Transformer 11kV side through cable	24V	SIEMENS 7SR5111		PC 100 meter CC 100 meter
6	Sambalpur	Dhulunda PSS	11kV	From Transformer 11kV side through cable	48V	SIEMENS 7SR2244		PC 100 meter CC 100 meter

1. The bids will be evaluated commercially on the overall lowest BOQ.

2. The bidders are advised to quote prices strictly in the above format and for all the line items as mentioned above. Failing to do so, bids are liable for rejection.

3. The bidders are advised to quote prices strictly in the above format. Failing to do so, bids are liable for rejection.

4.The bidder must fill each and every column of the above format. Mentioning “extra/inclusive”/other conditions in any of the column may lead for rejection of the price bid.

5. No cutting/ overwriting in the prices is permissible.

6.The quantity mentioned above are for evaluation purpose only and may vary as per actual site requirement.

ANNEXURE II

Technical Specifications

(Attached separately)

ANNEXURE III

Schedule of Deviations

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

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

S. No.	Clause No.	Tender Clause Details	Details of deviation with justifications

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

Seal of the Bidder:

Signature:

Name:

ANNEXURE IV

Schedule of Commercial Specifications

(The bidders shall mandatorily fill in this schedule and enclose it with the offer Part I: Technical Bid. In the absence of all these details, the offer may not be acceptable.)

S. No.	Particulars	Remarks
1.	Prices firm or subject to variation (If variable indicate the price variation clause with the ceiling if applicable)	Firm / Variable
1a.	If variable price variation on clause given	Yes / No
1b.	Ceiling	--------- %
1c.	Inclusive of Excise Duty	Yes / No (If Yes, indicate % rate)
1d.	Sales tax applicable at concessional rate	Yes / No (If Yes, indicate % rate)
1e.	Octroi payable extra	Yes / No (If Yes, indicate % rate)
1f.	Inclusive of transit insurance	Yes / No
2.	Delivery	Weeks / months
3.	Guarantee clause acceptable	Yes / No
4.	Terms of payment acceptable	Yes / No
5.	Performance Bank Guarantee acceptable	Yes / No
6.	Liquidated damages clause acceptable	Yes / No
7.	Validity (180 days) (From the date of opening of technical bid)	Yes / No
8.	Inspection during stage of manufacture	Yes / No
9.	Rebate for increased quantity	Yes / No (If Yes, indicate value)
10.	Change in price for reduced quantity	Yes / No (If Yes, indicate value)
11.	Covered under Small Scale and Ancillary Industrial Undertaking Act 1992	Yes / No (If Yes, indicate, SSI Reg'n No.)

ANNEXURE V

Checklist of all the documents to be submitted with the Bid

Bidder has to mandatorily fill in the checklist mentioned below:-

S. No.	Documents attached	Yes / No / Not Applicable
1	EMD of required value	
2	Tender Fee as mentioned in this RFQ	
3	Company profile/ organogram	
4	Signed copy of this RFQ as an unconditional acceptance	
5	Duly filled schedule of commercial specifications (Annexure IV)	
6	Sheet of commercial/ technical deviation if any (Annexure III)	
7	Balance sheet for the last completed three financial years; mandatorily enclosing Profit & loss account statement	
8	Acknowledgement for Testing facilities if available (duly mentioned on bidder letter head)	
9	List of Machine/ tools with updated calibration certificates if applicable	
10	Details of order copy (duly mentioned on bidder letter head)	
11	Order copies as a proof of quantity executed	
12	Details of Type Tests if applicable (duly mentioned on bidder letter head)	
13	All the relevant Type test certificates as per relevant IS/ IEC (CPRI/ ERDA/ other certified agency) if applicable	
14	Project/ Supply Completion certificates	
15	Performance certificates	
16	Client Testimonial/ Performance Certificates	
17	Credit rating/ Solvency certificate	
18	Undertaking regarding non blacklisting (On company letter head)	
19	List of trained/ Untrained Manpower	

Annexure VI

Acceptance Form for Participation In Reverse Auction Event

(To be signed and stamped by the bidder)

In a bid to make our entire procurement process more fair and transparent, TPWODL intends to use the reverse auctions as an integral part of the entire tendering process. All the bidders who are found as technically qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

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

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

Signature & Seal of the Bidder

Annexure VII

Scope of Work and SLA

Scope of work

1. This specification covers the technical requirements of Design, Engineering, Manufacturing, supplying, testing at manufacturer's works, Packing, transportation, and unloading of 11kV Capacitor Bank at site/stores complete with all accessories for efficient and trouble free operation at the site. The specific requirements are covered in the enclosed technical data sheet.
2. It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to TPWODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.
3. The scope includes all the civil work including back filling, leveling, Equipment foundations, earthing pits, cage fencing, access gates, cable trench.
4. Site visits to be done by bidders and final BOM to be submitted prior to technical evaluation.
5. Tentative layout to be submitted by bidders during Prebid discussion to TPWODL.
6. **Earthing:**
   Adequate number of earth electrodes, heavily coated GI Flat of 50mmX6mm shall be provided for proper earthing connections. Two earth Pads diagonally opposite shall be provided for earthing for the elevating structure. Dual earthing point for each equipment shall be provided.

7. **Fencing:**
   Complete Cage type fencing shall be provided for Capacitor Bank, Series reactor and NCT. At least 750 mm(11kV) & 1000 mm(33kV) clearance from all the live parts of cap bank and fencing to be maintained. Cage fencing in welded mesh of size 19MMx19MM to restrict rodent and reptile entry, welded/supported in MS structural steel framework covering the capacitor bank from all sides and at the top shall be provided to isolate the equipment. Minimum dia. of fencing mesh wire shall be 10SWG. Height of fencing and all clearances shall be as per the electrical clearance requirements. Gates as per the requirements shall be provided at desired locations for access. All MS work for cage fencing shall be heavily galvanized as per IS 4826. Structural steel work shall be supported on RCC foundations. Earthing of fencing door via insulated copper cable to be provided. This also includes supply of foundation bolts. Door limit switch shall be provided in enclosure doors. Earthing arrangement for the fencing along with the cap bank shall be provided by bidder.

8. **Guarantee:**
   Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 66 months from the

date of last supplies made under the contract, whichever is earlier, bidder shall be liable to undertake to replace/rectify such defects at his own costs, within mutually agreed timeframe, and to the entire satisfaction of TPWODL, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus, the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company.

Civil Scope:

1.0 Capacitor Bank Foundation
2.0 Cable Trench to be extended up to Capacitor Bank
3.0 Cable Trench Cover for newly constructed Cable Trench to be provided.
4.0 Capacitor Bank Area to be done PCC & Gravelling as per technical requirement of CapacitorBank
5.0 Modification require in Control Room Building for any Panel Installation
6.0 Fencing to be done as per technical requirement of Capacitor Bank if required
7.0 Minor Filling & any approach require upto Capacitor Bank to be provided by bidder.

ANNEXURE X

TATA CODE OF CONDUCT

The Owner abides by the Tata Code of Conduct in all its dealing with stake holders and the same shall be binding on the Owner and the Contractor for dealings under this Order/ Contract. A copy of the Tata Code of Conduct is available a tour website:

https://www.tatapower.com/pdf/aboutus/Tata-Code-of-Conduct.pdf

The Contractor is requested to bring any concerns regarding this to the notice of our Chief Procurement & Stores e-mail ID: sunilk.sharma@tpwesternodisha.com

Annexure XI

ENVIRONMENT & SUSTAINABILITY POLICY

TATA

CORPORATE ENVIRONMENT POLICY

Tata Power is committed to a clean, safe and healthy environment, and we shall operate our facilities in an environmentally sensitive and responsible manner. Our commitment to environmental protection and stewardship will be achieved by:

- Complying with the requirements and spirit of applicable environmental laws and striving to exceed required levels of compliance wherever feasible
- Ensuring that our employees are trained to acquire the necessary skills to meet environmental standards
- Conserving natural resources by improving efficiency and reducing wastage
- Making business decisions that aim towards sustainable development
- Engaging with stakeholders to create awareness on sustainability

(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER
Lighting up Lives!

CORPORATE SUSTAINABILITY POLICY

At Tata Power, our Sustainability Policy integrates economic progress, social responsibility and environmental concerns with the objective of improving quality of life. We believe in integrating our business values and operations to meet the expectations of our customers, employees, partners, investors, communities and public at large

- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the customers and adhere to our promised standards of service delivery
- We will respect the universal declaration of human rights, International Labour Organization's fundamental conventions on core labour standards and operate as an equal opportunities employer
- We shall encourage and support our partners to adopt responsible business policies, Business Ethics and our Code of Conduct Standards
- We will continue to serve our communities:
  - By implementing sustainable Community Development Programmes including through public/private partnerships in and around our area of operations
  - By constantly protecting ecology, maintaining and renewing bio-diversity and wherever necessary conserving and protecting wild life, particularly endangered species
  - By encouraging our employees to serve communities by volunteering and by sharing their skills and expertise
  - By striving to deploy sustainable technologies and processes in all our operations and use scarce natural resources efficiently in our facilities
  - We will also help communities that are affected by natural calamities or untoward incidence, or that are physically challenged in line with the Tata Group's efforts

The management will commit all the necessary resources required to meet the goals of Corporate Sustainability.

(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER
Lighting up Lives!

ANNEXURE II

Technical Specification

STANDARAD TECHNICAL SPECIFICATION

For

HV FEEDER BCPU NON-DIRECTIONAL OVER-CURRENT & EARTH FAULT PROTECTION RELAY

DETAILS OF DOCUMENT REVISION:

Rev. No.	Rev. Date	Changes Made	Details of document update	Updated By	Approved By
R2	14/03/2022	Updated	Updated as per TPWODL requirements	KGR	VBN
R3	01/08/2023	Updated	Updated as per TPWODL requirements	KGR	VBN

CONTENTS

1. SCOPE:

The scope of this document is to give design and constructional features, inspection, supply, loading, forwarding and unloading of HV FEEDER NON-DIRECTIONAL OVER-CURRENT & EARTH FAULT PROTECTION RELAY to be used in TPWODL, Odisha distribution network.

2. APPLICABLE STANDARDS:

Except when they conflict with the specific requirements of this specification, the Relays at various sub-units/components mounted on the panels shall conform to the latest revisions of the following standards:

Sr No	Standard	Description
1	IS 3231 / 1986 Reaffirmed 1997	Electrical relays for power system protection
2	IEC 60255 amended up to date	Numerical biased protection relay
3	IEC 61850	Communication Protocol

3. CLIMATIC CONDITIONS:

The service conditions shall be as follows:

[a] Maximum altitude above sea level	: 1000 m
[b] Maximum ambient temperature	: 50 ° C
[c] Maximum daily average ambient air temperature	: 40 ° C
[d] Minimum ambient air temperature	: -5° C
[e] Maximum temperature attainable by an object exposed to the sun	: 60 ° C
[f] Maximum yearly weighted average ambient temperature	: 32° C
[g] Maximum relative humidity	: 100%
[h] Average no. of rainy days in a year	: 120 days
[i] Average annual rainfall	: 150 cm
[j] Maximum wind pressure	: 260 Kg/Sq.m.
[k] Average number of thunderstorm days per annum	: 70

Environmentally, the region where the equipment will be installed includes coastal areas, subject to high relative humidity, which can give rise to condensation.
Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for Relays.
Therefore, material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive, tropical and humid coastal atmosphere.

4. SYSTEM CONDITION:

PARTICULARS	DESCRIPTION
Frequency	50 Hz (±3%)
Nominal System Voltage	33 KV / 11 KV
Maximum System Voltage	36Kv / 12 KV
Number of phases	Three
Neutral Earthing Arrangement	Solidly Grounded

5. GENERAL TECHNICAL REQUIREMENT:

Particulars	Requirement
Protection Elements	3 O/C + 1 E/F + Two Stages of High set for both O/C & E/F separately + UV & OV, Circuit breaker failure (CBF) and Auto-Reclosure (79). Earth fault shall be calculated one considering phase coils in protection relay.
CT Secondary input current to relay	Selection for 1 A / 5 A through software & shall be possible at site
Operating Characteristics selectable	1. IDMT IEC – 3 Sec. 2. IDMT - 1.3 sec. 3. IEC Very Inverse 4. IEC Extremely Inverse 5. IEC Definite time 6. IEC User defined inverse 7. IEC Long time inverse
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance
IDMT O/C Plug setting	5 % to 200% in steps of 1%
IDMT E/F Plug setting	5 % to 200 % in steps of 1 %
High Set O/C setting	10 % to 2000 % in steps of 1 % (20 times)
High Set E/F setting	10 % to 2000 % in steps of 1 % (20 times)
Time multiplier setting for O/C & E/F for IDMT	0.02 to 1.0 in steps of 0.01
Time delay for High set O/C & E/F	0 sec to 10 sec in steps of 0.01 sec
Memory storage for fault information	Storing of latest 500 events with date & time stamping and storage of latest 10 fault records, fault amplitude , type of fault, faulty phase with FIFO feature (available on display & shall be retrievable through software in standard CFG format). Waveform capturable from both relay start & relay trip shall be configurable. Relay Shall have inbuilt battery back-up of at least 12 Hrs.

Broken Conductor Protection	The relay shall be capable of Broken Conductor Protection. Setting range should be I2/I1 from 0.5 to 1.0
Negative Phase Sequence Protection.	The relay shall be capable of Negative Phase Sequence Protection.
Over-voltage & Under-voltage protection	Relay shall comprise of two stage of Over-voltage protection and two stage Under-voltage protection. Single phase to ground PT voltage shall be 63.5V
*Neutral displacement protection (NDR)	Separate voltage coil (low voltage) to be considered in protection relay. (Note: This one is to be considered only for capacitor bank CRP).
*Neutral unbalance protection	Separate current coil (low/sensitive currents) to be considered in protection relay. (Note: This one is to be considered only for capacitor bank CRP).
Pre-Logic	User programmable facility to achieve customized functions, create logics with external information through DI/DO etc. TPWODL approved configuration shall be supplied as a pre-configured relay.
Configuration Method	Relay shall be configurable from HMI as well as software through Laptop.
Relay Hardware Requirement	1. Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatically conditions. 2. Relay electronic cards shall have conformal coating.
Monitoring on HMI	1. RMS Current, Voltage (Primary & Secondary) 2. Active Power 3. Reactive Power 4. Power frequency 5. Trip Circuit Monitoring Feature (TCS)
Mounting	1. Relay should be flush mounted with preferably DRAW OUT type model with CT shorting facility of make before break type. OR 2. Flush Mounted with fixed type connections shall also be Considered 3. All relay connections shall be fixed screw type terminals with adequate spacing on back side. 4. Galvanic isolation between field connection & relay hardware.
LED indications	7 programmable LEDs & 1 LED for healthy indication. Colour of LED 01- Power ON – Green colour 02- Pick up – Yellow colour 03 – L1 – Red colour 04 – L2– Red colour 05 – L3– Red colour 06 – E/F– Red colour

	07 – High set– Red colour
Push buttons	Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.
Output contacts	The relay shall have 12 no's potential free and heavy duty programmable contacts. Min 12 no's relay output contacts shall be provided for specific function outputs for alarm, trip & trip circuit supervision. All output contacts should be freely programmable. Power contact should be capable of braking trip coil current.
Contact rating	Continuous carry -5A, Make & carry for 0.2 sec-30A
Input contacts	The relay shall have 19 no's of binary input contacts with pickup value 80% of input voltage. Binary inputs pickup should be only on DC voltages & not on AC voltages.
Self-diagnosis feature	Relay should have self-diagnosis for its healthiness of functioning & should show indication in case of its failure. The relay shall have continuous automatic self-monitoring and alarming facilities. The above feature shall not affect the relay availability i.e. when an actual fault occurs in the system during the checking cycle, the above cycle shall be immediately interrupted and the relay shall check and respond to the system fault. The system shall have the following visual indications for supervision of each command channel.
Password protection	The relay should have provision password protection for the applied settings
Selectivity of primary CT current	The relay should have facility to select the primary CT current from 50A to 2000A in steps of 50A. The relay should display the CT primary current.
Operational indicator	LED
IS reference	IEC 61850, IEC 60255, IS 3231 amended up to date
LCD Display	Relay shall have minimum 4 line LCD backlit display
Features	Minimum 2 setting groups
Disturbances recorder	The DR shall capture waveforms of analogue channels, and all the DI channels & the DO channels. It shall be possible to configure and capture in DR, all the internal functions like overcurrent start etc. for better analysis of the fault information. It shall have a minimum storage of 10 records of 1 sec each. It shall have facility to record information prior to fault incidence with a pre-trigger time setting of 25 % (programmable).
Communication protocol	Numerical relays shall have a data port for local access using Hand-held device / Notebook PC (with software). All the numerical relays shall have common software. Each relay shall have IEC 61850 port which can be used for SCADA applications and relay networking for downloading DR

	waveforms. The relay communication protocol used shall support time stamping and waveform file transfer. Details of Numerical relay communication ports are as follows. Front: Ethernet port Rear: IEC 61850 (for integration of relays with SCADA and accessing DR from remote through Tata Power automation WAN) SNTP protocol support (from SCADA system). Parallel Redundancy Protocol (PRP) / Rapid Spanning Tree Protocol (RSTP) feature will provided as default with dual RJ45 or dual FO port.
Pulse Sampling Rate	Relay shall have the Scan rate of sampling each of the analog channels having the fundamental frequency of 50HZ in the order of 1000Hz or better sampling.
Special Requirement	One complete set of Relay configuration tool (Laptop, communication cable, Moxa etc) to be supplied for every 30 no's lot of Relays, and pre-configured relay software along with all device configuration software to be pre- installed.
BCPU FUNCTIONALITY	
Bay Control Elements	Circuit breaker control function should have open & close command of CB as well as status. Compatible with L/R.
Response Time	Signal type - Response time to/from HMI Digital Input - 1 Sec Analogue Input - 1 Sec Digital output - 0.75 Sec
Time Synchronization	The time synchronization of BCPU shall be in line with central SCADA master station (FEP) via data concentrator placed at substation.
Interlock Function	All bay level interlocks are to be incorporated in the Bay level unit so as to permit control from the Bay level unit/ local bay mimic panel, with all bay interlocks in place, during maintenance and commissioning or in case of contingencies.
Sequence of event	BCPU shall be capable of handling 2000 events and buffer will be on FIFO model.
Contact Bouncing	The inputs shall be acquired by exception with 1 ms resolution. Contact bouncing in inputs shall not be assumed as change of state.

System Architecture for SCADA Communication:

The above BCPU shall be configured in such a way that it will enable SAS on a decentralized architecture and on a concept of bay-oriented, distributed intelligence. Functions shall be decentralized, object-oriented and located as close as possible to the process. The main process information of the station shall be stored in distributed databases. The typical
SAS architecture shall be structured in two levels, i.e. in a station and a bay level.

At bay level, the IEDs shall provide all bay level functions regarding control, monitoring and protection, inputs for status indication and outputs for commands. The IEDs should be directly connected to the switchgear without any need for additional interposition or transducers. Each bay control IED shall be independent from each other and its functioning shall not be affected by any fault occurring in any of the other bay control units of the station.

The high-voltage apparatus within the station shall be operated from different places: Remote control centres (MCC/BCC), Local Bay controller IED (in the bays).
Operation shall be possible by only one operator at a time. The operation shall depend on the conditions of other functions, such as interlocking, synchro-check, etc. however shall report all cyclic and digital data to at least 8 masters. The priority shall always be on the lowest enabled control level.

Errors in Communication:
A significant problem to be overcome in the implementation of communication links is the possibility of electromagnetic interference. The low voltage levels that are used on most types of communication link may be prone to interference as a result. Careful design of the interfaces between the devices used and the communication bus, involving the use of opto-couplers is required to minimise the risk. Care over the arrangement of the communication cables is also required. It may also help to use a communication protocol that incorporates a means of error detection/correction. While it may not be possible to correct all errors, detection offers the opportunity to request re-transmission of the message, and also for statistics to be gathered on error rates on various parts of the system. An unusually high error rate on a part of the communication system can be flagged to maintenance crews for investigation.

Breaker Control Philosophy:
The data exchange with the Data Concentrator with bay level electronic device shall take place via the inter-bay bus. Capability to control, monitor and protect each individual bay from the respective bay level equipment in case of maintenance of Remote/ Local Work Station or if the communication to a particular bay fails should be provided. The Bay Units shall be connected directly to the inter bay -bus independent of each other and its functioning shall not be affected by any fault occurring i n any of the Bay units either in its own bay or other Bay units pertaining to other bays of the station. Clear control priorities shall prevent initiation of operation of a single switch at the same time from more than one of the various control levels i.e. Bay level & station level and there shall be interlock between various control & protection level. The priority shall always be with the lowest enabled control level. Normal operation shall be thru Remote/Local Workstation till the time centre SCADA is not in operation however failure of any equipment shall automatically transfer the control to lower level.

BKR Control From	BKR L/R	CB L/R	BCU L/R
BKR PANEL	Local		

TNC Switch	Remote	Local	
BCU Local	Remote	Local	Local
SCADA	Remote	Remote	Remote

6. MARKING:

Each Relay shall be legibly and indelibly marked to show the following:

1. Name of the Purchaser : "TPWODL"
2. Name or trade mark of the manufacturer
3. Year of Manufacturing
4. Certificate mark

7. TESTS:

All routine, acceptance & type test shall be carried out in accordance with the relevant IS/IEC. All routine, acceptance & type test (if not valid) shall be witnessed by TPWODL authorized representative. All the components shall be type tested with the relevant standard.
The Relay shall comply with following routine, type and acceptance tests as per IS 3231 / 1986 Reaffirmed 1997 and IEC 61850.

A. Type tests: (As per IEC 60255-6)

1. Functional Test (Under normal operating condition)
2. Impulse voltage test
3. High frequency interference test
4. Discharge of static electricity test
5. High energy surge voltages (Surge immunity test)
6. Power system frequency test
7. Power consumption in current circuit
8. Power consumption in auxiliary circuit
9. Dielectric test
10. Radiated radio frequency electromagnetic field immunity test
11. Fast transient disturbance test
12. Vibration response test
13. Shock response test
14. Cold test (storage & operating)
15. Dry heat test (Storage & Operating)
16. Degree of protection IP 54
17. Thermal (short time thermal withstand test)
18. Drop out , pick up , ratio test
19. DC supply interruption
20. AC ripples on DC supply
21. Voltage dips and short interruptions

B. Acceptance test:

1. Operating value test
2. Operating time test
3. Operating Principle Analysis
4. Communication/ SCADA compatibility conformance Test

C. Routine tests:

1. Operating value test
2. Operating time test
3. Communication/ SCADA compatibility conformance Test
4. Functionality Test

8. TESTING FACILITIES:

a. The Bidder must clearly indicate what testing facilities are available in the works of the manufacturer and whether the facilities, are adequate to carry out all the routine as well as type tests. These facilities should be made available to Purchaser's Engineers is deputed to carry out or witness the tests. If any tests cannot be carried out at the manufacturer's works, the reasons should be clearly stated in the tender.

b. The Bidder shall furnish detailed type test reports of the offered Relay as per clause-7 of this specification. All the above Type Tests shall be carried out at laboratories (ERDA/CPRI).

9. DRAWINGS:

Following drawings and documents shall be prepared based on Purchaser's specifications and statutory requirements and shall be submitted with the bid:

S.No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	GA Drawing	√		√
3	Installation Instruction/Manual		√	√
4	QA & QC Plan	√	√	√
5	Test Certificates	√	√	√

After the award of the contract, four (4) copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval within 08 days. Bidder shall be subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser
All the documents & drawings shall be in English language.

Instruction/Manuals: Bidder shall furnish softcopy and three (3) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices if any.

10. TEST CERTIFICATES:

1. The test shall be carried out as per the IS before dispatch and the test certificates shall be furnished for approval.
2. Copies of type test certificates of identical materials for each type with dimensional drawings shall invariably accompany the tender.
3. The type test validity shall be in accordance with CEA guidelines, May-2020.

11. SAMPLES:

Bidder shall send one sample relay for TPWODL approval after electrical test at TPWODL premises. During testing OEM engineer shall be present to resolve the query.

12. PACKING:

Each relay must be packed as per industry standard to maintain its healthiness.

13. PRE-DESPATCH INSPECTION:

Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the Purchaser.
Following documents shall be sent along with material

a) Test reports
b) MDCC issued by Purchaser

c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)

14. INSPECTION AFTER RECEIPT AT STORES:

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection.

15. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning. Bidder shall be liable to undertake to replace/rectify such defects at his own costs, within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

Latent defect clause: Bidder shall be responsible for free replacement for another 3 years period from the end of guarantee period for any latent defect if noticed or reported by the company. In case failure of IEDs during warranty period exceeds 20% of total relays of PO , this will be termed as latent defect and free replacement of all IEDs of the PO will be required without any cost implication to TPWODL

16. QUALITY CONTROL:

The bidder shall submit with the offer Quality Assurance Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

17. TRAINING:

BA shall provide training of IED functionalities, 61850 configuration, relay parameterization to owners engineers- 10 persons, 3 days at the location decided by TPWODL without any extra charges. Venue of the training shall be either bidder works or TPWODL office as per the decision of TPWODL.

Training shall cover following aspects but not limited to only these topics:

Engineering configuration of IED s per IEC 61850, interfacing with relay software, parameterisation, relay setting calculation, Project file preparation uploading/downloading of project file, downloading FDR, protection function its significance and operation, GOOSE, interoperability Data set preparation, secondary injection testing via computerized IED testing kit, Simulation of protection function and BI/BO through software/Relay HMI etc.

18. GUARANTEED TECHNICAL PARTICULARS:

GTP FOR HV FEEDER NON-DIRECTIONAL OVER-CURRENT & EARTH FAULT PROTECTION RELAY

Particulars	Requirement	
Protection Elements	3 O/C + 1 E/F + Two Stages of High set for both O/C & E/F separately + UV & OV, Circuit breaker failure (CBF) and Auto-Reclosure (79). Earth fault shall be calculated one considering phase coils in protection relay.	
CT Secondary input current to relay	Selection for 1 A / 5 A through software & shall be possible at site	
Operating Characteristics selectable	8. IDMT IEC – 3 Sec. 9. IDMT - 1.3 sec. 10. IEC Very Inverse 11. IEC Extremely Inverse 12. IEC Definite time 13. IEC User defined inverse 14. IEC Long time inverse	
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance	
IDMT O/C Plug setting	5 % to 200% in steps of 1%	
IDMT E/F Plug setting	5 % to 200 % in steps of 1 %	
High Set O/C setting	10 % to 2000 % in steps of 1 % (20 times)	
High Set E/F setting	10 % to 2000 % in steps of 1 % (20 times)	
Time multiplier setting for O/C & E/F for IDMT	0.02 to 1.0 in steps of 0.01	

Time delay for High set O/C & E/F	0 sec to 10 sec in steps of 0.01 sec	
Memory storage for fault information	Storing of latest 500 events with date & time stamping and storage of latest 10 fault records, fault amplitude , type of fault, faulty phase with FIFO feature (available on display & shall be retrievable through software in standard CFG format). Waveform capturable from both relay start & relay trip shall be configurable. Relay Shall have inbuilt battery back-up of at least 12 Hrs.	
Broken Conductor Protection	The relay shall be capable of Broken Conductor Protection. Setting range should be I2/I1 from 0.5 to 1.0	
Negative Phase Sequence Protection.	The relay shall be capable of Negative Phase Sequence Protection.	
Over-voltage & Under-voltage protection	Relay shall comprise of two stage of Over-voltage protection and two stage Under-voltage protection. Single phase to ground PT voltage shall be 63.5V	
*Neutral displacement protection (NDR)	Separate voltage coil (low voltage) to be considered in protection relay (Note: This one is to be considered only for capacitor bank CRP).	
*Neutral unbalance protection	Separate current coil (low/sensitive currents) to be considered in protection relay. (Note: This one is to be considered only for capacitor bank CRP).	
Pre-Logic	User programmable facility to achieve customized functions, create logics with external information through DI/DO etc. TPWODL approved configuration shall be supplied as a pre-configured relay.	
Configuration Method	Relay shall be configurable from HMI as well as software through Laptop.	
Relay Hardware Requirement	1. Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatically conditions. 2. All Relay electronic cards shall have harsh environment conformal coatings.	
Monitoring on HMI	1. RMS Current, Voltage (Primary & Secondary) 2. Active Power 3. Reactive Power 4. Power frequency 5. Trip Circuit Monitoring Feature (TCS)	

Mounting	1. Relay should be flush mounted with preferably DRAW OUT type model with CT shorting facility of make before break type. OR 2. Flush Mounted with fixed type connections shall also be Considered. 3. All relay connections shall be fixed screw type terminals with adequate spacing on back side. 4. Galvanic isolation between field connection & relay hardware.	
LED indications	7 programmable LEDs & 1 LED for healthy indication. Colour of LED 01- Power ON – Green colour 02- Pick up – Yellow colour 03 – L1 – Red colour 04 – L2– Red colour 05 – L3– Red colour 06 – E/F– Red colour 07 – High set– Red colour	
Push buttons	Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.	
Output contacts	The relay shall have 12 no's potential free and heavy duty programmable contacts. Min 12 no's relay output contacts shall be provided for specific function outputs for alarm, trip & trip circuit supervision. All output contacts should be freely programmable. Power contact should be capable of braking trip coil current.	
Contact rating	Continuous carry -5A, Make & carry for 0.2 sec-30A	
Input contacts	The relay shall have 19 no's of binary input contacts with pickup value 80% of input voltage. Binary inputs pickup should be only on DC voltages & not on AC voltages.	
Self-diagnosis feature	Relay should have self-diagnosis for its healthiness of functioning & should show indication in case of its failure. The relay shall have continuous automatic self-monitoring and alarming facilities. The above feature shall not affect the relay availability i.e. when an actual fault occurs in the system during the checking cycle, the above cycle shall be immediately interrupted and the relay shall check and respond to the system fault. The system shall have the following visual indications for supervision of each command channel.	

Password protection	The relay should have provision password protection for the applied settings	
Selectivity of primary CT current	The relay should have facility to select the primary CT current from 50A to 2000A in steps of 50A. The relay should display the CT primary current.	
Operational indicator	LED	
IS reference	IEC 61850, IEC 60255, IS 3231 amended up to date	
LCD Display	Relay shall have minimum 4 line LCD backlit display	
Features	Minimum 2 setting groups	
Disturbances recorder	The DR shall capture waveforms of analogue channels, and all the DI channels & the DO channels. It shall be possible to configure and capture in DR, all the internal functions like overcurrent start etc. for better analysis of the fault information. It shall have a minimum storage of 10 records of 1 sec each. It shall have facility to record information prior to fault incidence with a pre-trigger time setting of 25 % (programmable).	
Communication protocol	Numerical relays shall have a data port for local access using Hand-held device / Notebook PC (with software). All the numerical relays shall have common software. Each relay shall have IEC 61850 port which can be used for SCADA applications and relay networking for downloading DR waveforms. The relay communication protocol used shall support time stamping and waveform file transfer. Details of Numerical relay communication ports are as follows. Front: Ethernet port Rear: IEC 61850 (for integration of relays with SCADA and accessing DR from remote through Tata Power automation WAN) SNTP protocol support (from SCADA system). Parallel Redundancy Protocol (PRP) / Rapid Spanning Tree Protocol (RSTP) feature will provided as default with dual RJ45 or dual FO port.	
Pulse Sampling Rate	Relay shall have the Scan rate of sampling each of the analog channels having the fundamental frequency of 50HZ in the order of 1000Hz or better sampling.	
Special Requirement	One complete set of Relay configuration tool (Laptop, communication cable, Moxa etc) to be supplied for every 30 no's lot of Relays, and pre-configured relay software along with all device configuration software to be pre- installed.	

BCPU FUNCTIONALITY		
Bay Control Elements	Circuit breaker control function should have open & close command of CB as well as status. Compatible with L/R.	
Response Time	Signal type - Response time to/from HMI Digital Input - 1 Sec Analogue Input - 1 Sec Digital output - 0.75 Sec	
Time Synchronization	The time synchronization of BCPU shall be in line with central SCADA master station (FEP) via data concentrator placed at substation.	
Interlock Function	All bay level interlocks are to be incorporated in the Bay level unit so as to permit control from the Bay level unit/ local bay mimic panel, with all bay interlocks in place, during maintenance and commissioning or in case of contingencies.	
Sequence of event	BCPU shall be capable of handling 2000 events and buffer will be on FIFO model.	
Contact Bouncing	The inputs shall be acquired by exception with 1 ms resolution. Contact bouncing in inputs shall not be assumed as change of state.	

Name & Signature of Bidder with seal

19. SCHEDULE OF DEVITAIONS:

The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the purchaser's specifications.

SCHEDULE OF DEVIATIONS:
(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company

Name & Signature of Bidder with seal

STANDARD TEHNICAL SPECIFICATION OF 11KV OUTDOOR CAPACITOR BANK RATING AT 1.5/2.5 MVAR WITH CIRCUIT BREAKER

PREPARED BY	REVIEWED BY	APPROVED BY
K GOVINDARAJ	ANUP JAWASE	S B KUNDARGI

CONTENTS

1.0 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing and forwarding, supply, unloading, Installation, site testing and commissioning at TPWODL stores/sites. Following equipment's / materials covered under the scope with all fittings, accessories and associated auxiliary equipment, mandatory spares which are required for efficient and trouble-free operation.

a) Cap bank unit with related accessories.

b) Rated VCB along with BCPU, CT&PT.-**

c) Special accessories/ items if any to support functioning of Cap bank.

** VCB and control panel, BCPU, Misc Relays related specs and GTP are included separately.

2.0 CLIMATIC CONDITIONS

The service conditions shall be as follows:

1. Maximum altitude above sea level 1,000m
2. Maximum ambient air temperature 50°C
3. Maximum daily average ambient air temperature 35°C
4. Minimum ambient air temperature 3.5°C
5. Maximum relative humidity 95%
6. Average number of thunderstorm days per annum (isokeraunic level) 70
7. Average number of rainy days per annum 120
8. Average annual rainfall 150cm
9. Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3g
10. Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15g
(g being acceleration due to gravity)
11. Wind velocity: 300 km/hr, 200 km/hr and 160 km/hr Environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

3. APLICABLE STANDARD

The Material covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards /IEC/ International **Standards and shall conform to the regulations of local statutory authorities.**

IS:13925 part 1 - 2012	Shunt capacitors for AC Power systems having a rated voltage above 1000V
IS:12672	Internal Fuses for Shunt capacitors
IS:2099	Bushings for voltage above 1000V
IS:5553	Reactors
IS:13118	High Voltage AC Circuit Breakers
IS:9921	AC Disconnectors (Isolators) & earthing switches
IS:9920	High Voltage Switches
IS:2705	High Voltage Current Transformers
IS 731/1971	Tests on post insulators for system with nominal voltage higher than 1000V
IS:2071	High Voltage tests
IEC Recommendations CISPR	RIV measurements
IS:2609	Partial Discharge measurements
IS:3716	Insulation co-ordination & Application Guide.
IS:1554	Low Voltage Cables
IS: 3070 Draft ETDC 30	Metal Oxide Surge Arrestors
as per IS Rules	Clearances in Air

4.0 TYPE AND RATING

The capacitor bank shall be suitable for outdoor operation under the climatic conditions, as specified in Tender specification, without any protection from sun and rain.

The capacitor bank shall have the following rating: -

S. No.	PARTICULARS	11KV	11KV
1	Capacitor bank rating	1.5MVAr	2.5MVAr
2	Nominal System Voltage	11 KV	11 KV
3	Highest System Voltage	12 KV	12 KV
4	System power frequency in Hz.	50HZ	50HZ

5	Temperature class with allowable maximum and minimum temperature in °C	50/5 deg C	50/5 deg C
6	Rated voltage per unit in KV	7.3KV	7.3KV
7	Rated output per unit in KVAR	Bidders to be provide	Bidders to be provide
8	Rated capacitance in µF.	Bidders to be provide	Bidders to be provide
9	Rated current in Amp.	Bidders to be provide	Bidders to be provide
10	Rated insulation level (Nominal voltage/Impulse voltage).	28Kv rms / 75KVp	28Kv rms / 75KVp
11	Discharge time/voltage in second/voltage.	Within 600 secs	Within 600 secs
12	Fusing arrangement either internally fused or externally fused or fuse less	Internally fused	Internally fused
13	Number of bushing, double/single/triple bushing.	Double	Double
14	Number of phases. Single phase or three phase	3 phase	3 phase
15	Type of connection	Double star (YY)	Double star (YY)
16	Capacitor bank type	Fixed type	Fixed type
	Minimum clearances		
a)	Between Phases	Bidders to be provide	Bidders to be provide
b)	Between Live Parts & Ground	Bidders to be provide	Bidders to be provide
c)	Phase to earth	Bidders to be provide	Bidders to be provide
d)	Minimum ground clearance from live part	Bidders to be provide	Bidders to be provide
e)	Creepage Distance(minimum)	Bidders to be provide	Bidders to be provide
f)	Mechanical endurance	Bidders to be provide	Bidders to be provide
g)	Electrical endurance	Bidders to be provide	Bidders to be provide

The above are our minimum requirements. The manufacturers may offer their standard design, keeping in view the minimum requirements.

5. STANDARDS

The capacitor bank shall comply with the requirements of IS:13925 part 1 – 2012, IS:12672, IS:2099, IS:5553, IS:13118, IS:9921, IS:9920, IS:2705, IS 2544/1973 IS 731/1971, IS:2071, IS:2609, IS:3716, IS:1554, IS: 3070 Draft ETDC 30 with latest amendment thereof, except wherein specified otherwise. Equipment, meeting any other authoritative standard, which ensures equal or better quality then the standard mentioned above, would also be acceptable. The bidders shall clearly indicate the applicable standards to which their equipment complies-with. A copy of such standard may also be enclosed.

6. GENERAL

The capacitor bank and all other equipments other than the indoor control panel shall be suitable for being installed outdoors & would be located at switchyards of various substations. The equipment shall remain functional during and subsequent to the application of seismic loading. The exact value of seismic level (Horizontal acceleration) and maximum wind pressure may be considered as 0.3 g and 300/200/150 km/hr. respectively. The shunt capacitor should be designed for satisfactory operation even with presence of harmonics in the system. Suitable devices of required ratings should be included in the scope of supply. The general arrangement drawing along with the detailed lay out plan of the capacitor bank shall be submitted for necessary approval. Each bank shall be of 1.5/2.5 MVAr rating at 11kV and shall be double star connected bank with neutral point connected through NCT. If there are more than one capacitor banks in the sub-station, damping reactors of 0.2% rating should be used on the neutral side of the capacitor bank. The inductance value will control amplitude and frequency of the inrush current at back to back switching. Peak capacitor inrush current hall be less than 100 times rated current of the capacitor and less than the breaker making current. The protective scheme shall be by a current relay arranged as follows:

i) If the failure of one or more elements cause an over voltage of less than 10% tolerable on the other remaining healthy units, then the unbalance current shall cause in the first step to sound an alarm. But if more than the above numbers of elements fail causing the voltage rise of more than 10% on the other healthy units or the over voltage on the remaining healthy elements exceeds 65% then the unbalance current shall cause to trip and isolate the capacitor bank instantaneously in the second step.

ii) The per phase and individual star group rating shall be built up if required by series- parallel combination of individual units so as to achieve the desired bank rating.

iii) Internal fuses shall comply with IS- 12672 and shall be provided for the several individual elements within each unit.

iv) Although the tolerances in the output rating of each individual unit shall be as per IS- 13925 (Part I) 2012, yet it shall be ensured that in a completely assembled bank, the departures from the nominal rating and within the specified tolerance values shall not cause nuisance alarm or tripping since such alarm or tripping shall be to meet only with the protective requirements specified in (iii).

v) Individual units shall be designed to meet the requirements of the permissible overloads & with internal discharge devices as specified in IS- 13925 (Part I)/ 2012.

vi) Internal fuses for individual elements within unit shall be as per the manufacturer's design and shall be ensured for adequacy such as to withstand normal switching inrush transient currents, discharge current when the bank is switched off. Fuses shall be capable of disconnecting a faulty unit or element over a wide range of unit terminal voltages from 70 to 150 %. In case all the elements in the same row are fused out in cascade in an internal fuse unit then the fuse element blown out shall be capable of successful disconnection, with a voltage of not less than 100% rated voltage appearing across its terminals. The unit shall withstand this voltage successfully and continuously. An internal element/elements fuse blowing out shall not cause, case rupture of the container of the unit.

vii) The individual capacitor units shall be of ungrounded type with two bushings and fully insulated for rack potential. The capacitance shall be built up with high grade, all polypropylene dielectric film and aluminum foil. The polypropylene film shall cover the aluminum foil smoothly evenly and without any locked air pockets or voids. The containers shall be of CRCA sheet with minimum thickness 2mm duly welded and hermitically sealed. All welded joints shall be finished smoothly. The interior of the capacitor shall be degreased and derusted and shall not be painted. The insulating liquid shall be such that it shall remain chemically inert to the dielectric film. Aluminum foil shall not chemically degrade itself while in service.

viii) Guaranteed failure rate i.e. no. of units failing per year) should not be more than 0.5% per annum during warranty period. In case the failure rate exceeds 0.5% per annum, then the supplier will have to give as free replacement two capacitor units for each failed unit in excess to the above guaranteed figure.

ix) The raw material used for capacitor manufacturing i.e. PP film, non-PCB nontoxic oil & aluminium foil shall be of best quality obtainable in international market. Thickness of PP film (both sides hazy) shall be indicated in the technical particulars by weight method. No. of layers of dielectric shall not be less than three. Low loss capacitors shall be preferred. Offers with less than three layers of dielectric will not be considered. List of sources of raw material shall be enclosed along with the offer.

x) The capacitor elements shall be thoroughly dried & impregnated with an impregnant which had been completely refined & degasified so as not to have any gas or impurities which may cause detioration of the dielectric.

The impregnant used shall have low viscosity & high chemical stability. The impregnant should be non-PCB (NPCB).

7. SPECIFICATION FOR CAPACITOR BANKS

7.1 The capacitors shall be arranged in double star. Neutral Current transformer provided shall detect any unbalance due to Capacitor unit failure. Neutral Current transformer shall be provided between two Star points of the bank. Star point shall be ungrounded. Capacitor unit should be made up of all polypropylene film dielectric with NON-PCB impregnant liquid and provide with internal fuse element. The containers shall be made from CRCA sheet of thickness not less than 2mm. (14 SWG). The Capacitor unit should be arranged in open galvanized steel rack with copper tinned conductors for their interconnections and aluminium bus bar for interconnections between capacitor bank, L.A., series reactor and neutral current transformer.

7.2 The container shall be hermetically sealed by controlled arc welding/tig welding process. The metal flanges of the bushing should be soldered /welded to the container and covered with epoxy compound providing a strong hermetical seal to the container. Suitable mounting brackets, as required by the purchaser shall be welded to the container. The minimum creepage distance of the bushing shall be

375mm. The container of each capacitor unit shall be provided with suitable earthing terminal clearly marked

7.3 The capacitor bank shall be designed, manufactured and tested as Per IS-13925 (Part-I) 2012. The shunt Capacitor bank would be out door type & would be Located at switchyards of various substations. Unless otherwise specified, the capacitors shall be suitable for upper limit of temperature category 50° C as per IS-13925.

7.4 The standard rated output of a switched capacitor bank shall be 1.5/2.5 Mvar as specified at 11.00 kV rated voltage. The bank shall comprise of single-phase units each rated for 7.3kV phase to earth voltage connected in double star with neutrals interconnected through NCT. The maximum permissible overloads with regard to voltage, current and reactive output shall conform to IS: 13925 (part I) 2012 with latest amendments.

7.5 The power loss in capacitors shall not exceed 0.2 Watt/kVAr. Suitable discharge device shall be connected across the capacitor units in accordance with the provision of IS: 13925 (part I) 2012 with latest amendments. The discharge device shall reduce the residual voltage from the cross value of the rated voltage to 50V or less within 10 minutes after the capacitor is disconnected from the source of supply.

7.6 Better configuration with appropriate capacity of cell units may also be acceptable subject to approval of the Chief Engineer (Dist.) prior to tender finalization.

7.7 The outside of the container should have smooth and tidy look and should be coated with weather-proof and corrosion-resistant paint of white or light gray shade. The container/enclosure shall be painted with light gray colour, shade 631 as per IS: 5.

7.8 The capacitor shall be provided with a rating plate and terminal markings as stipulated in IS: 13925.

7.9 Other details of capacitor bank shall be adopt with the attached Guaranteed Technical Parameters.

7.10 Electrical & mechanical interlock should be provide between circuit breaker and capacitor bank for the safety point of view & To avoid the maloperation of CB with respect to capacitor bank.

7.11 All the auxiliary equipments control supply which is associated with capacitor bank should be 24 or 48 VDC level for the installation and operation at any of the odisha discom circles and odssp. The same will be confirm during detail engineering while procurement by Tpwodl.

7.12 All the type test reports should be attached for the auxiliary equipments like CB, CT, Isolator, etc at the time of tendering without deviations & the type tested certificates should be approved by aggericated electrical institutions.

7.10 MOUNTING STRUCTURE:

7.10.1 The mounting racks shall be fabricated from suitable steel sections and shall be duly hot dip galvanized as per applicable IS. Mounting racks along with support insulators shall be suitable for mounting on elevating structure.

7.10.2 The racks shall be complete with insulators, bolts & nuts, foundation bolts and other hardware, etc. for assembly into complete bank. Interconnecting materials and suitable bimetallic terminal connectors for connection with other equipments shall also be provided.

7.10.3 The height of the racks of capacitor bank shall be such that for making electrical connection with the other equipments, proper electrical clearance is maintained.
7.10.4 The hot dip galvanized elevating structure shall be provided of capacitor bank & isolator. Provision for mounting of LA, SR & NCT shall be made on the capacitor bank elevating & mounting structure.

7.11 PROTECTION:
7.11.1 Fuses:
i). The fuses shall withstand repeated application of transient conditions associated with normal duty of capacitor unit.
ii). Fuses shall be capable of limiting arc energy within the case of faulty capacitor to such small proportions that the danger of case rupture is eliminated.
iii). It shall have adequate rupturing capacity for the fault levels at the terminals of the capacitor.
iv). It shall have adequate thermal capacity to cater for increased heating which may occur due to harmonics.
v). It shall have an ampere rating which will provide proper co-ordination between its total clearing time current curve and capacitor unit's case rupturing capacity.

7.11.2 The capacitor banks shall be provided with the following others protections:
(a) Over current and earth fault protection to cover bus faults between the capacitor banks and its controlling circuit breaker.
(b) Over voltage protection.
(c) Neutral Unbalance protection. (Connected on Neutral CT between star points)
(d) Under voltage protection.
(e) Leading Power factor Protection. (optional not required overvoltage is solving purpose)
(f) Neutral Displacement protection.
(g) Thermal overload protection. (one OC stage is also sufficient)

Requirement of each of the above protection are described below: -

1. Over-current, Earth fault & Thermal protection:

a) Three phase Numerical (IDMT) over-current relay and numerical (IDMT) earth fault relays shall be provided for phase over-current and earth fault protection.
b) Overcurrent & Earth Fault each should comprise of minimum 3 stages One IDMT & Two Highset with Minimum delay from 0 msec to 1sec.
c) IDMT shall have a setting range of 5 to 200%.
d) The relay shall have all standard IEC/ANSI characteristics.
e) The relay shall also include a high set instantaneous over-current unit with a continuously adjustable setting range of 10-2000% (10 to 20 times) of rated current.
f) Relay Should have additional stage for Thermal overload protection definite time based on Phase CT.

g) Relay should be configurable from HMI as well as Laptop.

h) Relay should store Waveform, Events & Trip Logs which should be retrievable in standard CFG format. Minimum waveform capturing should be 5 sec.

i) Relay waveform capturable should start from both Relay Start or Relay Trip.

j) Relay should be designed for Outdoor mounting at kiosk for western odisha region.

k) Electronics cards should have a conformal coating.

l) Minimum no of Binary Input & Output required in relays are 8 BI & 8 BO's.

2. Over-voltage & Under voltage Protection:

a. Over-voltage shall have an inverse time characteristic & Defintie time Characterstics and shall be energized through VT connected to the main bus bars on the source side of the circuit breaker controlling the capacitor banks. Relay shall have variable settings from 100% to 130% in steps of at least 1% to 2%.

b. Undervoltage starting range from 0% to 95 % in steps of 1 % with definite time charecterstics should be settable.

3. Neutral Unbalance Protection:

Neutral Unbalance protection shall be provided with current operated relay with separate one no. NCT for each group of 1.5/2.5 MVAR. (CTR may be 5/1 or 10/1 based on designed) The relays used shall be provided with a time delay device to prevent operation under transients and to allow individual fuses to isolate the faulty units. Inverse time delay relay may be used.

4. Neutral Displacement relay

a. Separate Neutral displacement relay (NDR) should be provide for protection purposes.
b. Neutral displacement protection based on residual overvoltage with definite time should be settable from0.5 % to 25% voltage range.
c. The relay should have 3rd harmonic suppression protection.
d. The relay should have 2 stages of setting elements as DMT &IDMT relay respectively.
e. Relay should have options as per standard requirements for capacitor bank protective purpose.
f. The relay shall have all standard IEC/ANSI characteristics.

7.11.3 The under-voltage protection shall not operate in the event of fault on 11 KV lines which may dip the bus bar voltage to 50%. There should be provision for adjustments in settings of voltage and time to coordinate the 11 KV line protections with the under-voltage protection to avoid malfunctioning of under-voltage relay under line fault conditions.

7.11.4 The power factor meter should be provided.

7.12 Associated Equipments: The associated equipments as mentioned in clause 1.4 above of this Tech. Specification having detailed specification described hereinafter shall be supplied along with the capacitor banks. The hot dip galvanized elevating structure shall be provided of capacitor bank & isolator. The general arrangement of equipments is shown in the single line diagram appended with this specification.

8. NEUTRAL CURRENT TRANSFORMERS:

Neutral Current Transformer shall be single phase, outdoor; oil immersed dead tank type or dry type. The ratio of the neutral current transformer shall be compatible with unbalance calculations of the capacitor bank & it shall be selected on the basis of the unbalance current flowing through neutral of capacitor bank during the failure of elements in one capacitor unit (at alarm stage & trip stage).

9. SUPPORT STRUCTURES & EQUIPMENT FRAME:

9.1 Equipment frame, support structure, angles, channels etc. meant for the outdoor switch gear and other equipment viz. CTs, NCT, Isolators etc. shall all be hot dip galvanized. All the ferrous metal parts shall be hot dip galvanized smoothly as per IS 3638(as amended up to date), IS or any other equivalent authoritative standard. The material shall be galvanized only after shop operations upon it have been completed. The metal parts before galvanization should be thoroughly cleaned of any paint, grease, rust, scales or alkalis or any foreign deposits which are likely to come in the way of galvanization process. The metal parts coating shall withstand minimum four one-minute dips in copper sulphate solution as per IEC-168. Fasteners (nut-bolts) shall be of nonmagnetic stainless steel. No spring washer shall be used, instead one check nut of suitable size shall be provided with each bolt.

9.1.1 Support structure shall be supplied for each of the outdoor equipment and shall be suitable to maintain the clearances and spacing stipulated for various equipments. Current transformers may be mounted on the same structure as that of the circuit breaker provided the requisite electrical and mechanical clearances are properly maintained. Typical bay arrangements indicating sectional clearances are shown in the enclosed drawings.

9.1.2 The main structure shall be fabricated out of hot dip galvanized angle of minimum 75 x 75 x 6 mm or equivalent strength.

9.1.3 Successful tenderers shall clearly indicate on the relevant G.A. drawings the total dead weight coming on each support structure. Impact load, if any, shall also be stated on relevant drawing. These details are required for designing suitable foundations for the support structure for CBs, Isolators, etc.

9.2 Equipment terminal connectors (HV)

9.2.1 Tenderers shall include in their scope suitable connectors for each outdoor equipment. In the case of equipment with copper terminals, the terminal connectors shall be made of electrolytic grade copper, and shall be suitable for crimping type connection. Material required for inter connection between various bay equipment in between the two isolators of each bay shall be included in the tenderer's scope of supply. Details of the inter connector and the material used for the terminals/jumpers shall be furnished in the offer. In order to fix the jumper length, size etc. standard layout drawing is enclosed. Successful tenderer shall have to adopt Board's standard foundation plan.

9.2.2 Take-off terminals of both the isolators of each bay and for Cu-Al bimetallic connections shall be of electrolytic grade aluminium and suitable for crimping ACSR jumper along with suitable bimetallic plate of minimum 2 mm thickness. These connectors shall be suitable for 200 mm sq. ACSR conductor. All nut-bolts used in the connectors shall be of non-magnetic stainless steel. In place of spring washers, check nut of suitable size shall be provided.

9.3 Earthing Metal tanks of the instrument transformers and all other equipment, C & R panels, mechanism boxes, structures etc. shall be provided with two separate earthing terminals of size 16 mm dia. X 30 mm length H.D.G., with one plane washer and one nut, for connection to station earth-mat.

9.4 Lifting arrangement Instrument transformers and switchgear equipment shall be provided with suitable lifting arrangement to lift the entire unit. Lifting arrangement (lifting eye) shall be positioned in such a way so as to avoid any damage to the porcelain housing, primary terminals or the tanks during the process of lifting for installation/transport. The general arrangement drawing shall show clearly the lifting arrangements provided such as lifting eye, guide etc.

9.5 Painting

9.5.1 All sheet metal parts (panel, mechanism box, metal housing. Instrument transformer etc.) for outdoor installation shall be designed and fabricated with special care to avoid rust/fungus formation and corrosion. All metal parts shall preferably be hot dip galvanized. If this is not possible due to practical difficulties, cold galvanizing or epoxy coating shall be provided for all sheet metal parts, used for outdoor installation. Sheet steel shall be treated as per the 7-tank process. In case tank process for treating the sheet, metal is not possible, alternate process adopted shall be clearly explained in the technical offer which shall be got approved by the Board. Dark Admiral Grey shade as per colour shade no. 632 of IS-5 shall be used for epoxy coating.

9.5.2 The sheet metal works, after final painting shall present an esthetically pleasing appearance, free of any dent or uneven surface.

9.6 Labels

9.6.1 All front mounted as well as externally mounted items including fuses shall be provided with individual identification labels. Labels shall be mounted directly below the respective equipment and shall clearly indicate the equipment designation. Labeling shall be on aluminum anodized plates of 1 mm thickness. The letters are to be properly engraved.

9.6.2 All the equipment and their parts shall be provided with suitable labels or identification and ease of operation and maintenance.

10. 11KV SERIES REACTORS:

Suitable 0.2% current limiting reactors shall be provided on the neutral side of the Capacitor bank in rural areas having low THD level. However, 6% series reactor shall be provided on the line side of the Capacitor bank to be provided in Urban areas where THD level is more. The inductance value will control the amplitude and frequency for the inrush current. Peak inrush current shall be less than 100 times rated current of the capacitor bank and less than the breaker making current.

i) The series reactors shall be out door type, single phase, air cored, air cooled, Dry type with Aluminum winding. The normal current rating of the reactor shall be 130% of rated continuous current of the capacitor bank. The Voltage rating of the series reactor's base insulators shall be nominal system voltage of 11 KV.

ii) The provision for mounting of reactor is to be made on capacitor bank structure.

iii) The reactor shall be free from annoying hum or vibration. The design shall be such as not to cause any undesirable interference with radio or communication circuits. All routine tests shall be carried out as per IS5553 or equivalent international standard.

iv) The complete assembly of the Capacitor bank shall be on a mild steel galvanized steel structure.

Special requirement:

1. In order to execute a safe switching of breaker if any suppressor like snubber circuit is required than it should be engineered, designed, supplied, installed & commissioned by the bidder.
2. And warranty of such circuit should be same as CAP bank units.

11.TYPE TESTS

Type test certificates on capacitor bank for the following tests, strictly as per IS 13925(Part 1-2012), with latest amendment thereof, from any of the independent Govt. Laboratory, or at any recognized and reputed international laboratory or testing institution, shall invariably furnished: -

- Thermal stability test
- Measurement of the tangent of the loss angle of the capacitor at elevated temperature
- AC voltage test between terminals & container
- Lighting impulse voltage test between terminals and container
- Short circuit discharge test
- Test of an external fuse in combination with a capacitor
- Disconnecting test on internal fuses

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.

The above tests must not have been conducted on the equipment earlier than 10 years from the date of opening of bids.

In case of any change in design/type of capacitor bank already type tested and the one offered against this specification, the owner reserves the right to demand repetition of type tests, without any extra cost.

12. ACCEPTANCE AND ROUTINE TESTS

All acceptance and routine tests, as stipulated in relevant standards, shall be carried out by the manufacturer, in presence of owner's representative

Immediately after finalization of the programme of type testing, the manufacturers shall give, fifteen days advance intimation to the owner, to enable him depute his representative for witnessing the tests.

13. TYPE TEST CERTIFICATES:

1. The bidder shall furnish the type test certificates as mentioned above as per the corresponding standards.

2. All the tests shall be conducted at CPRI / ERDA as per the relevant standards.

3. Type tests should have been conducted in certified Test laboratories during the period not exceeding 10 years from the date of opening the bid.

4. In the event of any discrepancy in the test reports, i.e., any test report not acceptable same shall be carried out without any cost implication to TPWODL.

5. Bidder shall submit the Test Reports for the Tree Retardant properties of the insulation

14. TECHNICAL SPECIFICATIONS REFERENCES:

To attain the power factor leading with power system, it requires proper system design to achieve the lead. In the same view, some of auxiliary equipments are required for the full protection and operation of capacitor banks. To maintain the system in a safe way, few necessary items are required as mentioned earlier in this document. The items are circuit breaker, Isolator, LA, CT and Nct . Required detail technical specifications are attached below as reference for the best understanding of technical specifications which is approved by TPWODL.

1) **Isolator: Document No. TPWODL/ENGG/SPEC/034/2021**
2) **Circuit breaker: Document No. TPWODL/ENGG/SPEC/019/2021**
3) **Current Transformer: Document No. TPWODL/ENGG/SPEC/036/2021**
4) **Control & Relay panel: Document No. TPWODL/ENGG/SPEC/062/2021**
5) **BCPU: Document No. TPWODL/ENGG/SPEC/010/2021**
6) **Potential Transformer: Document No. TPWODL/ENGG/SPEC/028/2021**

15. RECOMMENDED SPARES

The tenderer shall furnish in his offer, a list of recommended spares with unit rates for each capacitor that may be necessary for satisfactory operation and maintenance of the capacitor bank for a period of 5 years. The purchaser reserves the right of selection of items and quantities of these spares to be ordered. The cost of such spares shall not be considered for tender evaluation. The unit prices should be valid for two years from the date of issue of detail A/T.

16. ERECTION AND MAINTENANCE TOOLS

The tenderer shall submit a list and unit rates of all the special tools, equipment and instruments required for erection, testing, commissioning and maintenance of the capacitor bank. The purchaser shall decide the quantity of tools to be ordered. Prices of these tools shall not be considered for tender evaluation. However, the list of necessary tools/equipment which will be supplied free of cost with capacitor bank may be furnished separately.

17. PRE - DESPATCH INSPECTION

1. Material shall be subject to inspection by a duly authorized representative of TPWODL.
2. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to

rejection.

3. Bidder shall grant free access to the places of manufacture to TPWODL's representatives at all times when the work is in progress.
4. Inspection by TPWODL or authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
5. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL.

Following documents shall be sent along with material:

a) Test report
b) MDCC issued by TPWODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Brought out (raw) material test certificates
h) Delivery Challan
i) Other Documents (as applicable)

INSPECTION AFTER RECEIPT AT STORES:

The material received at TPWODL, Odisha store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to "Network planning, Engineering and Quality" department

18.PERFORMANCE GUARANTEE

The equipment offered shall be guaranteed for satisfactory performance for a period of 66 months from the date of receipt of complete equipment at destination store/site in good condition or 60 months from the date of satisfactory commissioning of equipment whichever is earlier. The equipment found defective/failed within the above guarantee period shall be replaced/repaired by the supplier free of cost within one month of receipt of intimation. If the defective/failed equipment are not replaced/repaired as per the above guarantee clause, the company shall recover an equivalent amount plus 15 % supervision charges from any of the supplier's bills.

19.DRAWINGS

The tenderer shall furnish four sets of relevant descriptive and illustrative published literature/pamphlets and the following drawings for preliminary study:

a. General outline drawings showing outside dimensions, shipping dimensions, weights, quantity of insulating media air receiver capacity and such other prominent details.

b. Structural drawing, design calculations and loading data for support structures.

c. Foundation drilling plan and loading data for foundation design.

d. Type test reports of capacitor bank along with a separate list showing all the tests carried out with date & place of test.

e. Test reports, literatures and pamphlets of bought out items and raw materials.

f. Cage layout along with interlock provision between cage and VCB.

g. Series reactor support structure GA drawings with dimensions as per IS standards.

The successful tenderer shall, within 6 weeks of placement of order, submit THREE sets of final versions of all the above said drawings in A-3 size, bill of material, packing list & all type test reports for purchaser's approval to the office of GM (Stores). The purchaser shall communicate his comments/approval on the drawings to the supplier within reasonable period. The supplier shall, if necessary, modify the drawings and resubmit four copies of the modified drawings for purchaser's approval within two weeks from the date of purchaser's comments. After receipt of purchaser's approval, the supplier shall, within three weeks, submit 10 prints & two good quality reproducible of the approved drawings and 10 sets of instructions manuals in respect of Capacitor bank to the office of GM (Stores).

The successful tenderer shall furnish in the form of nicely bound volumes, the manuals covering erection, commissioning, operation and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices. Marked erection drawings shall identify the component parts of the equipment as shipped to enable Engineer/Purchaser to carry out erection with his own personnel. Each manual shall also contain one set of all the approved drawings type test reports as well as acceptance test reports to corresponding consignment dispatched. The total quantity of the operating manuals/approved drawings sets to be supplied by the supplier shall be equal to the number of three phase breakers of rating, ordered.

The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the supplier's risk.

Approval of drawings/work by the purchaser shall not relieve the supplier of any of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revisions of applicable standards, rules and codes of practices.

20. PACKING AND FORWARDING

The equipment shall be packed in suitable crates so as to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper lifting arrangement such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information:

a. Name of the consignee.

b. Details of consignment.

c. Destination.

d. Total weight of consignment.

e. Sign showing upper/lower side of the crate.

f. Handling and unpacking instructions.

g. Bill of materials indicating contents of each package and spare materials

The supplier shall ensure that the packing list and bill of materials are approved by the purchaser before dispatch.

21.GURANTEED TECHNICAL PARTICULARS

GTP of 11KV CAPACITOR BANK
(To be submitted by the bidder)

Sl. No.	Description	Unit	1500KVAr	2500KVAr	Bidder's Offer
1	Manufacturer's Name		Bidders to be provide	Bidders to be provide	
2	Maker's type designation		CHD	CHD	
3	Standard followed		IS 13925 (Part-1) 2012	IS 13925 (Part-1) 2012	
4	Purpose		Power factor improvement	Power factor improvement	
5	Location		Outdoor	Outdoor	
6	Rated voltage	KV	12.65	12.65	
7	Service Voltage	KV	11KV	11KV	
8	Rated frequency	Hz	50Hz	50Hz	
9	System fault current (Ka at Sec)	A	Bidders to be provide	Bidders to be provide	
10	Ambient Temperature: Max/Min	degree centigrade	50/5	50/5	
11	Rated Output (Installed)				
a	Voltage	KV	12.65	12.65	
b	Reactive Power	KVAR	Bidders to be provide	Bidders to be provide	
12	Rated Output (Effective)		Bidders to be provide	Bidders to be provide	
a	Voltage	KV	11	11	
b	Reactive Power	KVAR	1500	2500	
13	No of phases		3	3	
14	Rated capacitance in micro Farad	MFD	29.84	49.75	
15	Type of connection	Star / Delta	Double star (YY)		
16	Capacitor dielectric type	APP / MPP	Polypropylene film	Polypropylene film	
17	Thickness in mm of insulation system/ dielectric		Bidders to be provide	Bidders to be provide	
18	Watt loss of paper/film at various dielectric		Bidders to be provide	Bidders to be provide	

Sl. No.	Description	Unit	1500KVAr	2500KVAr	Bidder's Offer
	temperatures (enclosed)				
19	Max. Stress on the dielectric in volts/micron.		Bidders to be provide	Bidders to be provide	
20	No. of units per bank		Bidders to be provide	Bidders to be provide	
21	Type of mounting		Structure mounting	Structure mounting	
22	**Terminal arrangement**				
a	Incoming terminal		Al flat	Al flat	
b	Outgoing terminal		NA	NA	
23	**Capacitor unit**		Single phase	Single phase	
a	Rated output	KVar	Bidders to be provide	Bidders to be provide	
b	Rated voltage	KV	7.3	7.3	
c	Rated current	A	Bidders to be provide	Bidders to be provide	
d	Number of bushing		2	2	
24	Unit Protection (as per feasibility)		Internal Fuse	Internal Fuse	
25	Discharge device material		Metal oxide Resistors (External fitted Resistors).	Metal oxide Resistors (External fitted Resistors).	
26	Unit container material / thickness (mm)		CRCA / 1.5 mm	CRCA / 1.5 mm	
27	Guaranteed temperature rise of capacitor unit above ambient temperature		10^0 C	10^0 C	
28	Panel dimensions in mm (L x D x H)		1350´500´2000 mm	1350´500´2000 mm	
29	Expected temperature rise at site within the panel, with all capacitor units switched Oni) With Ventilation fan ON		18^0 C	18^0 C	
30	Panel enclosure protection offered		IP 42 minimum	IP 42 minimum	

Sl. No.	Description	Unit	1500KVAr	2500KVAr	Bidder's Offer
31	Maximum permissible over voltage		110%	110%	
32	Maximum permissible over current		130%	130%	
33	Dielectric loss less than 0.2w / KVAR		Di-electric loss is 0.2 as per IS13340-93	Di-electric loss is 0.2 as per IS13340-93	
34	Guaranteed minimum capacitor switching operations (ON/OFF) per year		Bidders to be provide	Bidders to be provide	
35	Residual voltage after de-energization & at 60 seconds		Less than 50 V	Less than 50 V	
36	Directly connected internal discharge resistor		Yes	Yes	
37	Design life of capacitor unit		>1,00,000 Hours.	>1,00,000 Hours.	
38	APFC panel insulation level		2 KV	2 KV	
39	1-minute power frequency withstand KV	KVrms	28	28	
40	Impulse withstand voltage	KVp	75	75	
41	Main bus bar material / size (sqmm)		Bidders to be provide	Bidders to be provide	
42	Main bus bar rated current		Bidders to be provide	Bidders to be provide	
43	Main bus bar short time withstand		Bidders to be provide	Bidders to be provide	
44	CT make & accuracy class		Bidders to be provide	Bidders to be provide	
45	CT ratio & burden (VA)		Bidders to be provide	Bidders to be provide	
	APFC Panel				
46	APFC relay make / type		Bidders to be provide	Bidders to be provide	
47	Required Protections				
a)	Over-current, Earth fault & Thermal protection	A	i) IDMT : 5 to 200 % ii) Time delay : 0 - 1 sec	i) IDMT : 5 to 200 % ii) Time delay : 0 - 1 sec	

Sl. No.	Description	Unit	1500KVAr	2500KVAr	Bidder's Offer
			iii) Highset : 10 - 2000%	iii) Highset : 10 - 2000%	
b)	a)Over Voltage b)Under voltage protection	V	i) Over Voltage Setting range : 100% - 130% (In steps 1% - 2%) ii) Under voltage Setting range : 0% -95% (In steps 1%)	i) Over Voltage Setting range : 100% - 130% (In steps 1% - 2%) ii) Under voltage Setting range : 0% -95% (In steps 1%)	
c)	Neutral Displacement relay		Setting range: 0.5% - 25%	Setting range: 0.5% - 25%	
i	DC Input voltage		24V DC +/- 10% Tolerance	24V DC +/- 10% Tolerance	
ii	Stages of protection	Element 1 - Ist stage	DMT with time delay	DMT with time delay	
iii		Element 2 - 2ND STAGE	IDMT curve	IDMT curve	
iv	Voltage setting range		Bidders to be provide	Bidders to be provide	
v	Display		LCD display	LCD display	
vi	Configuration		Both options - through HMI & Laptop	Both options - through HMI & Laptop	
vii	Communication port (Front & Rear)		Serial port and RS 485	Serial port and RS485	
d)	CTR for neutral	A	5/1 or 10/1	5/1 or 10/1	
e)	Protection Relays configuration	Port option	Configurable through HMI & Laptop also.	Configurable through HMI & Laptop also.	
f)	Event reports	Format	CFG	CFG	
g)	Waveform capaturing (Minimum)	Sec	5	5	
h)	Mounting design		Outdoor	Outdoor	
i)	Binary Inputs / Outputs (Minimum)		16 BI's & 8 BO's	16 BI's & 8 BO's	
j)	Standard followed		As per IEC/ANSI	As per IEC/ANSI	
48	Load manager make / type		Bidders to be provide	bidders to be provide	

Sl. No.	Description	Unit	1500KVAr	2500KVAr	Bidder's Offer
49	AC contactor make		Bidders to be provide	bidders to be provide	
50	AC contactor utilization category as per IS		Bidders to be provide	bidders to be provide	
51	MCCB Make/Type/ Cat No. with SC rating (Icu=Ics=35 kA/50kA for Incomer & outgoing		Bidders to be provide	bidders to be provide	
52	Reactor Coil to limit in rush current provided: Yes/ No	Y/N	Bidders to be provide	Bidders to be provide	
53	Ventilation fan provided: (with details of Numbers, type capacity & make with back up calculation)	Yes/ No	Yes	Yes	
54	Capacitor unit is type tested: (If yes, the test report No/ date should be mentioned and a copy should be submitted for REL's review)	Yes/ No	Yes	Yes	
55	The offered APFC Panel is tested for temperature rise test at ERDA/ CPRI: (If yes, the test report no/ date should be mentioned and a copy should be submitted for REL's review)	Yes/ No	Yes	Yes	
56	Discharge time with internal discharge device	Secs	Within 600 Secs.	Within 600 Secs.	
57	Min. elect. Clearances in the bank between phase to phase & live parts to earth in mm	IS	As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
58	Maximum permissible over voltage& duration corresponding to the same in % for 1Hr./2Hr./ 4Hr./ continuous		As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
59	Overall dimensions of the Capacitor Bank		Bidders to be provide	Bidders to be provide	

Sl. No.	Description	Unit	1500KVAr	2500KVAr	Bidder's Offer
60	Layout & dimensions drawings (to be attached separately		Bidders to be provide	Bidders to be provide	
61	Maximum over voltage the Unit Capacitor is capable of withstanding continuously in % rated KV		As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
62	Insulator strength of bushings & Cap. units		28kV(rms) 75kV(Pk)	28kV(rms) 75kV(Pk)	
63	Bushing's minimum Creepage	mm	25mm/KV	25mm/KV	
64	No. of Capacitor elements per unit Capacitor with No. of series/parallel elements (Sketch enclosed)		Bidders to be provide	Bidders to be provide	
65	Mode of internal connection of the Capacitor elements (Sketch enclosed)		Bidders to be provide	Bidders to be provide	
66	Voltage across each element in unit at rated voltage		Bidders to be provide	Bidders to be provide	
67	Percentage Loss of Capacitance at which an internally fused Capacitor unit is considered useless		As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
68	Capacitor bank type		Fixed Type	Fixed Type	

Signature of Bidder:

Name of the Company:

Date:

Office Seal:

GTP of 11KV CIRCUIT BREAKER
(To be submitted by the bidder)

	Vacuum Circuit Breaker	To be provided by bidder
1.	Type	
	Reference Standard	
	Arc quenching medium	
	No. of break / phase	
	Rated voltage	
	Highest voltage	
	Frequency	
	Rated normal current	
	Breaking Capacity	
	Making Capacity	
	STC for 3 Sec.	
	Insulation level	
	Minimum Creepage distance	
	Temperature rise	
	Operating duty cycle	
	First pole to clear factor	
	Single phase capacitor breaking capacity	
	Cable charging breaking capacity	
	Minimum Pole to Pole clearance	
	Clearance between lower Live part of VCB to Ground Level	
	Clearance between lower Live part of the VCB and Upper Surface of the Metallic Structure	
	Closing time	
	Opening time	
	Mechanical Endurance Capacity	
	Electrical Endurance Capacity	
	Operating mechanism	
	Number of Trip coil	

	DC Aux. voltage	
	AC Aux. voltage	
	No. of spare contacts Aux Switch (NO & NC)	
	No. of spare contacts in Limit Switch (NO & NC)	
	Contact multiplier	
	Space heater	
	Illuminating lamp	
	Anti-pumping Relay	
	Breaker control switch	
	Local Remote switch	
	Spring charging motor	
	Degree of Protection of control cubicle	
	Sheet thickness of control cubicle	
2.	**Vacuum Bottle**	
	Make	
	Model No(Supporting Literature to be enclosed)	
	Rated Voltage	
	Normal Current	
	Breaking Capacity	
	Making Capacity	
	STC for 3 sec	
	Minimum Mechanical life in no. of operations	
	Minimum Electrical life in no. of operations at rated current	
	Minimum Electrical life in no. of operations at 25 KA	
	Dry Power Frequency withstand voltage for 1 min.	
	Impulse withstand voltage	
	Contact Material	
	Type of plating	
3.	**Low Voltage Terminal connector**	
	Make	
	Type	
	Size	
4.	**Primary Terminal Connector**	
	Material	
	Size	
	Continuous current rating	
	Nuts, bolts & washers	
	Reference Standard	
	Number of connectors per VCB	
5.	**Trip & Close coil**	
	Voltage & Wattage of Closing coil	
	Voltage & Wattage of Trip coil	
6.	**Control wire**	
	Make	
	Voltage grade	

	Size	
	Colour	
7.	**Earthing Terminal**	
	Material	
	Shape	
	Size	
	Current Rating	
8.	**Painting details**	
	Surface cleaning process	
	Paint thickness	
	Paint shade	
9.	**Accessories**	
	Spring charging handle	
	VCB operating handle	
10.	**Name Plate details**	
	Manufacturer	
	Type of VCB	
	Rated voltage	
	Rated current	
	Rated frequency	
	Insulation level	
	Short Circuit Breaking Current	
	Short Circuit withstand Current & duration	
	Short Circuit Making Current	
	Operating sequence	
	Make and Model of Vacuum Interrupter	
	Aux. DC voltage	
	Aux. AC voltage	
	Total weight	
	Serial number	
	Purchase Order reference	
11.	**Property Plate**	
12.	**Guarantee**	

GTP of 11KV CURRENT TRANSFORMER

(To be submitted by the bidder)

Sl. No	Technical Parameter	Units	To Be Provided by Bidder
1.	Type		
2.	Nominal System voltage	KV	
3.	Highest System Voltage	KV	

4.	Rated Current	Amp	
A	Rated Continues Current	Amp	
5.	Frequency	Hz	
6.	Short time thermal current stipulated time duration	KA	
7.	Dynamic current Rating	KA	
8.	Lighting Impulse withstand voltage	KV	
9.	Class of Insulation	Cl	
10.	Creepage Distance	Mm	
11.	Ratio	CTR	
12.	Class of Accuracy		
13.	Burden	VA	
14.	Application		
15.	Type of Mounting		
16.	Place of installation		
17.	Number of secondary windings	Nos	
18.	Primary terminal connector		
19.	Fixing hole dimension		
20.	Painting		
21.	Secondary terminal box		
22.	Suitability		
23.	One min. power frequency withstand voltage for primary winding (rms)	Kv	
24.	One-minute power frequency withstands voltage of secondary winding (rms)	Kv	

GTP of 11KV CONTROL & RELAY PANEL

(To be submitted by the bidder)

S.No.	PARTICULARS	Bidder Offer
1	Manufacturer name	
2	Frequency	
3	Nominal System Voltage	
4	Maximum System Voltage	
5	Number of phases	

S.No.	PARTICULARS	Bidder Offer
6	Neutral Earthing Arrangement	
7	Fibre Optic Cable	
a.	Control Room to Switchyard/Switchgear	
b.	Within Control Room	
8	Data transmit	
a.	Cable type	
b.	Speed	
c.	Frequency	
9	Ingress protection	
10	cold rolled sheet steel of thickness	
11	Mounting	
a.	Centre lines of switches, push buttons and indicating lamps from the bottom of the panel	
b.	centre lines of relays, meters and recorders from the bottom of the panel	
12	Auxiliary supply	
13	Terminal Blocks	
i.	Voltage grade	
ii.	Current	
iii.	Terminal block connection	
a	All CT &PT circuits	
b	All AC/DC Power Supply Circuits	
c	All other circuits	
iv.	Minimum clearance	
a	First row of terminal blocks and the associated cable gland plate	
b	Two rows of terminal blocks edges	
14	Painting	
15	Associated Accessories	
i.	Plug Point	
ii	AC socket with switch	
iii.	MCB	
iv.	HRC	
16	Interior Lighting	

S.No.	PARTICULARS	Bidder Offer
a.	Lighting fixture rated voltage	
b	Panel controlled Light	
17	Space Heater	
a	Rated Voltage	
18	Earthing Size Material and Colour	
a	Bus bar	
b	Gland plate	
c	Colour code	
19	Control and instrument switches	
20	Indicating lamps	
21	Energy Meters	
i.	Type	
ii.	Basic Current (Ib)	
iii.	Rated Max. Current (Imax)	
iv.	Rated Secondary Current (Ib)	
v.	Operating Voltage	
vi.	Power Consumption	
vii.	Starting Current	
22	19” Rack Mountable with Power Socket and Ports at rear side	
23	Compliance to IEC 61850-3, IEEE 1613 Standards	
24	Port Speed: 10Mbps/100Mbps for Station Bus and 1Gbps for Process Buss	
25	Should have minimum of 12 Ports, number of switches minimum 2	
26	LED indicators for link establishment and data transfer for each port	
27	Should support remote user setting configuration.	
28	Should own separate maintenance/console port	
29	Should support SNMP Server v1.0/v2.0/v3.0	
30	Auxiliary Power Supply: 24 VDC or 48VDC (depending upon the Station DC Voltage) with ±15% tolerance, Dual Power Supply	
31	All the cards/modules of the Switch must have conformal coating for protection against harsh and polluted environment	

S.No.	PARTICULARS	Bidder Offer
32	LIFTING arrangement.	
33	Painting	
34	Heater provision	
35	Illumination provision	
36	Make of relays	
a.	L/O	
b.	BCPU (O/C& E/f)	
c.	Trip supervision relay	
d	Differential Relay	
37	Weight	
38	Dimension (LXWXH) in mm	
39	Mounting arrangement	
40	Control cable tray provision for dressing	
41	Control cable entry provision (top/bottom)	
42	Labelling for all aux components	
43	Wires and lug as per specs	
44	Extension of earthing at both sides provision	
45	Earthing connection hardware	
46	Plug point provision	

GTP of 11KV NEUTRAL CURRENT TRANSFORMER

(To be submitted by the bidder)

Sl. No	Technical Parameter	Units	To Be Provided by Bidder
1.	Type		
2.	Nominal System voltage	KV	
3.	Highest System Voltage	KV	
4.	Rated Current	Amp	
A	Rated Continues Current	Amp	
5.	Frequency	Hz	
6.	Short time thermal current stipulated time duration	KA	
7.	Dynamic current Rating	KA	
8.	Lighting Impulse withstand voltage	KV	
9.	Class of Insulation	Cl	

10.	Creepage Distance	Mm	
11.	Ratio	CTR	
12.	Class of Accuracy		
13.	Burden	VA	
14.	Application		
15.	Type of Mounting		
16.	Place of installation		
17.	Number of secondary windings	Nos	
18.	Primary terminal connector		
19.	Fixing hole dimension		
20.	Painting		
21.	Secondary terminal box		
22.	Suitability		
23.	One min. power frequency withstand voltage for primary winding (rms)	Kv	
24.	One minute power frequency withstands voltage of secondary winding (rms)	Kv	

GTP of 11KV POTENTIAL TRANSFORMER

(To be submitted by the bidder)

S. No.	Technical Parameter	To Be Provided by Bidder
1	Name of Manufacturer & Country of Origin.	
2	Manufacturer Type designation	
3	IS to which PT confirms	
4	Nominal system voltage.	
5	Highest system voltages.	
6	Frequency.	
7	Class of Insulation	
8	One-minute Power Frequency withstand voltage (KVrms)	
9	Impulse withstand Voltage (KVP)	

10	One-minute power frequency withstands voltage of secondary winding (rms)	
a.	Phase to Phase	
b.	Between sections	
11	Transformation ratio(s).	
a.	Rated Primary Voltage (in Volts)	
b.	Rated Secondary Volts (in Volts)	
c.	Rated burden.	
d.	Class of Accuracy.	
12	Winding Details	
a.	Material of conductor.	
b.	No. of turns.	
c.	Cross sectional area.	
d.	Weight of winding.	
13	Whether complete type test reports as per relevant IS enclosed.	
14	Total weight of PT	
15	Overall dimensions.	
16	Mounting details.	
17	Bushing details.	
a.	Confirm to IS:	
b.	Make.	
c.	Total creepage distance (mm)	
d.	Protected creepage distance.	
18	Make of terminal connector	
19	Test results of oil as per IS:335	
a.	Quantity of oil	
b.	Break Down Voltage	
c.	Color of oil (shall be color less)	
20	Lifting Arrangement	
21	Any other specific feature.	

GTP of 11KV SERIES REACTOR
(To be submitted by the bidder)

SL.NO	Description	Bidder's Offer
1	Make	
2	Type	
3	Reference Standard	
4	% Impedance	
5	System Voltage, Frequency, & number of phases	
6	Basic insulation level	
7	Type of cooling	
8	Overall dimensions a) Length in mm b) Width in mm c) Height in mm	
9	Over current factor	
10	For 6% Reactor	
a	Rated continuous through put KVAr	
b	Rated current Amps / phase	
c	Impedance Ohms/Phase	
d	Load losses in KW for 3 phases	
15	For 0.2% Reactor	
a	Rated continuous through put KVAr	
b	Rated current Amps / phase	
c	Impedance Ohms/Phase	
d	Load losses in KW for 3 phases	

21.SCHEDULE OF DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirmthe purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above. Seal of the Company:

Signature of

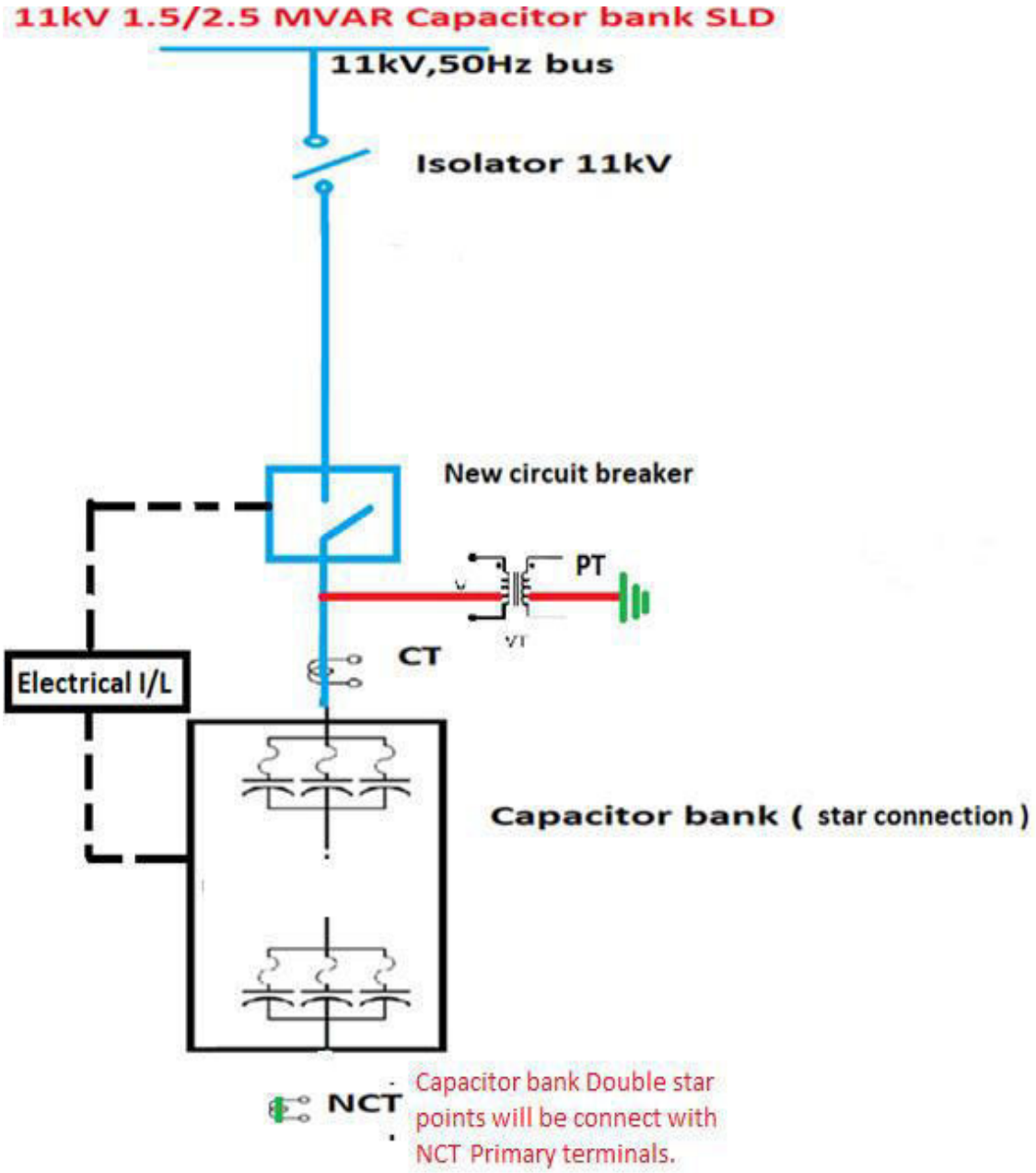
Bidder: Name of

the Company:

Date:

Office Seal:

22.Single Line Diagram – 11kV capacitor bank 1.5/2.5 MVAr



STANDARD TEHNICAL SPECIFICATION OF 33KV OUTDOOR CAPACITOR BANK RATING AT 2.5 / 5 MVAR WITH CIRCUIT BREAKER

PREPARED BY	REVIEWED BY	APPROVED BY
K GOVINDARAJ	ANUP JAWASE	S B KUNDARGI

CONTENTS

1.0 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing and forwarding, supply, unloading, Installation, site testing and commissioning at TPWODL stores/sites. Following equipment's / materials covered under the scope with all fittings, accessories and associated auxiliary equipment, mandatory spares which are required for efficient and trouble-free operation.

a) Cap bank unit with related accessories.

b) Rated VCB along with BCPU, CT&PT.-**

c) Special accessories/ items if any to support functioning of Cap bank.

** VCB and control panel, BCPU, Misc. Relays related specs and GTP are included separately.

2.0 CLIMATIC CONDITIONS

The service conditions shall be as follows:

1. Maximum altitude above sea level 1,000m
2. Maximum ambient air temperature 50°C
3. Maximum daily average ambient air temperature 35°C
4. Minimum ambient air temperature 3.5°C
5. Maximum relative humidity 95%
6. Average number of thunderstorm days per annum (isokeraunic level) 70
7. Average number of rainy days per annum 120
8. Average annual rainfall 150cm
9. Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3g
10. Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)
11. Wind velocity: 300 km/hr, 200 km/hr and 160 km/hr Environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

3.0 APLICABLE STANDARD

The Material covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards /IEC/ International Standards and shall conform to the regulations of local statutory authorities.

IS:13925 part 1 - 2012	Shunt capacitors for AC Power systems having a rated voltage above 1000V
IS:12672	Internal Fuses for Shunt capacitors
IS:2099	Bushings for voltage above 1000V
IS:5553	Reactors
IS:13118	High Voltage AC Circuit Breakers
IS:9921	AC Disconnectors (Isolators) & earthing switches
IS:9920	High Voltage Switches
IS:2705	High Voltage Current Transformers
IS 731/1971	Tests on post insulators for system with nominal voltage higher than 1000V
IS:2071	High Voltage tests
IEC Recommendations CISPR	RIV measurements
IS:2609	Partial Discharge measurements
IS:3716	Insulation co-ordination & Application Guide.
IS:1554	Low Voltage Cables
IS: 3070 Draft ETDC 30	Metal Oxide Surge Arrestors
as per IS Rules	Clearances in Air

4.0 TYPE AND RATING

The capacitor bank shall be suitable for outdoor operation under the climatic conditions, as specified in Tender specification, without any protection from sun and rain.
The capacitor bank shall have the following rating: -

S. No.	PARTICULARS	33KV	33KV
1	Capacitor bank rating	2.5 MVAr	5 MVAr
2	Nominal System Voltage	33 KV	33 KV
3	Highest System Voltage	36 KV	36 KV
4	System power frequency in Hz.	50HZ	50HZ
5	Temperature class with allowable maximum and minimum temperature in °C	50/5 deg C	50/5 deg C

S. No.	PARTICULARS	33KV	33KV
6	Rated voltage per unit in KV	20 KV	20 KV
7	Rated output per unit in KVAR	Bidders to be provide	Bidders to be provide
8	Rated capacitance in μF.	Bidders to be provide	Bidders to be provide
9	Rated current in Amp.	Bidders to be provide	Bidders to be provide
10	Rated insulation level (Nominal voltage/Impulse voltage).	70Kv rms / 150KVp	70Kv rms / 150KVp
11	Discharge time/voltage in second/voltage.	Within 600 secs	Within 600 secs
12	Fusing arrangement either internally fused or externally fused or fuse less	Internally fused	Internally fused
13	Number of bushing, double/single/triple bushing.	Double	Double
14	Number of phases. Single phase or three phase	3 phase	3 phase
15	Type of connection	Double star (YY)	Double star (YY)
16	Capacitor bank type	Fixed type	Fixed type
	Minimum clearances		
a)	Between Phases	Bidders to be provide	Bidders to be provide
b)	Between Live Parts & Ground	Bidders to be provide	Bidders to be provide
c)	Phase to earth	Bidders to be provide	Bidders to be provide
d)	Minimum ground clearance from live part	Bidders to be provide	Bidders to be provide
e)	Creepage Distance(minimum)	Bidders to be provide	Bidders to be provide
f)	Mechanical endurance	Bidders to be provide	Bidders to be provide
g)	Electrical endurance	Bidders to be provide	Bidders to be provide

The above are our minimum requirements. The manufacturers may offer their standard design, keeping in view the minimum requirements.

5. STANDARDS

The capacitor bank shall comply with the requirements of IS:13925 part 1 – 2012, IS:12672, IS:2099, IS:5553, IS:13118, IS:9921, IS:9920, IS:2705, IS 2544/1973 IS 731/1971, IS:2071, IS:2609, IS:3716, IS:1554, IS: 3070 Draft ETDC 30 with latest amendment thereof, except wherein specified otherwise. Equipment, meeting any other authoritative standard, which ensures equal or better quality then the standard mentioned above, would also be acceptable. The bidders shall clearly indicate the applicable standards to which their equipment complies-with. A copy of such standard may also be enclosed.

6. GENERAL

The capacitor bank and all other equipments other than the indoor control panel shall be suitable for being installed outdoors & would be located at switchyards of various substations. The equipment shall remain functional during and subsequent to the application of seismic loading. The exact value of seismic level (Horizontal acceleration) and maximum wind pressure may be considered as 0.3 g and 300/200/150 km/hr. respectively. The shunt capacitor should be designed for satisfactory operation even with presence of harmonics in the system. Suitable devices of required ratings should be included in the scope of supply. The general arrangement drawing along with the detailed lay out plan of the capacitor bank shall be submitted for necessary approval. Each bank shall be of 2.5/5 MVAr rating at 33kV and shall be double star connected bank with neutral point connected through NCT. If there are more than one capacitor banks in the sub-station, damping reactors of 0.2% rating should be used on the neutral side of the capacitor bank. The inductance value will control amplitude and frequency of the inrush current at back to back switching. Peak capacitor inrush current shall be less than 100 times rated current of the capacitor and less than the breaker making current. The protective scheme shall be by a current relay arranged as follows:

i) If the failure of one or more elements cause an over voltage of less than 10% tolerable on the other remaining healthy units, then the unbalance current shall cause in the first step to sound an alarm. But if more than the above numbers of elements fail causing the voltage rise of more than 10% on the other healthy units or the over voltage on the remaining healthy elements exceeds 65% then the unbalance current shall cause to trip and isolate the capacitor bank instantaneously in the second step.

ii) The per phase and individual star group rating shall be built up if required by series- parallel combination of individual units so as to achieve the desired bank rating.

iii) Internal fuses shall comply with IS- 12672 and shall be provided for the several individual elements within each unit.

iv) Although the tolerances in the output rating of each individual unit shall be as per IS- 13925 (Part I) 2012, yet it shall be ensured that in a completely assembled bank, the departures from the nominal rating and within the specified tolerance values shall not cause nuisance alarm or tripping since such alarm or tripping shall be to meet only with the protective requirements specified in (iii).

v) Individual units shall be designed to meet the requirements of the permissible overloads & with internal discharge devices as specified in IS- 13925 (Part I)/ 2012.

vi) Internal fuses for individual elements within unit shall be as per the manufacturer's design and shall be ensured for adequacy such as to withstand normal switching inrush transient currents, discharge current when the bank is switched off. Fuses shall be capable of disconnecting a faulty unit or element over a wide range of unit terminal voltages from 70 to 150 %. In case all the elements in the same row are fused out in cascade in an internal fuse unit then the fuse element blown out shall be capable of successful disconnection, with a voltage of not less than 100% rated voltage appearing across its terminals. The unit shall withstand this voltage successfully and continuously. An internal element/elements fuse blowing out shall not cause, case rupture of the container of the unit.

vii) The individual capacitor units shall be of ungrounded type with two bushings and fully insulated for rack potential. The capacitance shall be built up with high grade, all polypropylene dielectric film and aluminum foil. The polypropylene film shall cover the aluminum foil smoothly evenly and without any locked air pockets or voids. The containers shall be of CRCA sheet with minimum thickness 2mm duly welded and hermitically sealed. All welded joints shall be finished smoothly. The interior of the capacitor shall be degreased and derusted and shall not be painted. The insulating liquid shall be such that it shall remain chemically inert to the dielectric film. Aluminum foil shall not chemically degrade itself while in service.

viii) Guaranteed failure rate i.e. no. of units failing per year) should not be more than 0.5% per annum during warranty period. In case the failure rate exceeds 0.5% per annum, then the supplier will have to give as free replacement two capacitor units for each failed unit in excess to the above guaranteed figure.

ix) The raw material used for capacitor manufacturing i.e. PP film, non-PCB nontoxic oil & aluminium foil shall be of best quality obtainable in international market. Thickness of PP film (both sides hazy) shall be indicated in the technical particulars by weight method. No. of layers of dielectric shall not be less than three. Low loss capacitors shall be preferred. Offers with less than three layers of dielectric will not be considered. List of sources of raw material shall be enclosed along with the offer.

x) The capacitor elements shall be thoroughly dried & impregnated with an impregnant which had been completely refined & degasified so as not to have any gas or impurities which may cause detioration of the dielectric.

The impregnant used shall have low viscosity & high chemical stability. The impregnant should be non-PCB (NPCB).

7. SPECIFICATION FOR CAPACITOR BANKS

7.1 The capacitors shall be arranged in double star. Neutral Current transformer provided shall detect any unbalance due to Capacitor unit failure. Neutral Current transformer shall be provided between two Star points of the bank. Star point shall be ungrounded. Capacitor unit should be made up of all polypropylene film dielectric with NON-PCB impregnant liquid and provide with internal fuse element. The containers shall be made from CRCA sheet of thickness not less than 2mm. (14 SWG). The Capacitor unit should be arranged in open galvanized steel rack with copper tinned conductors for their interconnections and aluminium bus bar for interconnections between capacitor bank, L.A., series reactor and neutral current transformer.

7.2 The container shall be hermetically sealed by controlled arc welding/tig welding process. The metal flanges of the bushing should be soldered /welded to the container and covered with epoxy compound providing a strong hermetical seal to the container. Suitable mounting brackets, as required by the purchaser shall be welded to the container. The minimum creepage distance of the bushing shall be 375mm. The container of each capacitor unit shall be provided with suitable earthing terminal clearly marked

7.3 The capacitor bank shall be designed, manufactured and tested as Per IS-13925 (Part-I) 2012. The shunt Capacitor bank would be out door type & would be Located at switchyards of various substations. Unless otherwise specified, the capacitors shall be suitable for upper limit of temperature category 50° C as per IS-13925.

7.4 The standard rated output of a switched capacitor bank shall be 2.5 / 5 Mvar as specified at 33 kV rated voltage. The bank shall comprise of single-phase units each rated for 20 kV phase to earth voltage connected in double star with neutrals interconnected through NCT. The maximum permissible overloads with regard to voltage, current and reactive output shall conform to IS: 13925 (part I) 2012 with latest amendments.

7.5 The power loss in capacitors shall not exceed 0.2 Watt/kVAr. Suitable discharge device shall be connected across the capacitor units in accordance with the provision of IS: 13925 (part I) 2012 with latest amendments. The discharge device shall reduce the residual voltage from the cross value of the rated voltage to 50V or less within 10 minutes after the capacitor is disconnected from the source of supply.

7.6 Better configuration with appropriate capacity of cell units may also be acceptable subject to approval of the Chief Engineer (Dist.) prior to tender finalization.

7.7 The outside of the container should have smooth and tidy look and should be coated with weather-proof and corrosion-resistant paint of white or light gray shade. The container/enclosure shall be painted with light gray colour, shade 631 as per IS: 5.

7.8 The capacitor shall be provided with a rating plate and terminal markings as stipulated in IS: 13925.

7.9 Other details of capacitor bank shall be adopt with the attached Guaranteed Technical Parameters.

7.10 Electrical & mechanical interlock should be provide between circuit breaker and capacitor bank for the safety point of view & To avoid the maloperation of CB with respect to capacitor bank.

7.11 All the auxiliary equipments control supply which is associated with capacitor bank should be 24 or 48 VDC level for the installation and operation at any of the odisha discom circles and odssp. The same will be confirm during detail engineering while procurement by TPWODL.

7.12 All the type test reports should be attached for the auxiliary equipments like CB, CT, Isolator, etc at the time of tendering without deviations & the type tested certificates should be approved by aggericated electrical institutions.

7.10 MOUNTING STRUCTURE:

7.10.1 The mounting racks shall be fabricated from suitable steel sections and shall be duly hot dip galvanized as per applicable IS. Mounting racks along with support insulators shall be suitable for mounting on elevating structure.

7.10.2 The racks shall be complete with insulators, bolts & nuts, foundation bolts and other hardware, etc. for assembly into complete bank. Interconnecting materials and suitable bimetallic terminal connectors for connection with other equipments shall also be provided.

7.10.3 The height of the racks of capacitor bank shall be such that for making electrical connection with the other equipments, proper electrical clearance is maintained.

7.10.4 The hot dip galvanized elevating structure shall be provided of capacitor bank & isolator. Provision for mounting of LA, SR & NCT shall be made on the capacitor bank elevating & mounting structure.

7.11 PROTECTION:

7.11.1 Fuses:

i). The fuses shall withstand repeated application of transient conditions associated with normal duty of capacitor unit.

ii). Fuses shall be capable of limiting arc energy within the case of faulty capacitor to such small proportions that the danger of case rupture is eliminated.

iii). It shall have adequate rupturing capacity for the fault levels at the terminals of the capacitor.

iv). It shall have adequate thermal capacity to cater for increased heating which may occur due to harmonics.

v). It shall have an ampere rating which will provide proper co-ordination between its total clearing time current curve and capacitor unit's case rupturing capacity.

7.11.2 The capacitor banks shall be provided with the following others protections:

(a) Over current and earth fault protection to cover bus faults between the capacitor banks and its controlling circuit breaker.

(b) Over voltage protection & Under voltage protection.

(c) Unbalance protection.

(d) Neutral displacement protection.

Requirement of each of the above protection are described below: -

1. Over-current, Earth fault & Thermal protection:

a) Three phase Numerical (IDMT) over-current relay and numerical (IDMT) earth fault relays shall be provided for phase over-current and earth fault protection.

b) Overcurrent & Earth Fault each should comprise of minimum 3 stages One IDMT & Two Highset with Minimum delay from 0 msec to 1sec.

c) IDMT shall have a setting range of 5 to 200%.

d) The relay shall have all standard IEC/ANSI characteristics.

e) The relay shall also include a high set instantaneous over-current unit with a continuously adjustable setting range of 10-2000% (10 to 20 times) of rated current.

f) Relay Should have additional stage for Thermal overload protection definite time based on Phase CT.

g) Relay should be configurable from HMI as well as Laptop.

h) Relay should store Waveform, Events & Trip Logs which should be retrievable in standard CFG format. Minimum waveform capturing should be 5 sec.

i) Relay waveform capturable should start from both Relay Start or Relay Trip.

j) Relay should be designed for Outdoor mounting at kiosk for western odisha region.

k) Electronics cards should have a conformal coating.

l) Minimum no of Binary Input & Output required in relays are 8 BI & 8 BO's.

2. Over-voltage & Under voltage Protection:

a. Over-voltage shall have an inverse time characteristic & Definite time Characteristics and shall be energized through VT connected to the main bus bars on the source side of the circuit

breaker controlling the capacitor banks. Relay shall have variable settings from 100% to 130% in steps of at least 1% to 2%.

b. Undervoltage starting range from 0% to 95 % in steps of 1 % with definite time characteristics should be settable.

3. Neutral Unbalance Protection:

Neutral Unbalance protection shall be provided with current operated relay with separate one no. NCT for each group of 2.5 / 5 MVAR. (CTR may be 5/1 or 10/1 based on designed) The relays used shall be provided with a time delay device to prevent operation under transients and to allow individual fuses to isolate the faulty units. Inverse time delay relay may be used.

4. Neutral Displacement relay

a. Separate Neutral displacement relay (NDR) should be provide for protection purposes.
b. Neutral displacement protection based on residual overvoltage with definite time should be settable from0.5 % to 25% voltage range.
c. Relay should have 3rd harmonic suppression protection.
d. Relay should have 2 stages of setting elements as DMT &IDMT relay respectively.
e. Relay should have options as per standard requirements for capacitor bank protective purpose.
f. The relay shall have all standard IEC/ANSI characteristics.

7.11.3 The under-voltage protection shall not operate in the event of fault on 33 KV lines which may dip the bus bar voltage to 50%. There should be provision for adjustments in settings of voltage and time to coordinate the 33 KV line protections with the under-voltage protection to avoid malfunctioning of under-voltage relay under line fault conditions.

7.11.4 The power factor meter should be provided.

8. NEUTRAL CURRENT TRANSFORMERS:

Neutral Current Transformer shall be single phase, outdoor; oil immersed dead tank type or dry type. The ratio of the neutral current transformer shall be compatible with unbalance calculations of the capacitor bank & it shall be selected on the basis of the unbalance current flowing through neutral of capacitor bank during the failure of elements in one capacitor unit (at alarm stage & trip stage).

9. SUPPORT STRUCTURES & EQUIPMENT FRAME:

9.1 Equipment frame, support structure, angles, channels etc. meant for the outdoor switch gear and other equipment viz. CTs, NCT, Isolators etc. shall all be hot dip galvanized. All the ferrous metal parts shall be hot dip galvanized smoothly as per IS 3638(as amended up to date), IS or any other equivalent authoritative standard. The material shall be galvanized only after shop operations upon it have been completed. The metal parts before galvanization should be thoroughly cleaned of any paint, grease, rust, scales or alkalis or any foreign deposits which are likely to come in the way of galvanization process. The metal parts coating shall withstand minimum four one-minute dips in copper sulphate solution as per IEC-168. Fasteners (nut-bolts) shall be of nonmagnetic stainless steel. No spring washer shall be used, instead one check nut of suitable size shall be provided with each bolt.

9.1.1 Support structure shall be supplied for each of the outdoor equipment and shall be suitable to maintain the clearances and spacing stipulated for various equipments. Current transformers may be mounted on the same structure as that of the circuit breaker provided the requisite electrical and mechanical clearances are properly maintained. Typical bay arrangements indicating sectional clearances are shown in the enclosed drawings.

9.1.2 The main structure shall be fabricated out of hot dip galvanized angle of minimum 75 x 75 x 6 mm or equivalent strength.

9.1.3 Successful tenderers shall clearly indicate on the relevant G.A. drawings the total dead weight coming on each support structure. Impact load, if any, shall also be stated on relevant drawing. These details are required for designing suitable foundations for the support structure for CBs, Isolators, etc.

9.2 Equipment terminal connectors (HV)

9.2.1 Tenderers shall include in their scope suitable connectors for each outdoor equipment. In the case of equipment with copper terminals, the terminal connectors shall be made of electrolytic grade copper, and shall be suitable for crimping type connection. Material required for inter connection between various bay equipment in between the two isolators of each bay shall be included in the tenderer's scope of supply. Details of the inter connector and the material used for the terminals/jumpers shall be furnished in the offer. In order to fix the jumper length, size etc. standard layout drawing is enclosed. Successful tenderer shall have to adopt Board's standard foundation plan.

9.2.2 Take-off terminals of both the isolators of each bay and for Cu-Al bimetallic connections shall be of electrolytic grade aluminium and suitable for crimping ACSR jumper along with suitable bimetallic plate of minimum 2 mm thickness. These connectors shall be suitable for 200 mm sq. ACSR conductor. All nut-bolts used in the connectors shall be of non-magnetic stainless steel. In place of spring washers, check nut of suitable size shall be provided.

9.3 Earthing Metal tanks of the instrument transformers and all other equipment, C & R panels, mechanism boxes, structures etc. shall be provided with two separate earthing terminals of size 16 mm dia. X 30 mm length H.D.G., with one plane washer and one nut, for connection to station earth-mat.

9.4 Lifting arrangement Instrument transformers and switchgear equipment shall be provided with suitable lifting arrangement to lift the entire unit. Lifting arrangement (lifting eye) shall be positioned in such a way so as to avoid any damage to the porcelain housing, primary terminals or the tanks during the process of lifting for installation/transport. The general arrangement drawing shall show clearly the lifting arrangements provided such as lifting eye, guide etc.

9.5 Painting

9.5.1 All sheet metal parts (panel, mechanism box, metal housing. Instrument transformer etc.) for outdoor installation shall be designed and fabricated with special care to avoid rust/fungus formation and corrosion. All metal parts shall preferably be hot dip galvanized. If this is not possible due to practical difficulties, cold galvanizing or epoxy coating shall be provided for all sheet metal parts, used for outdoor installation. Sheet steel shall be treated as per the 7-tank process. In case tank process for treating the sheet, metal is not possible, alternate process adopted shall be clearly explained in the technical offer which shall be got approved by the Board. Dark Admiral Grey shade as per colour shade no. 632 of IS-5 shall be used for epoxy coating.

9.5.2 The sheet metal works, after final painting shall present an esthetically pleasing appearance, free of any dent or uneven surface.

9.6 Labels

9.6.1 All front mounted as well as externally mounted items including fuses shall be provided with individual identification labels. Labels shall be mounted directly below the respective equipment and shall clearly indicate the equipment designation. Labeling shall be on aluminum anodized plates of 1 mm thickness. The letters are to be properly engraved.

9.6.2 All the equipment and their parts shall be provided with suitable labels or identification and ease of operation and maintenance.

10. 33KV SERIES REACTORS:

Suitable 0.2% current limiting reactors shall be provided on the neutral side of the Capacitor bank in rural areas having low THD level. However, 6% series reactor shall be provided on the line side of the Capacitor bank to be provided in Urban areas where THD level is more. The inductance value will control the amplitude and frequency for the inrush current. Peak inrush current shall be less than 100 times rated current of the capacitor bank and less than the breaker making current.

i) The series reactors shall be out door type, single phase, air cored, air cooled, Dry type with Aluminum winding. The normal current rating of the reactor shall be 130% of rated continuous current of the capacitor bank. The Voltage rating of the series reactor's base insulators shall be nominal system voltage of 33 KV.

ii) The provision for mounting of reactor is to be made on capacitor bank structure.

iii) The reactor shall be free from annoying hum or vibration. The design shall be such as not to cause any undesirable interference with radio or communication circuits. All routine tests shall be carried out as per IS5553 or equivalent international standard.

iv) The complete assembly of the Capacitor bank shall be on a mild steel galvanized steel structure.

Special requirement:

1. In order to execute a safe switching of breaker if any suppressor like snubber circuit is required than it should be engineered, designed, supplied, installed & commissioned by the bidder.
2. And warranty of such circuit should be same as CAP bank units.

11.TYPE TESTS

Type test certificates on capacitor bank for the following tests, strictly as per IS 13925(Part 1-2012), with latest amendment thereof, from any of the independent Govt. Laboratory, or at any recognized and reputed international laboratory or testing institution, shall invariably furnished: -

1) Thermal stability test
2) Measurement of the tangent of the loss angle of the capacitor at elevated temperature
3) AC voltage test between terminals & container
4) Lighting impulse voltage test between terminals and container
5) Short circuit discharge test
6) Test of an external fuse in combination with a capacitor
7) Disconnecting test on internal fuses

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.

The above tests must not have been conducted on the equipment earlier than 10 years from the date of opening of bids.
In case of any change in design/type of capacitor bank already type tested and the one offered against this specification, the owner reserves the right to demand repetition of type tests, without any extra cost.

12. ACCEPTANCE AND ROUTINE TESTS:

All acceptance and routine tests, as stipulated in relevant standards, shall be carried out by the manufacturer, in presence of owner's representative
Immediately after finalization of the programme of type testing, the manufacturers shall give, fifteen days advance intimation to the owner, to enable him depute his representative for witnessing the tests.

13. TYPE TEST CERTIFICATES:

1. The bidder shall furnish the type test certificates as mentioned above as per the corresponding standards.
2. All the tests shall be conducted at CPRI / ERDA as per the relevant standards.
3. Type tests should have been conducted in certified Test laboratories during the period not exceeding 10 years from the date of opening the bid.
4. In the event of any discrepancy in the test reports, i.e., any test report not acceptable same shall be carried out without any cost implication to TPWODL.
5. Bidder shall submit the Test Reports for the Tree Retardant properties of the insulation

14. TECHNICAL SPECIFICATIONS REFERENCES:

To attain the power factor leading with power system, it requires proper system design to achieve the lead. In the same view, some of auxiliary equipments are required for the full protection and operation of capacitor banks. To maintain the system in a safe way, few necessary items are required as mentioned earlier in this document. The items are circuit breaker, Isolator, LA, CT and Nct. Required detail technical specifications are attached below as reference for the best understanding of technical specifications which is approved by TPWODL.

1) **Isolator: Document No. TPWODL/ENGG/SPEC/046/2021**
2) **Circuit breaker: Document No. TPWODL/ENGG/SPEC/019/2021**
3) **Current Transformer: Document No. TPWODL/ENGG/SPEC/037/2021**
4) **Control & Relay panel: Document No. TPWODL/ENGG/SPEC/062/2021**
5) **BCPU: Document No. TPWODL/ENGG/SPEC/010/2021**
6) **Potential Transformer: Document No. TPWODL/ENGG/SPEC/027/2021**

15. RECOMMENDED SPARES

The tenderer shall furnish in his offer, a list of recommended spares with unit rates for each capacitor that may be necessary for satisfactory operation and maintenance of the capacitor bank for a period of 5 years. The purchaser reserves the right of selection of items and quantities of these spares to be ordered. The cost of such spares shall not be considered for tender evaluation. The unit prices should be valid for two years from the date of issue of detail A/T.

16. ERECTION AND MAINTENANCE TOOLS

The tenderer shall submit a list and unit rates of all the special tools, equipment and instruments required for erection, testing, commissioning and maintenance of the capacitor bank. The purchaser shall decide the quantity of tools to be ordered. Prices of these tools shall not be considered for tender evaluation. However, the list of necessary tools/equipment which will be supplied free of cost with capacitor bank may be furnished separately.

17.PRE - DESPATCH INSPECTION

1. Material shall be subject to inspection by a duly authorized representative of TPWODL.
2. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.
3. Bidder shall grant free access to the places of manufacture to TPWODL's representatives at all times when the work is in progress.
4. Inspection by TPWODL or authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
5. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL.

Following documents shall be sent along with material:

a) Test report
b) MDCC issued by TPWODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Brought out (raw) material test certificates
h) Delivery Challan
i) Other Documents (as applicable)

INSPECTION AFTER RECEIPT AT STORES:

The material received at TPWODL, Odisha store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to "Network planning, Engineering and Quality" department

18. PERFORMANCE GUARANTEE

The equipment offered shall be guaranteed for satisfactory performance for a period of 66 months from the date of receipt of complete equipment at destination store/site in good condition or 60 months from the date of satisfactory commissioning of equipment whichever is earlier. The equipment found defective/failed within the above guarantee period shall be replaced/repaired by the supplier free of cost

within one month of receipt of intimation. If the defective/failed equipment are not replaced/repaired as per the above guarantee clause, the company shall recover an equivalent amount plus 15 % supervision charges from any of the supplier's bills.

19. DRAWINGS

The tenderer shall furnish four sets of relevant descriptive and illustrative published literature/pamphlets and the following drawings for preliminary study:

a. General outline drawings showing outside dimensions, shipping dimensions, weights, quantity of insulating media air receiver capacity and such other prominent details.
b. Structural drawing, design calculations and loading data for support structures.
c. Foundation drilling plan and loading data for foundation design.
d. Type test reports of capacitor bank along with a separate list showing all the tests carried out with date & place of test.
e. Test reports, literatures and pamphlets of bought out items and raw materials.
f. Cage layout along with interlock provision between cage and VCB.
g. Series reactor support structure GA drawings with dimensions as per IS standards.

The successful tenderer shall, within 6 weeks of placement of order, submit THREE sets of final versions of all the above said drawings in A-3 size, bill of material, packing list & all type test reports for purchaser's approval to the office of GM (Stores). The purchaser shall communicate his comments/approval on the drawings to the supplier within reasonable period. The supplier shall, if necessary, modify the drawings and resubmit four copies of the modified drawings for purchaser's approval within two weeks from the date of purchaser's comments. After receipt of purchaser's approval, the supplier shall, within three weeks, submit 10 prints & two good quality reproducible of the approved drawings and 10 sets of instructions manuals in respect of Capacitor bank to the office of GM (Stores).
The successful tenderer shall furnish in the form of nicely bound volumes, the manuals covering erection, commissioning, operation and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices. Marked erection drawings shall identify the component parts of the equipment as shipped to enable Engineer/Purchaser to carry out erection with his own personnel. Each manual shall also contain one set of all the approved drawings type test reports as well as acceptance test reports to corresponding consignment dispatched. The total quantity of the operating manuals/approved drawings sets to be supplied by the supplier shall be equal to the number of three phase breakers of rating, ordered.
The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the supplier's risk.
Approval of drawings/work by the purchaser shall not relieve the supplier of any of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revisions of applicable standards, rules and codes of practices.

20.PACKING AND FORWARDING

The equipment shall be packed in suitable crates so as to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully

packed and marked with the appropriate caution symbols. Wherever necessary, proper lifting arrangement such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.
Each consignment shall be accompanied by a detailed packing list containing the following information:
a. Name of the consignee.
b. Details of consignment.
c. Destination.
d. Total weight of consignment.
e. Sign showing upper/lower side of the crate.
f. Handling and unpacking instructions.
g. Bill of materials indicating contents of each package and spare materials
The supplier shall ensure that the packing list and bill of materials are approved by the purchaser before dispatch.

21. GURANTEED TECHNICAL PARTICULARS

GTP of 33KV CAPACITOR BANK
(To be submitted by the bidder)

Sl. No.	Description	Unit	2.5MVAr	5MVAr	Bidder's Offer
1	Manufacturer's Name		Bidders to be provide	Bidders to be provide	
2	Maker's type designation		CHD	CHD	
3	Standard followed		IS 13925 (Part-1) 2012	IS 13925 (Part-1) 2012	
4	Purpose		Power factor improvement	Power factor improvement	
5	Location		Outdoor	Outdoor	
6	Rated voltage	KV	36KV	36KV	
7	Service Voltage	KV	33KV	33KV	
8	Rated frequency	Hz	50Hz	50Hz	
9	System fault current (Ka at Sec)	A	Bidders to be provide	Bidders to be provide	
10	Ambient Temperature: Max/Min	degree centigrade	50/5	50/5	
11	Rated Output (Installed)				
a	Voltage	KV	38	38	

Sl. No.	Description	Unit	2.5MVAr	5MVAr	Bidder's Offer
b	Reactive Power	KVAR	Bidders to be provide	Bidders to be provide	
12	Rated Output (Effective)		Bidders to be provide	Bidders to be provide	
a	Operating Voltage	KV	33	33	
b	Reactive Power	KVAR	2500	5000	
13	No of phases		3	3	
14	Rated capacitance in micro Farad	MFD	6.14	12.29	
15	Type of connection	Star / Delta	Double star (YY)	Double star (YY)	
16	Capacitor dielectric type	APP / MPP	Polypropylene film	Polypropylene film	
17	Thickness in mm of insulation system/ dielectric		Bidders to be provide	Bidders to be provide	
18	Watt loss of paper/film at various dielectric temperatures (enclosed)		Bidders to be provide	Bidders to be provide	
19	Max. Stress on the dielectric in volts/micron.		Bidders to be provide	Bidders to be provide	
20	No. of units per bank		Bidders to be provide	Bidders to be provide	
21	Type of mounting		Structure mounting	Structure mounting	
22	**Terminal arrangement**				
a	Incoming terminal		Al flat	Al flat	
b	Outgoing terminal		NA	NA	
23	**Capacitor unit**		Single phase	Single phase	
a	Rated output	KVar	Bidders to be provide	Bidders to be provide	
b	Rated voltage	KV	20	20	
c	Rated current	A	Bidders to be provide	Bidders to be provide	
d	Number of bushing		2	2	
24	Unit Protection (as per feasibility)		Internal Fuse	Internal Fuse	

Sl. No.	Description	Unit	2.5MVAr	5MVAr	Bidder's Offer
25	Discharge device material		Metal oxide Resistors (External fitted Resistors).	Metal oxide Resistors (External fitted Resistors).	
26	Unit container material / thickness (mm)		CRCA / 1.5 mm	CRCA / 1.5 mm	
27	Guaranteed temperature rise of capacitor unit above ambient temperature		10^0 C	10^0 C	
28	Panel dimensions in mm (L x D x H) Max		1350´500´2000 mm	1350´500´2000 mm	
29	Expected temperature rise at site within the panel, with all capacitor units switched Oni) With Ventilation fan ON		18^0 C	18^0 C	
30	Panel enclosure protection offered		IP 42 minimum	IP 42 minimum	
31	Maximum permissible over voltage		110%	110%	
32	Maximum permissible over current		130%	130%	
33	Dielectric loss less than 0.2w / KVAR		Di-electric loss is 0.2 as per IS13340-93	Di-electric loss is 0.2 as per IS13340-93	
34	Guaranteed minimum capacitor switching operations (ON/OFF) per year		Bidders to be provide	Bidders to be provide	
35	Residual voltage after de-energization & at 60 seconds		Less than 50 V	Less than 50 V	
36	Directly connected internal discharge resistor		Yes	Yes	
37	Design life of capacitor unit		>1,00,000 Hours.	>1,00,000 Hours.	
38	1-minute power frequency withstand KV	KVrms	70	70	
39	Impulse withstand voltage	KVp	150	150	

Sl. No.	Description	Unit	2.5MVAr	5MVAr	Bidder's Offer
40	Main bus bar material / size (sqmm)		Bidders to be provide		
41	Main bus bar rated current		Bidders to be provide	bidders to be provide	
42	Main bus bar short time withstand		Bidders to be provide	bidders to be provide	
43	CT make & accuracy class		Bidders to be provide	bidders to be provide	
44	CT Ratio & Burden (VA)		Bidders to be provide	bidders to be provide	
	APFC				
45	APFC relay make / type		Bidders to be provide	bidders to be provide	
46	Required Protections				
a)	Over-current, Earth fault & Thermal protection	A	i) IDMT: 5 to 200 % ii) Time delay : 0 - 1 sec iii) Highset : 10 - 2000%	i) IDMT : 5 to 200 % ii) Time delay : 0 - 1 sec iii) Highset : 10 - 2000%	
b)	a) Over Voltage b) Under voltage protection	V	i) Over Voltage Setting range: 100% - 130% (In steps 1% - 2%) ii) Under voltage Setting range : 0% -95% (In steps 1%)	i) Over Voltage Setting range: 100% - 130% (In steps 1% - 2%) ii) Under voltage Setting range : 0% - 95% (In steps 1%)	
c)	Neutral Displacement relay		Setting range: 0.5% - 25%	Setting range: 0.5% - 25%	
	DC Input voltage		24V DC +/- 10% Tolerance	24V DC +/- 10% Tolerance	
	Stages of protection	Element 1 - Ist stage	DMT with time delay	DMT with time delay	
		Element 2 - 2ND STAGE	IDMT curve	IDMT curve	
	Voltage setting range		Bidders to be provide	Bidders to be provide	
	Display		LCD display	LCD display	

Sl. No.	Description	Unit	2.5MVAr	5MVAr	Bidder's Offer
	Configuration		Both options - through HMI & Laptop	Both Options - through HMI & Laptop	
	Communication port (Front & Rear)		Serial port and RS 485	Serial port and RS485	
d)	CTR for neutral	A	5/1 or 10/1	5/1 or 10/1	
e)	Relay configuration	Port option	Configurable through HMI & Laptop also.	Configurable through HMI & Laptop also.	
f)	Event reports	Format	CFG	CFG	
g)	Waveform capturing (Minimum)	Sec	5	5	
h)	Mounting design		Outdoor	Outdoor	
i)	Binary Inputs / Outputs (Minimum)		16 BI's & 8 BO's	16 BI's & 8 BO's	
j)	Standard followed		As per IEC/ANSI	As per IEC/ANSI	
47	Load manager make / type		Bidders to be provide	bidders to be provide	
48	AC contactor make		Bidders to be provide	bidders to be provide	
49	AC contactor utilization category as per IS		Bidders to be provide	bidders to be provide	
50	MCCB Make/Type/ Cat No. with SC rating (Icu=Ics=35 kA/50kA for Incomer & outgoing		Bidders to be provide	bidders to be provide	
51	Reactor Coil to limit in rush current provided: Yes/ No	Y/N	Bidders need to provide	Bidders need to be provide	
52	Ventilation fan provided : (with details of Numbers, type capacity & make with back up calaculation)	Yes/ No	Yes	Yes	
53	Capacitor unit is type tested: (If yes the test report No/ date should be mentioned and a copy should be submitted for REL's review)	Yes/ No	Yes	Yes	

Sl. No.	Description	Unit	2.5MVAr	5MVAr	Bidder's Offer
54	The offered APFC Panel is tested for temperature rise test at ERDA/ CPRI: (If yes, the test report no/ date should be mentioned and a copy should be submitted for REL's review)	Yes/ No	Yes	Yes	
55	APFC panel insulation level		2 KV	2 KV	
56	Discharge time with internal discharge device	Secs	Within 600 Secs.	Within 600 Secs.	
57	Min. elect. Clearances in the bank between phase to phase & live parts to earth in mm	IS	As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
58	Maximum permissible over voltage& duration corresponding to the same in % for 1Hr./2Hr./ 4Hr./ continuous		As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
59	Overall dimensions of the Capacitor Bank		Bidders to be provide	Bidders to be provide	
60	Layout & dimensions drawings (to be attached separately		Bidders to be provide	Bidders to be provide	
61	Maximum over voltage the Unit Capacitor is capable of withstanding continuously in % rated KV		As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
62	Insulator strength of bushings & Cap. units		70kV(rms) 150kV (Pk)	70kV(rms) 150kV (Pk)	
63	Bushing's minimum Creepage	mm	25mm/KV	25mm/KV	

Sl. No.	Description	Unit	2.5MVAr	5MVAr	Bidder's Offer
64	No. of Capacitor elements per unit Capacitor with No. of series/parallel elements (Sketch enclosed)		Bidders to be provide	Bidders to be provide	
65	Mode of internal connection of the Capacitor elements (Sketch enclosed)		Bidders to be provide	Bidders to be provide	
66	Voltage across each element in unit at rated voltage		Bidders to be provide	Bidders to be provide	
67	Percentage Loss of Capacitance at which an internally fused Capacitor unit is considered useless		As per IS 13925 (Part-1) 2012	As per IS 13925 (Part-1) 2012	
68	Capacitor bank type		Fixed type	Fixed type	

Signature of Bidder:

Name of the Company:

Date:

Office Seal:

GTP of 33KV CIRCUIT BREAKER
(To be submitted by the bidder)

Sl.No	Technical Particulars	To be provided by bidder
1.	**Vacuum Circuit Breaker**	
	Type	
	Reference Standard	
	Arc quenching medium	
	No. of break / phase	
	Rated voltage	
	Highest voltage	
	Frequency	
	Rated normal current	
	Breaking Capacity	
	Making Capacity	
	STC for 3 Sec.	
	Insulation level	
	Minimum Creepage distance	
	Temperature rise	
	Operating duty cycle	
	First pole to clear factor	
	Single phase capacitor breaking capacity	
	Cable charging breaking capacity	
	Minimum Pole to Pole clearance	
	Clearance between lower Live part of VCB to Ground Level	
	Clearance between lower Live part of the VCB and Upper Surface of the Metallic Structure	
	Closing time	
	Opening time	
	Mechanical Endurance Capacity	
	Electrical Endurance Capacity	
	Operating mechanism	
	Number of Trip coil	
	DC Aux. voltage	
	AC Aux. voltage	
	No. of spare contacts Aux Switch (NO & NC)	
	No. of spare contacts in Limit Switch (NO & NC)	
	Contact multiplier	
	Space heater	
	Illuminating lamp	

Sl.No	Technical Particulars	To be provided by bidder
	Anti-pumping Relay	
	Breaker control switch	
	Local Remote switch	
	Spring charging motor	
	Degree of Protection of control cubicle	
	Sheet thickness of control cubicle	
2.	**Vacuum Bottle**	
	Make	
	Model No (Supporting Literature to be enclosed)	
	Rated Voltage	
	Normal Current	
	Breaking Capacity	
	Making Capacity	
	STC for 3 sec	
	Minimum Mechanical life in no. of operations	
	Minimum Electrical life in no. of operations at rated current	
	Minimum Electrical life in no. of operations at 25 KA	
	Dry Power Frequency withstand voltage for 1 min.	
	Impulse withstand voltage	
	Contact Material	
	Type of plating	
3.	**Low Voltage Terminal connector**	
	Make	
	Type	
	Size	
4.	**Primary Terminal Connector**	
	Material	
	Size	
	Continuous current rating	
	Nuts, bolts & washers	
	Reference Standard	
	Number of connectors per VCB	
5.	**Trip & Close coil**	
	Voltage & Wattage of Closing coil	
	Voltage & Wattage of Trip coil	
6.	**Control wire**	
	Make	
	Voltage grade	
	Size	

Sl.No	Technical Particulars	To be provided by bidder
	Colour	
7.	**Earthing Terminal**	
	Material	
	Shape	
	Size	
	Current Rating	
8.	**Painting details**	
	Surface cleaning process	
	Paint thickness	
	Paint shade	
9.	**Accessories**	
	Spring charging handle	
	VCB operating handle	
10.	**Name Plate details**	
	Manufacturer	
	Type of VCB	
	Rated voltage	
	Rated current	
	Rated frequency	
	Insulation level	
	Short Circuit Breaking Current	
	Short Circuit withstand Current & duration	
	Short Circuit Making Current	
	Operating sequence	
	Make and Model of Vacuum Interrupter	
	Aux. DC voltage	
	Aux. AC voltage	
	Total weight	
	Serial number	
	Purchase Order reference	
11.	**Property Plate**	
12.	**Guarantee**	

GTP of 33KV ISOLATOR
(To be submitted by the bidder)

Sl. No.	Technical Parameter	Units	To be filled by the bidder
1	Make & Type		
2	Maximum permissible continuous service voltage	KV	
3	Clearance in air (minimum)		
a.	Between Phase	mm	
b.	Between live parts & earth	mm	
4	Distance between centers of outer stack of insulators	mm	
5	Power Frequency withstand test voltage for completely assembled switches		
a.	Against ground		
i.	Dry	KV	
ii.	Wet	KV	
b.	Across Open Contacts		
i.	Dry	KV	
ii.	Wet	KV	
6	Impulse withstand Test voltage of completely assembled isolator switch with 1.2/50micro sec. impulse wage		
a.	Against ground	KVpeak	
b.	Across the open ends of the phase	KVpeak	
c.	Between phases	KVpeak	
7	Particulars of the Main contact		
a.	Type		
A.	Main Contacts		
i.	Fixed contacts		
ii.	Moving contacts		
b.	Materials		
c	Size		
i.	Main Fixed contacts		
ii.	Main Moving contacts		
	Earth Contacts		
i.	Fixed contacts		
ii.	Moving contacts		
b.	Materials		
c	Size		

Sl. No.	Technical Parameter	Units	To be filled by the bidder
i	Earth Fixed contacts		
ii	Earth Moving Contacts		
d.	Current Density	(Amps/mm^2)	
i.	Fixed contacts	(Amps/mm^2)	
ii.	Current take off assembly	(Amps/mm^2)	
iii.	Aluminium pad	(Amps/mm^2)	
e.	Surface treatment and thickness of surface coating		
f.	Contact area	mm^2	
g.	Contact pressure	Amps	
h.	Contact support of fixed contact	mm	
8	Current density at the minimum cross section of switch blade	Amps/mm^2	
9	Continuous current rating	Amps	
10	Short time current rating	KArms	
a.	For 1 sec.	KArms	
b.	For 3 sec.	KArms	
11	Rated peak short circuit current	KApeak	
12	Momentary Current	KArms	
13	Temperature Rise Corresponding to Maximum continuous rated current rated at 50^{0}C Ambient		
14	Maximum Transformer magnetizing current which can be safely interrupted by the switch?		
15	Maximum current that can be safely interrupted between equipment bus bars	Amps.	
16	Maximum capacity current which can be safely interrupted by the isolator		
17	Number of times isolator can be operated without any need for inspection		
18	No. of operation which the switch can withstand without determination of contacts		
19	No. of Break per Phase		
20	Terminal Connectors		
a.	Clamp Body alloy composition		
b.	Bolts & Nuts size, material & tensile strength		
c.	Type of washers used		
d.	Temperature rise when carrying rated current at 50^{0}C ambient temperature.		
e.	Weight of each type of clamp	Kg.	
f.	Design of clamp		

Sl. No.	Technical Parameter	Units	To be filled by the bidder
21	Nuts and Bolts		
a.	Size, material and grade in current carrying path		
b.	Size, material & grade in other parts		
22	Material and size of plate provided below & on top of insulators		
23	Bearings		
a.	Material & size of Bearing		
b.	No. of bearings (location & size)		
c.	Type of bearing		
d.	Shaft dia. Of bearing	mm	
e.	Distance between two bearing	mm	
24	Tandem pipe		
a.	Size, class & no. of pipe		
b.	No. of Bearing/ Bush		
25	Down pipe size and class		
26	Isolator arrangement		
a.	Open Position		
b.	Close Position		
27	Ingress Protection		
28	Particulars of Post Insulators		
i.	Make		
ii.	Type		
iii.	Strength	Kg.	
iv.	Weight	Kg.	
iv.	No. of Post Insulator (Stack)		
iv.	No. of units per stack		
vi.	Height of stack	mm	
vii.	Puncture Voltage	KV	
viii.	Creepage distance	mm	
ix.	One-minute Dry Power Frequency withstand voltage	KVrms	
x.	Power Frequency Flashover voltage	KVrms	
xi.	Impulse flashover Voltage	KVpeak	
xii.	Impulse withstand voltage	KVpeak	
xiii.	Puncture Voltage	KV	
xiv.	No. of use Post Insulator		

GTP of 33KV CURRENT TRANSFORMER
(To be submitted by the bidder)

Sl. No	Technical Parameter	Units	To Be Provided by Bidder
1.	Type		
2.	Nominal System voltage	KV	
3.	Highest System Voltage	KV	
4.	Rated Current	Amp	
A	Rated Continues Current	Amp	
5.	Frequency	Hz	
6.	Short time thermal current stipulated time duration	KA	
7.	Dynamic current Rating	KA	
8.	Lighting Impulse withstand voltage	KV	
9.	Class of Insulation	Cl	
10.	Creepage Distance	Mm	
11.	Ratio	CTR	
12.	Class of Accuracy		
13.	Burden	VA	
14.	Application		
15.	Type of Mounting		
16.	Place of installation		
17.	Number of secondary windings	Nos	
18.	Primary terminal connector		
19.	Fixing hole dimension		
20.	Painting		
21.	Secondary terminal box		
22.	Suitability		
23.	One min. power frequency withstand voltage for primary winding (rms)	Kv	
24.	One-minute power frequency withstands voltage of secondary winding (rms)	Kv	

GTP of 33KV CONTROL AND RELAY PANEL
(To be submitted by the bidder)

S.No.	PARTICULARS	Bidder Offer
1	Manufacturer name	
2	Frequency	
3	Nominal System Voltage	
4	Maximum System Voltage	
5	Number of phases	
6	Neutral Earthing Arrangement	
7	Fibre Optic Cable	
a.	Control Room to Switchyard/Switchgear	
b.	Within Control Room	
8	Data transmit	
a.	Cable type	
b.	Speed	
c.	Frequency	
9	Ingress protection	
10	cold rolled sheet steel of thickness	
11	Mounting	
a.	Centre lines of switches, push buttons and indicating lamps from the bottom of the panel	
b.	centre lines of relays, meters and recorders from the bottom of the panel	
12	Auxiliary supply	
13	Terminal Blocks	
i.	Voltage grade	
ii.	Current	
iii.	Terminal block connection	
a	All CT &PT circuits	
b	All AC/DC Power Supply Circuits	
c	All other circuits	
iv.	Minimum clearance	
a	First row of terminal blocks and the associated cable gland plate	
b	Two rows of terminal blocks edges	

S.No.	PARTICULARS	Bidder Offer
14	Painting	
15	Associated Accessories	
i.	Plug Point	
ii	AC socket with switch	
iii.	MCB	
iv.	HRC	
16	Interior Lighting	
a.	Lighting fixture rated voltage	
b	Panel controlled Light	
17	Space Heater	
a	Rated Voltage	
18	Earthing Size Material and Colour	
a	Bus bar	
b	Gland plate	
c	Colour code	
19	Control and instrument switches	
20	Indicating lamps	
21	Energy Meters	
i.	Type	
ii.	Basic Current (Ib)	
iii.	Rated Max. Current (Imax)	
iv.	Rated Secondary Current (Ib)	
v.	Operating Voltage	
vi.	Power Consumption	
vii.	Starting Current	
22	19” Rack Mountable with Power Socket and Ports at rear side	
23	Compliance to IEC 61850-3, IEEE 1613 Standards	
24	Port Speed: 10Mbps/100Mbps for Station Bus and 1Gbps for Process Buss	
25	Should have minimum of 12 Ports, number of switches minimum 2	
26	LED indicators for link establishment and data transfer for each port	
27	Should support remote user setting configuration.	

S.No.	PARTICULARS	Bidder Offer
28	Should own separate maintenance/console port	
29	Should support SNMP Server v1.0/v2.0/v3.0	
30	Auxiliary Power Supply: 24 VDC or 48VDC (depending upon the Station DC Voltage) with ±15% tolerance, Dual Power Supply	
31	All the cards/modules of the Switch must have conformal coating for protection against harsh and polluted environment	
32	LIFTING arrangement.	
33	Painting	
34	Heater provision	
35	Illumination provision	
36	Make of relays	
a.	L/O	
b.	BCPU (O/C& E/f)	
c.	Trip supervision relay	
d	Differential Relay	
37	Weight	
38	Dimension (LXWXH) in mm	
39	Mounting arrangement	
40	Control cable tray provision for dressing	
41	Control cable entry provision (top/bottom)	
42	Labelling for all aux components	
43	Wires and lug as per specs	
44	Extension of earthing at both sides provision	
45	Earthing connection hardware	
46	Plug point provision	

GTP of 33KV NEUTRAL CURRENT TRANSFORMER

(To be submitted by the bidder)

Sl. No	Technical Parameter	Units	To Be Provided by Bidder
1.	Type		
2.	Nominal System voltage	KV	
3.	Highest System Voltage	KV	
4.	Rated Current	Amp	
A	Rated Continues Current	Amp	

5.	Frequency	Hz	
6.	Short time thermal current stipulated time duration	KA	
7.	Dynamic current Rating	KA	
8.	Lighting Impulse withstand voltage	KV	
9.	Class of Insulation	Cl	
10.	Creepage Distance	Mm	
11.	Ratio	CTR	
12.	Class of Accuracy		
13.	Burden	VA	
14.	Application		
15.	Type of Mounting		
16.	Place of installation		
17.	Number of secondary windings	Nos	
18.	Primary terminal connector		
19.	Fixing hole dimension		
20.	Painting		
21.	Secondary terminal box		
22.	Suitability		
23.	One min. power frequency withstand voltage for primary winding (rms)	Kv	
24.	One-minute power frequency withstands voltage of secondary winding (rms)	Kv	

GTP of 33KV POTENTIAL TRANSFORMER
(To be submitted by the bidder)

S. No.	Technical Parameter	To Be Provided by Bidder
1	Name of Manufacturer & Country of Origin.	
2	Manufacturer Type designation	

3	IS to which PT confirms	
4	Nominal system voltage.	
5	Highest system voltages.	
6	Frequency.	
7	Class of Insulation	
8	One-minute Power Frequency withstand voltage (KVrms)	
9	Impulse withstand Voltage (KVP)	
10	One-minute power frequency withstands voltage of secondary winding (rms)	
a.	Phase to Phase	
b.	Between sections	
11	Transformation ratio(s).	
a.	Rated Primary Voltage (in Volts)	
b.	Rated Secondary Volts (in Volts)	
c.	Rated burden.	
d.	Class of Accuracy.	
12	Winding Details	
a.	Material of conductor.	
b.	No. of turns.	
c.	Cross sectional area.	
d.	Weight of winding.	
13	Whether complete type test reports as per relevant IS enclosed.	
14	Total weight of PT	
15	Overall dimensions.	
16	Mounting details.	
17	Bushing details.	
a.	Confirm to IS:	
b.	Make.	
c.	Total creepage distance (mm)	
d.	Protected creepage distance.	
18	Make of terminal connector	
19	Test results of oil as per IS:335	
a.	Quantity of oil	
b.	Break Down Voltage	

c.	Color of oil (shall be color less)	
20	Lifting Arrangement	
21	Any other specific feature.	

GTP of 33KV SERIES REACTOR
(To be submitted by the bidder)

SL.NO	Description	Bidder's Offer
1	Make	
2	Type	
3	Reference Standard	
4	% Impedance	
5	System Voltage, Frequency, & number of phases	
6	Basic insulation level	
7	Type of cooling	
8	Overall dimensions a) Length in mm b) Width in mm c) Height in mm	
9	Over current factor	
10	For 6% Reactor	
a	Rated continuous through put KVAr	
b	Rated current Amps / phase	
c	Impedance Ohms/Phase	
d	Load losses in KW for 3 phases	
15	For 0.2% Reactor	
a	Rated continuous through put KVAr	
b	Rated current Amps / phase	
c	Impedance Ohms/Phase	
d	Load losses in KW for 3 phases	

20.SCHEDULE OF DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirmthe purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above. Seal of the Company:

Signature of

Bidder: Name

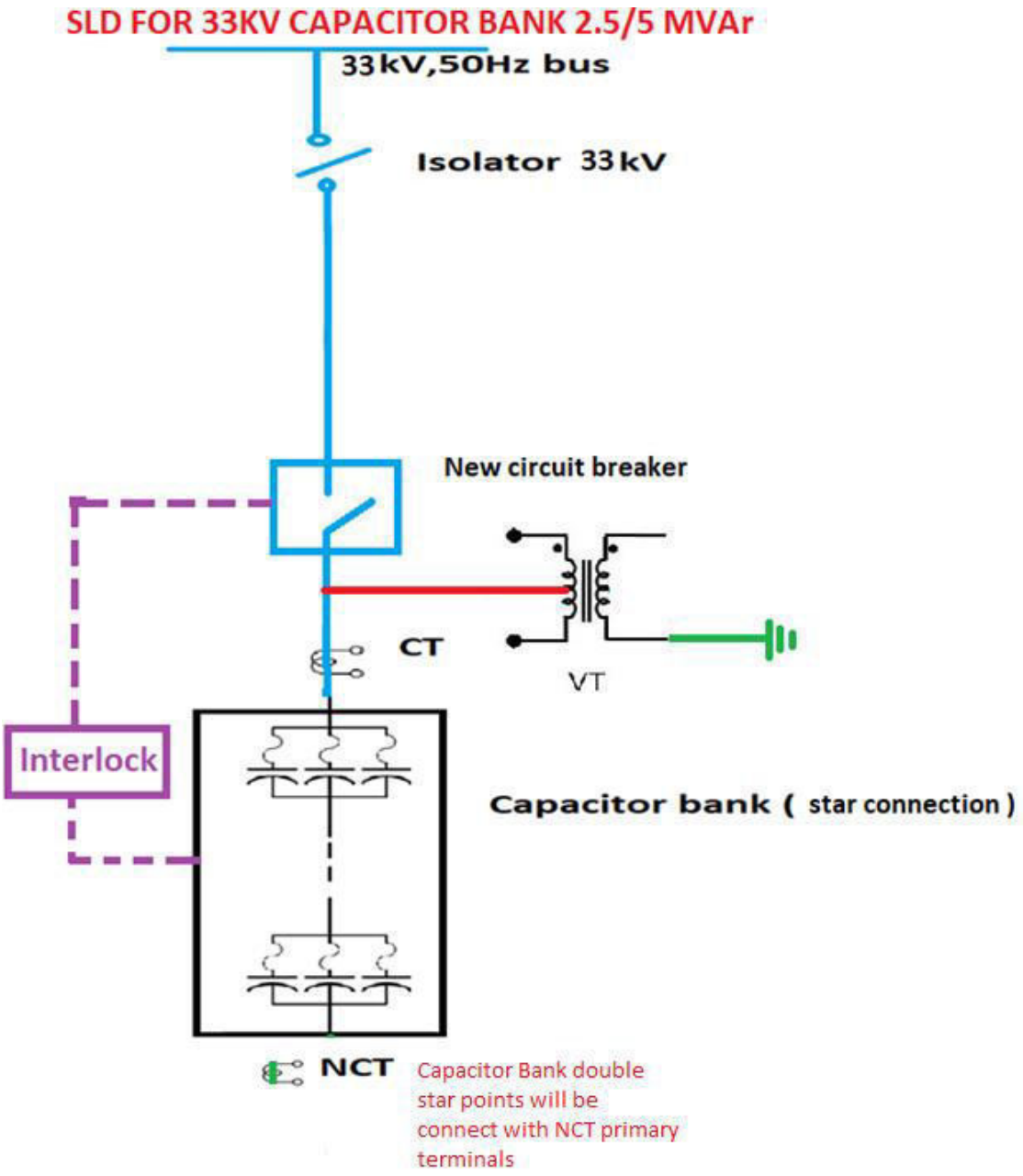
of the

Company:

Date:

Office Seal

22.Single Line Diagram – 33 kV capacitor bank 2.5 / 5 MVAr



STANDARD TECHNICAL SPECIFICATION OF 33KV & 11KV CONTROL PANEL (INDOOR TYPE) ALONG WITH PROTECTION RELAYS

DETAILS OF DOCUMENT REVISION:

Rev. No.	Rev. Date	Changes Made	Details of document update	Updated By	Approved By
R1	14/03/2022	Updated	Updated as per TPWODL requirements	KGR	VBN
R2	01/08/2023	Updated	Updated as per TPWODL requirements	KGR	VBN

CONTENTS

1.0 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing and forwarding, supply, unloading at TPWODL stores/sites, Installation, testing and commissioning. Following equipment's / materials covered under the scope with all fittings, accessories and associated auxiliary equipment, mandatory spares which are required for efficient and trouble-free operation.

a) 33KV Control & Relay Panel for Transformer
   i. L/O relays
   ii. Differential relay (for transformer feeder)
   iii. Trip circuit supervision Relay.
   iv. BCPU (O/C +E/F)
   v. Aux relays (WTI,OTI,BUZ,etc..,)

b) 11KV Control & Relay Panel for Transformer Incomer.
   i. L/O relay
   ii. Trip circuit supervision Relay.
   iii. BCPU (O/C +E/F)

c) 33KV Control & Relay Panel for Feeder
   i. L/O relay
   ii. Trip circuit supervision Relay.
   iii. BCPU (O/C +E/F)

d) 11KV Control & Relay Panel for Outgoing Feeder
   i. L/O relay
   ii. Trip circuit supervision Relay.
   iii. BCPU (O/C +E/F)

Refer above miscellaneous items specifications are attached with below mention Specification number:

Sr. No.	Technical Specifications	TPWODL Specification No
I.	BCPU HV feeder non-directional over-current & earth fault protection relay	TPWODL/ENGG/SPEC/010/2021
II.	Two winding transformer Differential protection Relay with integrated standby earth fault Relay (Only for transformer feeder CRP)	TPWODL/ENGG/SPEC/011/2021

The following scope is excluded from vendor

1) Civil foundation of panels including trenching.
2) Control cable laying for extending field input and aux supply.

3) Extension of earthing to panels.

2.0 APPLICABLE STANDARDS

The Control & Relay Panel covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards /IEC/ International Standards and shall conform to the regulations of local statutory authorities.

Indian/International Standard (IS/IEC)	Title
IS 9000	Basic Environmental testing procedure for electrical and electronic items
IS 694-1990	PVC insulated cables for working voltage up to and including 1100V
IS 2629-1985	Recommended practice for Hot Dip Galvanizing of iron & Steel
IS 2633-1986	Test for uniformity of Zinc Coating
IEC 60529	Degrees of Protection provided by enclosures (IP Code)
IEC 62052-11	Electricity metering equipment (a.c.) – General requirements, tests & test conditions
IEC 62053-22	Static meter for active energy (Class 0.2S and 0.5S)
IEC 61850	Communication networks and systems in substations (all parts including IEC 61850-8-1, IEC 61850-9-2)
IEC 61869-9	Digital Interface for Instrument Transformers
IEC 61869-13	Stand-alone Merging Units
IEC 61588/IEEE 1588v2	Precision clock synchronization protocol for networked measurement and control systems
IEC 62271 (102)	Power systems management and associated information exchange - Data and communications security

*In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.

3.0 CLIMATIC CONDITIONS OF THE INSTALLATION

The service shall be as follow:

1. Maximum altitude above sea level 1,000m
2. Maximum ambient air temperature 50°C
3. Maximum daily average ambient air temperature 35°C
4. Minimum ambient air temperature 0°C
5. Maximum temperature attainable by an object exposed to sun 60°C
6. Maximum relative humidity 95%
7. Average number of thunderstorm per annum 70
8. Average number of rainy days per annum 120
9. Rainy months June to October
10. Average annual rainfall 150cm
11. Maximum Wind velocity 200 km/hr
12. Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3g

13. Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

Environmentally, some of the regions, where the work will take place includes hilly areas, subject to high relative humidity, which can give rise to condensation. Atmosphere is generally laden with mild acid and dust due to industrial activities. Some places are in heavily industrial polluted areas. On occasions, the combination of humid, acidic and dust condensation may create pollution conditions for outdoor equipments. Therefore, outdoor materials and equipment's shall be designed and protected for use exposed, heavily polluted, acidic, corrosive, tropical and humid atmosphere.

4.0 GENERAL TECHNICAL REQUIREMENTS

Sr.No.	PARTICULARS	REQUIREMENT
1	Manufacturer name	Bidder to provide
2	Frequency	50 Hz (±3%)
3	Nominal System Voltage	33 KV / 11 KV
4	Maximum System Voltage	36 KV / 12 KV
5	Number of phases	Three
6	Neutral Earthing Arrangement	Solidly Grounded
7	Fibre Optic Cable	
a.	Control Room to Switchyard/Switchgear	4 Core, 62.5/125µm Single mode / Multi-mode
b.	Within Control Room	2 Core, 62.5/125µm Single mode / Multi-mode
8	Data transmit	
a.	Cable type	Category 6 i.e. CAT-VI
b.	Speed	1000Mbps
c.	Frequency	250 MHz
9	Ingress protection	IP - 55
10	cold rolled sheet steel of thickness	≥ 3mm
11	Mounting	
a.	Centre lines of switches, push buttons and indicating lamps from the bottom of the panel	≥ 750mm
b.	centre lines of relays, meters and recorders from the bottom of the panel	≥ 450mm
12	Auxiliary supply	24 V / 48 V DC +/- 10 % tolerance (As per site requirement)
13	Terminal Blocks	
i.	Voltage grade	1100 V
ii.	Current	10Amp
iii.	Cover	Should have a Transparent removable sleeve.
iii.	Terminal block connection	

Sr.No.	PARTICULARS	REQUIREMENT
a	All CT &PT circuits	Minimum of two of 4 sq. mm copper
b	All AC/DC Power Supply Circuits	One of 4 sq. mm Copper
c	All other circuits	Minimum of one of 2.5 sq. mm Copper
iv.	Minimum clearance	
a	First row of terminal blocks and the associated cable gland plate	250 mm
b	Two rows of terminal blocks edges	150 mm
14	Painting	Siemens grey RAL 7032
15	Associated Accessories	
i.	Plug Point	240V, Single phase 50Hz
ii	AC socket with switch	5 Amps and 15 Amps pin round standard Iridian plug
iii.	MCB	As per IS:13947
iv.	HRC	As per IS:13703
16	Interior Lighting	
a.	Lighting fixture rated voltage	240 Volts, single phase, 50 Hz
b	Panel controlled Light	Respective panel door switch
17	Space Heater	
a	Rated Voltage	240V, 50 Hz Ac supply
18	Earthing Size Material and Colour	
a	Bus bar	25 X 6 sq. mm solid flat copper bus bar
b	Gland plate	Minimum 2.5 sq. mm
c	Colour code	Green
19	Control and instrument switches	Rotary operated type
20	Indicating lamps	LED type (Shall be coloured LED's rather than coloured covers & Its shorting should not result into fuse failures, it should only open out).
21	Energy Meters	
i.	Type	3 Phase 4 Wire, CT/PT Operated Static Meters
ii.	Basic Current (Ib) & rated Max. Current (Imax)	When Ib=1A; Imax=2A When Ib=5A; Imax=10A (Ib & Imax shall be as per site requirements)
iii.	Rated Secondary Current (Ib)	1A or 5A for 66/33kV (balanced and unbalanced load), 5A for 11kV (balanced and unbalanced load)
iv.	Operating Voltage	110V (P-P), Meter shall be operational with required accuracy from 0.6 Vref to 1.2Vref

Sr.No.	PARTICULARS	REQUIREMENT
v.	Power Consumption	Voltage Circuit: Max. 1.5W and 10VA, Current Circuit: Max. 1VA
vi.	Starting Current	0.1% of Ib
22	Panel type or Application	Indoor type
23	Multi function meter	a) Reputed make b) Aux voltage: 24v to 60v DC, c) Modbus protocol with RS485 d) Accuracy: 0.2S e) Indicating V,I,MW,MVAR,PF,etc.,
24	Power pack	Input voltage: 230V AC & 110V AC (Both input supply provision to be provided with auto change over) Output voltage: 24V DC Continuous load: 100Watts Impulse load: 450 watts for 240 msec. Backup: 30 min (7AH*2 Nos, 12V battery)

4.1 General Requirements from the Business Associates:

1. The Business Associate should have at least 10 years of experience in design and supply of control and protection systems for electricity transmission and distribution applications.
2. The manufacturer, whose protection system is offered, should have designed, manufactured, tested, installed and commissioned such a system for electricity transmission and distribution for at least two years.
3. The manufacturer needs to submit the proof of completing such tasks with other utilities/concerns as its experience certificate.
4. The Business Associate can offer an innovative and advanced system. The offer is subjected to an approval from TPWODL after a thorough discussion between the BA and TPWODL. In case, an approval is not awarded to the BA's offered innovative system, TPWODL's existing/desired infrastructure prevails and the BA shall provide the system accordingly.
5. The BA should optimize on the cost of software products offered to TPWODL considering already available licenses with TPWODL. The BA should clearly indicate licensing policy for the software tools offered.
6. The BA should provide necessary training to the personnel recommended by TPWODL to maintain the system and troubleshooting reports.

4.2 General System Design:

1. Protection and Control IEDs respond to the signals of currents and voltages measured at certain points of the power system, and assess the state of the protected power

system component. The System shall be suitable for operation and monitoring of the complete substation including future extensions and shall works on IEC 61850.

2. Conventionally, analog values are injected directly into the IED through instrument transformers. IEDs combine analog-to-digital conversion of the signals with their analysis (digital filtering) and decision-making algorithms.

4.3 Fibre Optic Cable:

Between Control Room and Switchyard/Switchgear Room: 4 Core, 62.5/125µm single mode / Multi-mode, Loose tube, Jelly filled, Armoured Fibre Optic Cable Within Control Room: 2 Core, 62.5/125µm Multi-mode Fibre Optic Patch Chord.

4.4 CAT – VI :

1. 4 Pairs, 23 AWG Solid Bare Copper Conductor, PE Insulation, Unshielded Twisted Pair (UTP) with separator and PVC Outer Jacket
2. It should be designed to the ANSI/TIA-568-C.2 | ISO / IEC 11801 Category 6 requirements and transmit data at 1000 Mbps (~1 Gigabit per second) with a frequency of 250 MHz and suitable for 10BASE-T, 100BASE-TX Fast Ethernet and 1000BASE-T / 1000BASE-TX (Gigabit Ethernet).

Note: Refer TS no - TPWODL/AUTO/TEC/SPEC-003 for scada / automation related particulars.

5.0 GENERAL CONSTRUCTIONS OF CRP

Switchgear panel construction is governed by individual specification in minimum. The C&R panels against this specification shall be simplex type with all controls, indications, meters and protective relays mounted on the front.

For 33KV/ 11KV control and relay panel following features to be ensured.

5.1 Simplex Panel :

Simplex panel with dust proof design shall consist of a vertical front panel with equipment mounted there on and having wiring access from rear for control panels & either front or rear for relay panels. In case of panel having width equal to or more than 800mm, double leaf-doors shall be provided. Doors shall have handles with either built-in locking facility or will be provided with pad-lock.

5.2 Constructional Features:

1. Control and Relay Board shall be of panels of simplex type design as indicated in bill of quantity. It is the responsibility of the BA to ensure that the equipment specified and such unspecified complementary equipment required for completeness of the protective/control schemes is properly accommodated in the panels without congestion and if necessary, provide panels with larger dimensions. No price increase

at a later date on this account shall be allowed. However, the width of panels that are being offered to be placed in existing switchyard control rooms, should be in conformity with the space availability in the control room.

2. Panels shall be completely metal enclosed and shall be dust, moisture and vermin proof. The enclosure shall provide a degree of protection not less than IP-55 in accordance with IS: 2147. Panels shall be free standing, floor mounting type and shall comprise structural frames completely enclosed with specially selected smooth finished, cold rolled sheet steel of thickness not less than 3 mm for weight bearing members of the panels such as base frame, front sheet and door frames, and 2.0mm for sides, door, top and bottom portions.
3. There shall be sufficient reinforcement to provide level transportation and installation. All doors, removable covers and panels shall be gasketed all around with synthetic rubber gaskets Neoprene/EPDM generally conforming to provision of IS 11149. However, XLPE gaskets can also be used for fixing protective glass doors, if provided shall have screens and filters. The screens shall be made of either brass or GI wire mesh.
4. Design, materials selection and workmanship shall be such as to result in neat appearance, inside and outside with no welds, rivets or bolt head apparent from outside, with all exterior surfaces tune and smooth. Panels shall have dual exhaust fan at its rear end for dissipation of heat.
5. Panels shall have base frame with smooth bearing surface, which shall be fixed on the embedded foundation channels/insert plates. Anti-vibration strips made of shock absorbing materials that shall be supplied by the contractor, shall be placed between panel & base frame. Cable entries to the panels shall be from the bottom. Cable gland plate fitted on the bottom of the panel shall be connected to earthing of the panel/station through a flexible braided copper conductor rigidly. Relay panels of modern modular construction would also be acceptable.

5.3 Mounting:

1. All equipment on and in panels shall be mounted and completely wired to the terminal blocks ready for-external connections. The equipment on front of panel shall be mounted flush. Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent devices and are readily accessible without use of special tools. Terminal marking-on the equipment shall be clearly visible.
2. The BA shall carry out cut out, mounting and wiring of the free issue items supplied by others which are to be mounted in his panel in accordance with the corresponding equipment manufacturer drawings. Cut outs if any, provided for future mounting of equipment shall be properly blanked off with blanking plate.

3. The centre lines of switches, push buttons and indicating lamps shall be not less than 750mm from the bottom of the panel. The centre lines of relays, meters and recorders shall be not less than 450mm from the bottom of the panel.
4. The centre lines of switches, push buttons and indicating lamps shall be matched to give a neat and uniform appearance. Likewise, the top lines of all meters, relays and recorders etc. shall be matched.
5. Each of the control and relay panel against the specification shall be fitted with the following supervision lamps are:

i)	Circuit breaker `ON/Close'	Red.
ii)	Circuit breaker `OFF'	Green.
iii)	Circuit breaker `Auto-Trip'	White.
iv)	Circuit breaker 'spring charged'	Blue
v)	Trip circuit supervision 1	White
vi)	Trip circuit supervision 2	White

6. No equipment shall be mounted on the doors. At existing station, panels shall be matched with other panels in the control room in respect of dimensions, colour, appearance and arrangement of equipment (centre lines of switches, push buttons and other equipment) on the front of the panel.

6.4 Panel Internal Wiring:

1. Panels shall be supplied complete with interconnecting wiring provided between all electrical devices mounted and wired in the panels and between the devices and terminal blocks for the devices to be connected to equipment outside the panels. When panels are arranged to be located adjacent to each other all inter panel wiring and connections between the panels shall be furnished and the wiring shall be carried out internally, this is in the BA's scope.
2. All wiring shall be carried out with 1100V grade, single core, stranded copper conductor wires with PVC insulation. The minimum size of the multi-stranded copper conductor used for internal wiring shall be as follows:
3. Internal wiring to be connected to external equipment shall terminate on terminal blocks.
4. The terminal blocks for CTs & VTs shall be provided with test links and isolating facilities. The CT terminal blocks shall be provided with short circuiting and earthing facilities.
5. Shall have 20% terminals as spare terminals in each panel. All equipment mounted on front of the panels shall have individual name-plates with equipment designation engraved. Each panel shall also have circuit/feeder designation name plate.

6. All wiring shall be with 1100 V grade, single core, PVC insulated stranded copper conductor.
7. Wires shall be vermin proof. Minimum size of conductor shall be 2.5 sq. mm in general, but for CT & VT circuits it shall be 4 sq.mm. CT VT wiring will be coloured as per standard sign colour configuration including neutral and neutral CT wiring. Rest wiring will be in grey colour and earthing will be done by green coloured control cable. For CT & VT 4 sq.mm ring type lugs should be considered for proper wiring termination.
8. Contractor shall be solely responsible for completeness and correctness of all the wiring, and for proper functioning of the connected equipment.
9. Specification for Auxiliary relays/ MCB's
   a) Fuse Failure relay and trip Circuit Supervision relay shall be suitably selected, considering burden and auxiliary voltage. External circuitry like compensating resistances will not be accepted.
   b) Auxiliary contact multiplier relays should be of reputed make and selected on the basis of continuous current carrying capacity and rated voltage. The fluctuation in voltage level must be accounted for (+/-) 10% continuously.
   c) DC MCB's should not be substituted by AC MCB's for DC Distribution, irrespective of manufacturer's individual multi usage recommendations.
   d) DC Fail Supervision relay (80) shall be provided on all control and IED panels.
   e) Suitable contactor arrangement to be made in 33 KV line incomer panel/ 11 KV incomer panel so that in case of station DC failure the power pack driven by PT circuit powers up the relay and tripping circuits and keeps protection in service.
10. Spare I/Os wiring shall be brought upto terminal block for future use. All internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Wiring gutters & troughs shall be used for this purpose.
11. Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided near the top of the panels running throughout the entire length of the panels.
12. Wire termination shall be made with solder less crimping type and tinned copper lugs, which firmly grip the conductor. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from terminal blocks. All wires directly connected to trip circuit breaker or device shall be distinguished by the addition of red coloured unlettered ferrule. All the wires shall be provided with proper cross ferruling for the easy identification of wire source & destination.
13. Longitudinal troughs extending throughout the run length of the panel shall be preferred for inter panel wiring. Inter-connections to adjacent panel shall be brought out to a

separate set of terminal blocks located near the slots of holes meant for taking the inter-connecting wires.

14. BA shall be solely responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.

15. Reputed make Multi-function meter should be provided as per IS standards in control & relay panel and the current input wirings shall be ready condition for the external wirings which is coming from CT's metering core.

16. Aux relays shall be provided with wirings upto the terminal blocks for the alarm and trip inputs with min 3 output contacts as per tpwodl requirements.

17. Gland holes shall be provided inside the panel for the entry of power & Control cables.

6.5 Terminal Blocks:

1. All internal wiring to be connected to external equipment shall terminate on terminal blocks. Terminal blocks shall be 1100 V grade and have 10 Amps. Continuous rating, moulded piece, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts. Markings on the terminal blocks shall correspond to wire number and terminal numbers on the wiring diagrams. All terminal blocks shall have shrouding with transparent unbreakable material.
2. Disconnecting type terminal blocks for AC/DC, current transformer and voltage transformer secondary leads shall be provided. Also current transformer secondary leads shall be provided with short circuiting and earthing facilities.
3. At least 20% spare terminals shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks.
4. Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors of external cable on each side
   - All CT &PT circuits: minimum of two of 4 sq. mm copper.
   - AC/DC Power Supply Circuits: One of 4 sq. mm Copper.
   - All other circuits: minimum of one of 2.5 sq. mm Copper.
5. There shall be a minimum clearance of 250 mm between the first row of terminal blocks and the associated cable gland plate or panel side wall. Also the clearance between two rows of terminal blocks edges shall be minimum of 150mm.
6. Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal blocks is run in parallel and close proximity along each side of the wiring-duct to provide for convenient attachment of internal panel wiring. The side of the terminal block opposite the wiring duct shall be reserved for the Owner's external cable connections. All adjacent terminal blocks shall

also share this field wiring corridor. All wiring shall be provided with adequate support inside the panels to hold them firmly and to enable free and flexible termination without causing strain on terminals.

7. The number and sizes of the TPWODL's multi core incoming external cables will be furnished to the BA after placement of the order. All necessary cable terminating accessories such as gland plates, supporting clamps & brackets, wiring troughs and gutters etc. (except glands & lugs) for external cables shall be included the scope of supply.
8. All the spare terminals of relays to be wired upto TB's for future purposes and immediate access for the external wirings.
9. All TB's should be suitable for ring type lug connections.
10. For CT TB's, shorting arrangements is not required.
11. All field wirings (CT's,PT's ,AC, DC, etc.,)TB's should be provided as droppable links type.
12. For CT,PT's separate earthing droppable links are required.
13. All TB's should be press fit type on a metallic channels & all channels should be separately earthed.

6.6 Painting:

1. All sheet steel work shall be phosphate in accordance with the IS: 6005 "Code of practice for phosphate iron and steel". It should follow the seven tank process. Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning.
2. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water rinsing with a slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying.
3. The phosphate coating shall be sealed with application of two coats of ready mixed, stoved type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved. Thereafter an established painting procedure like electrostatic painting followed for powder coating the panel. The colour shade shall be Siemens grey RAL 7032.

6.7 Associated Accessories:

1. **Plug Point**: 240V, Single phase 50Hz, AC socket with switch suitable to accept 5 Amps and 15 Amps pin round standard Indian plug, shall be provided in the interior of each cubicle with ON-OFF switch.

2. **Interior Lighting:** Each panel shall be provided with an LED: lighting fixture rated for 240 Volts, single phase, 50 Hz supply for the interior illumination of the panel controlled by the respective panel door switch.
3. **Switches and Fuses:** Each panel shall be provided with necessary arrangements for receiving, distributing and isolating of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breakers (MCB). Selection of the main and sub-circuit MCB rating shall be such as to ensure selective clearance of sub-circuit faults. MCBs shall confirm to IS: 13947. Each MCB shall be provided with one potential free contact and the same shall be wired for annunciation purpose. However voltage transformer circuits for relaying and metering shall be protected by fuses. All fuses shall bee HRC cartridge type conforming to IS: 13703 mounted on plug-in type fuse bases.. Fuse carrier base as well as MCBs shall have imprints of the fuse 'rating' and 'voltage'.
4. **Space Heater**: Each panel shall be provided with a space heater rated for 240V, single phase, 50 Hz Ac supply for the internal heating of the panel to prevent condensation of moisture. The fittings shall be complete with switch unit
5. **Annunciator** : 16 windows type annunciator shall be provided in panel for the alarm & trip annunciation purposes.
6. Hooter shall be provided in panel associated with the annunciation & tripping circuits.
7. Power pack shall be provided in CRP.

6.8 Earthing :

1. All panels shall be equipped with an earth bus securely fixed. Location of earth bus shall ensure no radiation interference for earth systems under various switching Conditions of Isolators and breakers.

2. The material and sizes of the bus bar shall be at least 25 X 6 sq.mm solid flat copper bar with threaded holes at a gap of 50mm with a provision of bolts and nuts for connection with cable armours and mounted equipment etc for effective earthing. When several panels are Mounted adjoining each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply of the Contractor. Provision shall be made for extending the earth bus bars to future adjoining panels on either side.
3. Provision shall be made on each bus bar of the end panels for connecting Substation earthing grid. Necessary terminal clamps and connectors for this purpose shall be included in the scope of supply of BA.
4. All metallic cases of relays, instruments and other panel mounted equipment including gland plate, shall be connected to the earth bus by copper wires of size not less than 2.5 sq. mm. The colour code of earthing wires shall be green.
5. Looping of earth connections, which would result in loss of earth connection to other devices when the loop is broken, shall not be permitted. However, looping of earth

connections between equipment to provide alternative paths to earth bus shall be provided.

6. VT and CT secondary neutral or common lead shall be earthed at one place only at the terminal blocks where they enter the panel. Such earthing shall be made through links so that earthing may be removed from one group without disturbing continuity of earthing system for other groups.

1.9 Switches :

1. Control and instrument switches shall be rotary operated type with escutcheon plates clearly marked to show operating position and circuit designation plates and suitable for flush mounting with only switch front plate and operating handle projecting out.
2. The selection of operating handles for the different types of switches shall be as follows:
   - Breaker, Isolator: Pistol grip, black control switches
   - Selector switches: Oval or knob, black
   - Instrument switches: Round, knurled, black
3. The control switch of breaker and isolator shall be of spring return to neutral type. The switch shall have spring return from close and trip positions to "after close" and "after trip" positions respectively.
4. Instrument selection switches shall be of maintained contact (stay put) type. Ammeter selection switches shall have make-before-break type contacts so as to prevent open circuiting of CT secondary when changing the position of the switch. Voltmeter transfer switches for AC shall be suitable for reading all line- to-line and line-to-neutral voltages for non-effectively earthed systems and for reading all line to line voltages for effectively earthed systems.
5. Lockable type of switches which can be locked In particular positions shall be provided when specified. The key locks shall be fitted on the operating handles.
6. The contacts of all switches shall preferably open and close with snap action to minimize arcing. Contacts of switches shall be spring assisted and contact faces shall be with rivets of pure silver or silver alloy. Springs shall not be used as current carrying parts
7. The contact combination and their operation shall be such as to give completeness to the interlock and function of the scheme.
8. The contact rating of the switches shall be as follows:

Description (Contact rating in Amps)	24VDC	50VDC	240VAC
Make and Carry	10	10	10
Continuously Make and Carry for 0.5 sec	30	30	30
Break for resistive load	20	20	7

Inductive Load with L/R = 40ms	0.2

1.10 Indicating Lamps :

1. Indicating lamps shall be of cluster LED type suitable for panel mounting with rear terminal connections. Lamps shall be provided with series connected resistors preferably built in the lamp assembly. Lamps shall have translucent lamp covers to diffuse lights colored red, green, amber, dear white or blue as specified The lamp cover shall be preferably of screwed type, unbreakable and moulded from heat resisting material.
2. The lamps shall be provided with suitable resistors. Lamps and lenses shall be interchangeable and easily replaceable from the front of the panel. Tools, if required for replacing the bulbs and lenses shall also be included in the scope of the supply.
3. The indicating lamps with resistors shall withstand 120% of rated voltage on a continuous basis.
    - Red – Breaker ON
    - Green – Breaker OFF
    - Blue – Spring Charged
    - Amber – 86 operated
    - Blue – Breaker in test
    - Blue – Breaker in service
    - Dear white – TCS1 fail
    - Dear white – TCS2 fail

1.11 Dust Proof Environment:

All the panels in the control room and switchgear room have to be in a dust proof environment. Civil works have to be taken care in the same directions.

1.12 Energy Meters :

1. The Energy Measurements should be preferably done as per 3 wattmeter method. It shall use Potential Transformer and the Metering Core of the respective Current Transformers. The desired Metering class accuracy of 0.2s is expected for metering functions.
    a) Supply and Integration of Energy Meters with Software for centralized meter data reading shall be in Business Associate ’s scope. Supplied Software shall have independent for meter make or OEM to retrieving the meter data.
    b) Laying of Communication Cable along with conduit shall be in Business Associate ’s scope
    c) Supply and Installation of RJ11 Splitters shall be in Business Associate ’s scope

d) Supply, Installation and Configuration of TCP/IP to Serial Converter shall be in Business Associate 's scope if required.

e) Software configuration for integration of energy meters (at centralized meter data acquisition system) shall be in Business Associate 's scope. Business Associate shall have ensured the data communication.

2. The basic metering functions should be additionally supported by following:

S. No.	Description	Requirement
01	Type of the Meter	3 Phase 4 Wire, CT/PT Operated Static Meters
02	Accuracy Class of the Meter	Active Energy – Will be informed at detailed engineering stage Reactive Energy – 2 or better
03	Basic Current (Ib) & rated Max. Current (Imax)	When Ib=1A; Imax=2A When Ib=5A; Imax=10A (Ib & Imax shall as per site requirements)
04	Rated Secondary Current (I_b)	1A or 5A for 66/33kV (balanced and unbalanced load), 5A for 11kV (balanced and unbalanced load)
05	Reference conditions for testing the performance of the meter	V_{ref} = 110V ± 1% Freq = 50Hz ± 0.3% Temperature = 27°C ± 2°C
06	Operating Voltage	110V (P-P), Meter shall be operational with required accuracy from 0.6 V_{ref} to 1.2Vref
07	Operating Frequency	50Hz ± 5%
08	Power Consumption	Voltage Circuit: Max. 1.5W and 10VA, Current Circuit: Max. 1VA
09	Starting Current	0.1% of I_b
10	Short time over current	The meter shall be able to carry for 0.5s a current equal to 20 times the max. current
11	Influence of heating	Temperature rise at any point of the external surface of the meter shall not exceed by more than 20k with an ambient temperature at 45oC
12	Rated Impulse withstand voltage	6kV (Shall be applied ten times with one polarity & then repeated with the other polarity and minimum time between each impulse to be 3s)
13	AC withstand voltage for 1 min	4kV
14	Insulation resistance between	Frame & current, voltage circuits connected together: 5MΩ Each current circuit (and voltage circuit) & each and every other: 50MΩ

S. No.	Description	Requirement
15	Mechanical Requirements	Meter shall be in compliance with clause 12.3 of IS 14697
16	Resistance to Heat and Fire	The terminal block, terminal cover and Meter case shall ensure safety against spread of fire. They should not be ignited by thermal overload of live parts in contact with them as per clause 6.8 of IS 14697. Fire retardant material shall be used.
17	Protection against penetration of dust and water	Degree of Protection: IP 55, but without suction in the meter
18	Resistance against Climatic influence	Meter shall be in compliance with clause 12.6 of IS 14697
19	Electromagnetic Compatibility (EMC)	Meter shall be in compliance with clause 12.8 of IS 14697
20	Accuracy requirements	Meter shall be in compliance with clause 11.0 of IS 14697
21	Power Factor Range	Zero lag to Zero lead
22	Energy Measurement	Fundamental energy +Energy due to Harmonics. Energy meters shall preferably record. Total Harmonics distortion (THD) in voltage and current for at least 30 days
23	Connection Diagram	The connection diagram for the system shall be provided on terminal cover
24	Self-Diagnostic Feature	Self-diagnostic for calendar, RTU, Battery, all display segments and NVM.
25	Initial start up of meter	Meter shall be fully functional within 5s after reference voltage is applied to the meter terminals
26	Internal diameter of the terminal holes and Depth of terminal hole	5.5mm (min), 25mm
27	Clearance between adjacent Terminals	10mm (min)
28	Display	Backlit LCD, Scrolling, 10s for each parameter
29	History requirements	The meter shall be capable of recording the last two months data for following parameters, at the end of every month at 24:00 hrs: • Active demand (MW), import • Apparent demand (MVA), import • Reactive energy (MVArh) lag, import • Reactive energy (MVArh) lead, import

S. No.	Description	Requirement
		• Active energy (MWh), import Apparent energy (MVAh), import • Active demand (MW), export • Apparent demand (MVA), export • Reactive energy (MVA) lag, export • Reactive energy (MVArh) lead, export • Active energy (MWh), export • Apparent Energy (MVAh), export
30	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication, etc.
31	Software and Communication compatibility	The BCS and CMRI Software shall be supplied by the bidder for free of cost. Training for the use of the software shall also be provided by the bidder
32	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means.

3. Aux. Supply of Serial to TCP/IP Converter should be on Station DC Supply and usage of power converters are not allowed.
4. There should be PT selection scheme in line panel for selection of BUS-PT and Line PT for metering purpose.
5. In transformer panel PT selection scheme in the transformer panel is also required based on bus isolation selection.

6.0 NAME PLATE AND MARKING

With the other details on the name plate following should be suitably embossed on the name “PROPERTY OF TPWODL”.

a) All equipment mounted on front and rear side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. Also on the top of each panel on front as well as rear side, large and bold nameplates shall be provided for circuit/feeder designation.
b) All front mounted equipment shall also be provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
c) Each IED and meter shall be prominently marked. All relays- and other devices shall be clearly marked with manufacturer's name, manufacturer's type, serial number and electrical rating data.
d) Name Plates shall be made of anodized aluminium. Name plates shall be black with white engraving lettering.

e) Each switch shall bear clear inscription identifying its function e.g. 'BREAKER"52A`, "SYNCHRONISING" etc. Similar inscription shall also be provided on each device whose function is not other-wise identified. If any switch device does not bear this inscription separate name plate giving its function shall be provided for it. Switch shall also have clear inscription for each position Indication e.g. "Trip- Neutral-Close", "ON-OFF", "R-Y-B-OFF" etc.

f) All the panels shall be provided with name plate mounted inside the panel bearing PO No & Date, Name of the Substation & feeder and reference drawing number.

g) Continuous operating Voltage

h) Rated Voltage

i) Rated Frequency

j) Rated Normal Current

k) Manufacturer's Name

l) Guarantee period

m) ISI mark,

7.0 TEST

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by TPWODL authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessary conducted on C & R Panel.

7.1 FACTORY ACCEPTANCE TEST:

The manufacturing phase of the C&R Panel shall be concluded by the factory acceptance test (FAT). The purpose is to ensure that the Contractor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. If the FAT comprises only a certain portion of the system for practical reason. An integrated-FAT shall be conducted as per the TPWODL standard format which shall be finalised mutually during detail engineering. If the complete system consists of parts from various Business Associate s or some parts are already installed on site, in such case Business Associate will arrange the intra-communication between RTU/DC and such IEDs to meet the requirement.

7.2 SITE ACCEPTANCE TESTS:

All the relevant test at site to be conducted under the supervision of TPWODL authority satisfactorily based on approved SAT documents which are finalised mutually during detail engineering. The SAT documents to be approved from TPWODL authority.

7.3 HARDWARE INTEGRATION TESTS:

shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item shall be verified as an integral part of system. Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system. The equipment expansion capability shall also be verified during the hardware integration tests.

7.4 INTEGRATED SYSTEM TESTS:

shall verify the stability of the hardware and the software. During the tests all functions shall run concurrently, and all equipment shall operate a continuous 100 Hours period. The integrated system test shall ensure the IEDs is free of improper interactions between software and hardware while the system is operating as a whole.

8.0 TYPE TEST CERTIFICATES

1. The bidder shall furnish the type test certificates as mentioned above as per the corresponding standards.
2. All the tests shall be conducted at CPRI / ERDA as per the relevant standards.
3. Type tests should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of opening the bid.
4. In the event of any discrepancy in the test reports, i.e. any test report not acceptable same shall be carried out without any cost implication to TPWODL.
5. Bidder shall submit the test reports for the Tree Retardant properties of the insulation.

Test reports for following type tests shall be submitted for the Protection IED along with the Bid

8.1 INSULATION TEST

S. No.	Description	Standard
1	Dielectric Withstand Test	IEC 60255-5
		ANSI/IEEE C37.90-1989
		2kV rms for 1 minute between all case terminals connected together and the case earth.
		2kV rms for 1 minute between all terminals of independent circuits with terminals on each independent circuit connected together.
2	High Voltage Impulse Test, class III	IEC 60255-5
		5kV peak; 1.2/50 msec; 0.5J; 3 positive and 3 negative shots at intervals of 5s

8.2 ELECTRICAL ENVIRONMENT TESTS

S. No.	Description	Standard
1	DC Supply Interruption	IEC 60255-11 The unit will withstand a 20ms interruption in the auxiliary supply, in its quiescent state, Without de-energizing.
2	AC Ripple on DC supply	IEC 60255-11 The unit will withstand a 12% ac ripple on the dc supply.
3	AC voltage dips and short Interruptions	IEC 61000-4-11 20ms interruptions/dips.
4	High Frequency Disturbance	IEC 60255–22–1, class III At 1MHz, for 2s with 200 ohms source impedance: 2.5kV peak; 1 MHz; T = 15 μsec; 400 shots/sec; duration 2 sec between independent circuits and independent circuits and case earth. 1.0kV peak across terminals of the same circuit.
5	Fast Transient Disturbance	IEC 60255-22-4, class IV 4kV, 2.5kHz applied directly to auxiliary supply 4kV, 2.5kHz applied to all inputs.
6	Surge Withstand Capability	IEEE/ANSI C37.90.1 (1989) 4kV fast transient and 2.5kV oscillatory applied directly across each output contact, optically isolated input and power supply circuit.
7	Radiated Immunity	C37.90.2: 1995 25MHz to 1000MHz, zero and 100% square wave modulated. Field strength of 35V/m.
8	Electrostatic Discharge	IEC 60255-22-2 Class 4 15kV discharge in air to user interface, display and exposed metal work. IEC 60255-22-2 Class 3 8kV discharge in air to all communication ports. 6kV point contact discharge to any part of the front of the product.
9	Surge Immunity	IEC 61000-4-5: 1995 Level 4 4kV peak, 1.2/50ms between all groups and case earth. 2kV peak, 1.2/50ms between terminals of each group.
10	Capacitor Discharge	No change of state or any operation shall occur when a capacitor of capacitance shown below, charged to 1.5×Vn volts, is connected between any combination of

S. No.	Description	Standard
		terminals and any combination of terminals and ground. Master trip circuits - 10 μF Other protection & control circuits - 2 μF Carrier/channel interface - 0,2 μF

8.3 EMC TEST

S. No.	Description	Standard
1	Radio-Frequency Electromagnetic Field, Non-Modulated	IEC 60255–22–2, class III 10 V/m; 27 MHz to 500 MHz
2	Radio-Frequency Electromagnetic Field, Amplitude Modulated	ENV 50140, class III 10 V/m; 80 MHz to 1000 MHz; 80% AM; 1 kHz
3	Radio-Frequency Electromagnetic Field, Pulse Modulated	ENV 50140/ENV 50204 10 V/m; 900 MHz; repetition frequency 200 Hz; duty cycle 50 %
4	Disturbances Induced by Radio Frequency fields, Amplitude Modulated	ENV 50141, class III 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
5	Power Frequency Magnetic Field	EN 61000-4-8, class IV 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
6	Interference Voltage, Aux. Voltage	EN 50081-* 150 kHz to 30 MHz
7	Interference Field Strength	EN 50081-* 30 MHz to 1000 MHz

8.4 ATMOSPHERIC ENVIRONMENT TEST

S. No.	Description	Standard
1	Temperature	IEC 60255-6 Operating –25°C to +50°C Storage and transit –25°C to+70°C IEC 60068-2-1 for Cold IEC 60068-2-2 for Dry heat
2	Humidity	IEC 60068-2-3 56 days at 93% RH and +40°C

8.5 MECHANICAL STRESS TEST

S. No.	Description	Standard
1	Vibration (during Operation & Transportation)	IEC 255-21-1; IEC 68-2-6 Response Class 2 Endurance Class 2
2	Shock (during Operation and Transportation)	IEC 255-21-2, class 1, IEC 68-2-27 Shock response Class 2 Shock withstand Class 1 Bump Class 1
3	Seismic Vibration (during Operation)	IEC 60255-21-3 Class 2
4	Continuous Shock (during Transportation)	IEC 255-21-2, class 1, IEC 68-2-27

9.0 PRE-DESPATCH INSPECTION

1. Material shall be subject to inspection by a duly authorized representative of TPWODL.
2. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.
3. Bidder shall grant free access to the places of manufacture to TPWODL's representatives at all times when the work is in progress.
4. Inspection by TPWODL or authorized representatives shall not relieve the Business Associate of his obligation of furnishing equipment in accordance with the specifications.
5. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL.
6. Following documents shall be sent along with material:
   a) Test report
   b) MDCC issued by TPWODL
   c) Invoice in duplicate
   d) Packing list
   e) Drawings & catalogue
   f) Guarantee / Warrantee card
   g) Brought out (raw) material test certificates
   h) Delivery Challan
   i) Other Documents (as applicable)

10.0 INSPECTION AFTER RECEIPT AT STORE

The material received at TPWODL, Odisha store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch

inspection and one copy of the report shall be sent to "Network planning, Engineering and Quality" department.

11.0 GUARANTEE:

1. Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract.
2. In the event any defect is found by the TPWODL, up to a period of 60 months from the date of commissioning or 42 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 60/42 months could be enhanced subject to mutual agreements). Biddder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Business Associate 's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the Bidder or from the " Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for '**free replacement'** for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12.0 PACKING

1. The equipment shall be packed in crates suitable for vertical/horizontal transport, as the case may be and suitable to withstand bundling during transport and outdoor storage during transit.
2. The Business Associate shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided.
3. Any material found short inside the packing cases shall be supplied by Business Associate without any extra cost.
4. Each consignment shall be accompanied by a detailed packing, list containing the following information:-
   a) Name of the consignee.
   b) Details of consignment.
   c) P.O Number
   d) Destination
   e) Total weight of consignment.
   f) Handling and unpacking instructions.
   g) Bill of material indicating contents of each package

   The Business Associate shall ensure that the packing list and bill of material are approved by the purchaser before dispatch bidder shall ensure that all the equipment

covered under this specification shall be prepared for rail/road transport so as to protect the equipment from damage in transit.

13.0 TENDER SAMPLE

Not available

14.0 TRAINING

On the site job training to be imparted to TPWODL employees. Two man days of expert OEM employees to be considered for delivering the training.

15.0 QUILITY CONTROL

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPWODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-Business Associate 's works to carry out inspections.

16.0 MINIMUM TESTING FACILITIES

The Bidder shall have in house testing facilities for carrying outall routine tests and acceptance tests as per relevant international/Indian standards.

17.0 MANUFACTURING ACTIVITIES

The successful Bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order. Manufacturing mass quantity to start only after getting approved drawings or as per intimation from TPWODL.

18.0 SPARES, ACCESSORIES ND TOOLS

1. The bidder shall submit a recommended list for maintenance spares for smooth and trouble free operation of the C& R Panel.
2. The bidder, if at any time changes the design of the C& R Panel or discontinue manufacturing of the C& R Panel, shall provide opportunity to purchaser for purchase of spares for future use so as to ensure smooth & trouble-free functioning of the C& R Panel before such change in design or discontinue of manufacturing activity is affected.

19.0 DRAWINGS AND DOCUMENTS

Following drawings and documents shall be prepared based on TPWODL specifications and statutory requirements and shall be submitted with the bid:

a) Completely filled in Technical Particulars

b) General drawing arrangements
c) Bill of material
d) Type Test certificates.
e) Brought out (raw material) test certificates
f) Experience List

After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser. Following drawings / documents shall be submitted by the bidder for Purchaser's approval.

S.No.	Description	For Approval	For Review Information	Final Submission
1	Technical Particulars	√		√
2	General Arrangement drawings	√		√
3	Manual / catalogue		√	√
4	Installation / Commissioning Manuals		√	√
5	Instruction for use		√	√
6	Transport / Shipping dimension drawing		√	√
7	QA & QC Plan	√	√	√
8	Routine, Acceptance and Type Test Certificates	√	√	√
9	Brought out or Raw material test certificates		√	√
10	ICS	√		√
11	IFAT	√		√

*All the documents & drawings shall be in English language.

Instruction Manuals: Bidder shall furnish two softcopies and four (4) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

20.0 GUARANTEED TECHNICAL PARTICULARS

33kV & 11kV CONTROL & RELAY PANEL

S.No.	PARTICULARS	Bidder Offer
1	Manufacturer name	
2	Frequency	
3	Nominal System Voltage	
4	Maximum System Voltage	
5	Number of phases	
6	Neutral Earthing Arrangement	

S.No.	PARTICULARS	Bidder Offer
7	Fibre Optic Cable	
a.	Control Room to Switchyard/Switchgear	
b.	Within Control Room	
8	Data transmit	
a.	Cable type	
b.	Speed	
c.	Frequency	
9	Ingress protection	
10	cold rolled sheet steel of thickness	
11	Mounting	
a.	Centre lines of switches, push buttons and indicating lamps from the bottom of the panel	
b.	centre lines of relays, meters and recorders from the bottom of the panel	
12	Auxiliary supply	
13	Terminal Blocks	
i.	Voltage grade	
ii.	Current	
iii.	Cover	
iii.	Terminal block connection	
a	All CT &PT circuits	
b	All AC/DC Power Supply Circuits	
c	All other circuits	
iv.	Minimum clearance	
a	First row of terminal blocks and the associated cable gland plate	
b	Two rows of terminal blocks edges	
14	Painting	
15	Associated Accessories	
i.	Plug Point	
ii	AC socket with switch	
iii.	MCB	
iv.	HRC	
16	Interior Lighting	

S.No.	PARTICULARS	Bidder Offer
a.	Lighting fixture rated voltage	
b	Panel controlled Light	
17	Space Heater	
a	Rated Voltage	
18	Earthing Size Material and Colour	
a	Bus bar	
b	Gland plate	
c	Colour code	
19	Control and instrument switches	
20	Indicating lamps	
21	Energy Meters	
i.	Type	
ii.	Basic Current (Ib)	
iii.	Rated Max. Current (Imax)	
iv.	Rated Secondary Current (Ib)	
v.	Operating Voltage	
vi.	Power Consumption	
vii.	Starting Current	
22	19” Rack Mountable with Power Socket and Ports at rear side	
23	Compliance to IEC 61850-3, IEEE 1613 Standards	
24	Port Speed: 10Mbps/100Mbps for Station Bus and 1Gbps for Process Buss	
25	Should have minimum of 12 Ports, number of switches minimum 2	
26	LED indicators for link establishment and data transfer for each port	
27	Should support remote user setting configuration.	
28	Should own separate maintenance/console port	
29	Should support SNMP Server v1.0/v2.0/v3.0	
30	Auxiliary Power Supply: 48 VDC or 24VDC (depending upon the Station DC Voltage) with ±15% tolerance, Dual Power Supply	
31	All the cards/modules of the Switch must have conformal coating for protection against harsh and polluted environment	

S.No.	PARTICULARS	Bidder Offer
32	LIFTING arrangement.	
33	Painting	
34	Heater provision	
35	Illumination provision	
36	Make of relays	
a.	L/O	
b.	BCPU(O/C& E/f)	
c.	Trip supervision relay	
d	Differential Relay	
37	Weight	
38	Dimension (LXWXH) in mm	
39	Mounting arrangement	
40	Control cable tray provision for dressing	
41	Control cable entry provision (top/bottom)	
42	Labelling for all aux components	
43	Wires and lug as per specs	
44	Extension of earthing at both sides provision	
45	Earthing connection hardware	
46	Plug point provision	
47	Panel type (Application)	
48	Multi-function meter	
49	Power pack	

LOCKOUT RELAY (86) GTP:

PARTICULARS	REQUIREMENT	BIDDERS REMARKS
Elements	Lock-out protection (86)	
Auxiliary supply	24 V / 48 V DC +/- 10 % tolerance (As per site requirement)	
Functions	High speed tripping relays shall be provided for trip functions of various protection schemes.	
Operating Time	The operating time of the relay shall not be more than 20 ms.	
Operating Range	The pick-up value of the relay shall be in the range of 50 to 60% of rated voltage.	

Supervision	Healthiness of the tripping relays shall be supervised by suitable tripping relay supervision relay. It shall be static type	
Reset & Indication	Relay should hav Electrical reset & lovally through push button(illuminated type) & from remote facility which should be illuminated or flag type of indication.	
Contacts	Relay should have minimum 6 changeover contacts. Power contact should be capable of braking trip coil current	
Relay Hardware Requirement	Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatical conditions.	
Reset Push buttons	Relay must have electrical reset facility. Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.	
IS reference	IS 3231 amended up to date	

TCS RELAY GTP:

PARTICULARS	REQUIREMENT	
Elements	Trip Circuit Supervision	
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance (Same relay should be suitable for both the voltages)	
Functions	Pre & post trip circuit supervision. Its resistance value should be optimum during DC fluctuation it should not trip the breaker.	
LED	Should be there for indicating healthy trip circuit	
Operating Time	The operating time of the relay shall not be more than 20 ms.	
Operating Range	The pick-up value of the relay shall be in the range of 80 to 100% of rated voltage.	
Pick-up & Drop-off current at rated voltage UAux& 250 C	Should be lower than the trip coil pickup currents (0.3 - 0.7 mA)	
Burden at rated voltage – Auxiliary circuit (W) – Supervision circuit (W)	24 V 1 W 0.08 W	48V 1.4 W 0.15 W
Mechanical durability	1 Million switching operations	
Terminals	Suitable for upto 2.5 mm2 wires	
Reset & Indication	Relay should have a local reset facility which should be illuminated or flag type of indication.	

Contacts	Relay should have minimum 6 changeover contacts. Power contact should be capable of braking trip coil current
Relay Hardware Requirement	Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatical conditions.
IS reference	IS 3231 amended up to date
Contact configuration (self reset`	1 N/O +1 N/C + 2C/O
Max voltage within a contact system	250 V DC
Rated current	5A
Make and carry for 0.5 s	10A
Make and carry for 3.0 s	8A
Breaking capacity for DC with circuit time-constant L/R < 40 ms, at 48/110/220 VDC	1A/0.25A/0.15A
Electrical endurance Tested according to IEC 255-23	10,000 operations, at 110 V DC, 0.35A resistive, 360 op/hr

Note: The system DC voltage shall be confirmed in PO and subsequent during detail engineering/ drawing approval.

Signature: Seal of the Company

Designation Date:

21.0 SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH THE BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S.No.	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Signature: Seal of the Company

Designation Date:

STANDARD TECHNICAL SPECIFICATION OF 33KV & 11KV CONTROL PANEL (OUTDOOR TYPE)ALONG WITH PROTECTION RELAYS

PREPARED BY	REVIEWED BY	APPROVED BY
K GOVINDARAJ	SANJAY KUMAR PRASAD/ANUP JAWASE	VARUN BHATNAGAR

CONTENTS

1.0 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing and forwarding, supply, unloading at TPWODL stores/sites, Installation, testing and commissioning. Following equipment's / materials covered under the scope with all fittings, accessories and associated auxiliary equipment, mandatory spares which are required for efficient and trouble-free operation.

a) 33KV Control & Relay Panel for Transformer
   i. L/O relays
   ii. Differential relay (for transformer feeder)
   iii. Trip circuit supervision Relay.
   iv. BCPU (O/C +E/F)
   v. Aux relays (WTI,OTI,BUZ,etc..,)

b) 11KV Control & Relay Panel for Transformer Incomer.
   i. L/O relay
   ii. Trip circuit supervision Relay.
   iii. BCPU (O/C +E/F)

c) 33KV Control & Relay Panel for Feeder
   i. L/O relay
   ii. Trip circuit supervision Relay.
   iii. BCPU (O/C +E/F)

d) 11KV Control & Relay Panel for Outgoing Feeder
   i. L/O relay
   ii. Trip circuit supervision Relay.
   iii. BCPU (O/C +E/F)

Refer above miscellaneous items specifications are attached with below mention Specification number:

Sr. No.	Technical Specifications	TPWODL Specification No
I.	BCPU HV feeder non-directional over-current & earth fault protection relay	TPWODL/ENGG/SPEC/010/2021
II.	Two winding transformer Differential protection Relay with integrated standby earth fault Relay (Only for transformer feeder CRP)	TPWODL/ENGG/SPEC/011/2021

The following scope is excluded from vendor

1) Civil foundation of panels including trenching.
2) Control cable laying for extending field input and aux supply.

3) Extension of earthing to panels.

2.0 APPLICABLE STANDARDS

The Control & Relay Panel covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards /IEC/ International Standards and shall conform to the regulations of local statutory authorities.

Indian/International Standard (IS/IEC)	Title
IS 9000	Basic Environmental testing procedure for electrical and electronic items
IS 694-1990	PVC insulated cables for working voltage up to and including 1100V
IS 2629-1985	Recommended practice for Hot Dip Galvanizing of iron & Steel
IS 2633-1986	Test for uniformity of Zinc Coating
IEC 60529	Degrees of Protection provided by enclosures (IP Code)
IEC 62052-11	Electricity metering equipment (a.c.) – General requirements, tests & test conditions
IEC 62053-22	Static meter for active energy (Class 0.2S and 0.5S)
IEC 61850	Communication networks and systems in substations (all parts including IEC 61850-8-1, IEC 61850-9-2)
IEC 61869-9	Digital Interface for Instrument Transformers
IEC 61869-13	Stand-alone Merging Units
IEC 61588/IEEE 1588v2	Precision clock synchronization protocol for networked measurement and control systems
IEC 62271 (102)	Power systems management and associated information exchange - Data and communications security

*In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.

3.0 CLIMATIC CONDITIONS OF THE INSTALLATION

The service shall be as follow:

1. Maximum altitude above sea level 1,000m
2. Maximum ambient air temperature 50°C
3. Maximum daily average ambient air temperature 35°C
4. Minimum ambient air temperature 0°C
5. Maximum temperature attainable by an object exposed to sun 60°C
6. Maximum relative humidity 95%
7. Average number of thunderstorm per annum 70
8. Average number of rainy days per annum 120
9. Rainy months June to October
10. Average annual rainfall 150cm
11. Maximum Wind velocity 200 km/hr
12. Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3g

13. Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

Environmentally, some of the regions, where the work will take place includes hilly areas, subject to high relative humidity, which can give rise to condensation. Atmosphere is generally laden with mild acid and dust due to industrial activities. Some places are in heavily industrial polluted areas. On occasions, the combination of humid, acidic and dust condensation may create pollution conditions for outdoor equipments. Therefore, outdoor materials and equipment's shall be designed and protected for use exposed, heavily polluted, acidic, corrosive, tropical and humid atmosphere.

4.0 GENERAL TECHNICAL REQUIREMENTS

Sr.No.	PARTICULARS	REQUIREMENT
1	Manufacturer name	Bidder to provide
2	Frequency	50 Hz (±3%)
3	Nominal System Voltage	33 KV / 11 KV
4	Maximum System Voltage	36 KV / 12 KV
5	Number of phases	Three
6	Neutral Earthing Arrangement	Solidly Grounded
7	Fibre Optic Cable	
a.	Control Room to Switchyard/Switchgear	4 Core, 62.5/125µm Single mode / Multi-mode
b.	Within Control Room	2 Core, 62.5/125µm Single mode / Multi-mode
8	Data transmit	
a.	Cable type	Category 6 i.e. CAT-VI
b.	Speed	1000Mbps
c.	Frequency	250 MHz
9	Ingress protection	IP - 55
10	cold rolled sheet steel of thickness	≥ 3mm
11	Mounting	
a.	Centre lines of switches, push buttons and indicating lamps from the bottom of the panel	≥ 750mm
b.	centre lines of relays, meters and recorders from the bottom of the panel	≥ 450mm
12	Auxiliary supply	24 V / 48 V DC +/- 10 % tolerance (As per site requirement)
13	Terminal Blocks	
i.	Voltage grade	1100 V
ii.	Current	10Amp
iii.	Cover	Should have a Transparent removable sleeve.
iii.	Terminal block connection	

Sr.No.	PARTICULARS	REQUIREMENT
a	All CT &PT circuits	Minimum of two of 4 sq. mm copper
b	All AC/DC Power Supply Circuits	One of 4 sq. mm Copper
c	All other circuits	Minimum of one of 2.5 sq. mm Copper
iv.	Minimum clearance	
a	First row of terminal blocks and the associated cable gland plate	250 mm
b	Two rows of terminal blocks edges	150 mm
14	Painting	Siemens grey RAL 7032
15	Associated Accessories	
i.	Plug Point	240V, Single phase 50Hz
ii	AC socket with switch	5 Amps and 15 Amps pin round standard Iridian plug
iii.	MCB	As per IS:13947
iv.	HRC	As per IS:13703
16	Interior Lighting	
a.	Lighting fixture rated voltage	240 Volts, single phase, 50 Hz
b	Panel controlled Light	Respective panel door switch
17	Space Heater	
a	Rated Voltage	240V, 50 Hz Ac supply
18	Earthing Size Material and Colour	
a	Bus bar	25 X 6 sq. mm solid flat copper bus bar
b	Gland plate	Minimum 2.5 sq. mm
c	Colour code	Green
19	Control and instrument switches	Rotary operated type
20	Indicating lamps	LED type (Shall be coloured LED's rather than coloured covers & Its shorting should not result into fuse failures, it should only open out).
21	Energy Meters	
i.	Type	3 Phase 4 Wire, CT/PT Operated Static Meters
ii.	Basic Current (Ib) & rated Max. Current (Imax)	When Ib=1A; Imax=2A When Ib=5A; Imax=10A (Ib & Imax shall be as per site requirements)
iii.	Rated Secondary Current (Ib)	1A or 5A for 66/33kV (balanced and unbalanced load), 5A for 11kV (balanced and unbalanced load)
iv.	Operating Voltage	110V (P-P), Meter shall be operational with required accuracy from 0.6 Vref to 1.2Vref

Sr.No.	PARTICULARS	REQUIREMENT
v.	Power Consumption	Voltage Circuit: Max. 1.5W and 10VA, Current Circuit: Max. 1VA
vi.	Starting Current	0.1% of Ib
22	Panel type or Application	Outdoor type
23	Multi function meter	a) Reputed make b) Aux voltage: 24v to 60v DC, c) Modbus protocol with RS485 d) Accuracy: 0.2S e) Indicating V,I,MW,MVAR,PF,etc.,
24	Power pack	Input voltage: 230V AC & 110V AC (Both input supply provision to be provided with auto change over) Output voltage: 24V DC Continuous load: 100Watts Impulse load: 450 watts for 240 msec. Backup: 30 min (7AH*2 Nos, 12V battery)

4.1 General Requirements from the Business Associates:

1. The Business Associate should have at least 10 years of experience in design and supply of control and protection systems for electricity transmission and distribution applications.
2. The manufacturer, whose protection system is offered, should have designed, manufactured, tested, installed and commissioned such a system for electricity transmission and distribution for at least two years.
3. The manufacturer needs to submit the proof of completing such tasks with other utilities/concerns as its experience certificate.
4. The Business Associate can offer an innovative and advanced system. The offer is subjected to an approval from TPWODL after a thorough discussion between the BA and TPWODL. In case, an approval is not awarded to the BA's offered innovative system, TPWODL's existing/desired infrastructure prevails and the BA shall provide the system accordingly.
5. The BA should optimize on the cost of software products offered to TPWODL considering already available licenses with TPWODL. The BA should clearly indicate licensing policy for the software tools offered.
6. The BA should provide necessary training to the personnel recommended by TPWODL to maintain the system and troubleshooting reports.

4.2 General System Design:

1. Protection and Control IEDs respond to the signals of currents and voltages measured at certain points of the power system, and assess the state of the protected power

system component. The System shall be suitable for operation and monitoring of the complete substation including future extensions and shall works on IEC 61850.

2. Conventionally, analog values are injected directly into the IED through instrument transformers. IEDs combine analog-to-digital conversion of the signals with their analysis (digital filtering) and decision-making algorithms.

4.3 Fibre Optic Cable:

Between Control Room and Switchyard/Switchgear Room: 4 Core, 62.5/125µm single mode / Multi-mode, Loose tube, Jelly filled, Armoured Fibre Optic Cable Within Control Room: 2 Core, 62.5/125µm Multi-mode Fibre Optic Patch Chord.

4.4 CAT – VI :

1. 4 Pairs, 23 AWG Solid Bare Copper Conductor, PE Insulation, Unshielded Twisted Pair (UTP) with separator and PVC Outer Jacket
2. It should be designed to the ANSI/TIA-568-C.2 | ISO / IEC 11801 Category 6 requirements and transmit data at 1000 Mbps (~1 Gigabit per second) with a frequency of 250 MHz and suitable for 10BASE-T, 100BASE-TX Fast Ethernet and 1000BASE-T / 1000BASE-TX (Gigabit Ethernet).

Note: Refer TS no - TPWODL/AUTO/TEC/SPEC-003 for scada / automation related particulars.

5.0 GENERAL CONSTRUCTIONS OF CRP

Switchgear panel construction is governed by individual specification in minimum. The C&R panels against this specification shall be simplex type with all controls, indications, meters and protective relays mounted on the front.

For 33KV/ 11KV control and relay panel following features to be ensured.

5.1 Simplex Panel :

Simplex panel with dust proof design shall consist of a vertical front panel with equipment mounted there on and having wiring access from rear for control panels & either front or rear for relay panels. In case of panel having width equal to or more than 800mm, double leaf-doors shall be provided. Doors shall have handles with either built-in locking facility or will be provided with pad-lock.

5.2 Constructional Features:

1. Control and Relay Board shall be of panels of simplex type design as indicated in bill of quantity. It is the responsibility of the BA to ensure that the equipment specified and such unspecified complementary equipment required for completeness of the protective/control schemes is properly accommodated in the panels without congestion and if necessary, provide panels with larger dimensions. No price increase

at a later date on this account shall be allowed. However, the width of panels that are being offered to be placed in existing switchyard control rooms, should be in conformity with the space availability in the control room.

2. Panels shall be completely metal enclosed and shall be dust, moisture and vermin proof. The enclosure shall provide a degree of protection not less than IP-55 in accordance with IS: 2147. Panels shall be free standing, floor mounting type and shall comprise structural frames completely enclosed with specially selected smooth finished, cold rolled sheet steel of thickness not less than 3 mm for weight bearing members of the panels such as base frame, front sheet and door frames, and 2.0mm for sides, door, top and bottom portions. Proper rain shed covering to be provided considering the panel as outdoor applications. Completely closed front side door with gaskets to be provided in CRP to ensure the IP 55.
3. There shall be sufficient reinforcement to provide level transportation and installation. All doors, removable covers and panels shall be gasketed all around with synthetic rubber gaskets Neoprene/EPDM generally conforming to provision of IS 11149. However, XLPE gaskets can also be used for fixing protective glass doors, if provided shall have screens and filters. The screens shall be made of either brass or GI wire mesh. Design, materials selection and workmanship shall be such as to result in neat appearance, inside and outside with no welds, rivets or bolt head apparent from outside, with all exterior surfaces tune and smooth. Panels shall have dual exhaust fan at its rear end for dissipation of heat.
4. Panels shall have base frame with smooth bearing surface, which shall be fixed on the embedded foundation channels/insert plates. Anti-vibration strips made of shock absorbing materials that shall be supplied by the contractor, shall be placed between panel & base frame. Cable entries to the panels shall be from the bottom. Cable gland plate fitted on the bottom of the panel shall be connected to earthing of the panel/station through a flexible braided copper conductor rigidly. Relay panels of modern modular construction would also be acceptable. Proper holes to be provided for cable entry in bottom side & Cable glands to be provided accordingly.

5.3 Mounting:

1. All equipment on and in panels shall be mounted and completely wired to the terminal blocks ready for-external connections. The equipment on front of panel shall be mounted flush. Equipment shall be mounted such that removal and replacement can be accomplished individually without interruption of service to adjacent devices and are readily accessible without use of special tools. Terminal marking-on the equipment shall be clearly visible.
2. The BA shall carry out cut out, mounting and wiring of the free issue items supplied by others which are to be mounted in his panel in accordance with the corresponding equipment manufacturer drawings. Cut outs if any, provided for future mounting of equipment shall be properly blanked off with blanking plate.

3. The centre lines of switches, push buttons and indicating lamps shall be not less than 750mm from the bottom of the panel. The centre lines of relays, meters and recorders shall be not less than 450mm from the bottom of the panel.
4. The centre lines of switches, push buttons and indicating lamps shall be matched to give a neat and uniform appearance. Likewise, the top lines of all meters, relays and recorders etc. shall be matched.
5. Each of the control and relay panel against the specification shall be fitted with the following supervision lamps are:

i)	Circuit breaker `ON/Close'	Red.
ii)	Circuit breaker `OFF'	Green.
iii)	Circuit breaker `Auto-Trip'	White.
iv)	Circuit breaker 'spring charged'	Blue
v)	Trip circuit supervision 1	White
vi)	Trip circuit supervision 2	White

6. No equipment shall be mounted on the doors. At existing station, panels shall be matched with other panels in the control room in respect of dimensions, colour, appearance and arrangement of equipment (centre lines of switches, push buttons and other equipment) on the front of the panel.

6.4 Panel Internal Wiring:

1. Panels shall be supplied complete with interconnecting wiring provided between all electrical devices mounted and wired in the panels and between the devices and terminal blocks for the devices to be connected to equipment outside the panels. When panels are arranged to be located adjacent to each other all inter panel wiring and connections between the panels shall be furnished and the wiring shall be carried out internally, this is in the BA's scope.
2. All wiring shall be carried out with 1100V grade, single core, stranded copper conductor wires with PVC insulation. The minimum size of the multi-stranded copper conductor used for internal wiring shall be as follows:
3. Internal wiring to be connected to external equipment shall terminate on terminal blocks.
4. The terminal blocks for CTs & VTs shall be provided with test links and isolating facilities. The CT terminal blocks shall be provided with short circuiting and earthing facilities.
5. Shall have 20% terminals as spare terminals in each panel. All equipment mounted on front of the panels shall have individual name-plates with equipment designation engraved. Each panel shall also have circuit/feeder designation name plate.

6. All wiring shall be with 1100 V grade, single core, PVC insulated stranded copper conductor.
7. Wires shall be vermin proof. Minimum size of conductor shall be 2.5 sq. mm in general, but for CT & VT circuits it shall be 4 sq.mm. CT VT wiring will be coloured as per standard sign colour configuration including neutral and neutral CT wiring. Rest wiring will be in grey colour and earthing will be done by green coloured control cable. For CT & VT 4 sq.mm ring type lugs should be considered for proper wiring termination.
8. Contractor shall be solely responsible for completeness and correctness of all the wiring, and for proper functioning of the connected equipment.
9. Specification for Auxiliary relays/ MCB's
   a) Fuse Failure relay and trip Circuit Supervision relay shall be suitably selected, considering burden and auxiliary voltage. External circuitry like compensating resistances will not be accepted.
   b) Auxiliary contact multiplier relays should be of reputed make and selected on the basis of continuous current carrying capacity and rated voltage. The fluctuation in voltage level must be accounted for (+/-) 10% continuously.
   c) DC MCB's should not be substituted by AC MCB's for DC Distribution, irrespective of manufacturer's individual multi usage recommendations.
   d) DC Fail Supervision relay (80) shall be provided on all control and IED panels.
   e) Suitable contactor arrangement to be made in 33 KV line incomer panel/ 11 KV incomer panel so that in case of station DC failure the power pack driven by PT circuit powers up the relay and tripping circuits and keeps protection in service.
10. Spare I/Os wiring shall be brought upto terminal block for future use. All internal wiring shall be securely supported, neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Wiring gutters & troughs shall be used for this purpose.
11. Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided near the top of the panels running throughout the entire length of the panels.
12. Wire termination shall be made with solder less crimping type and tinned copper lugs, which firmly grip the conductor. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from terminal blocks. All wires directly connected to trip circuit breaker or device shall be distinguished by the addition of red coloured unlettered ferrule. All the wires shall be provided with proper cross ferruling for the easy identification of wire source & destination.
13. Longitudinal troughs extending throughout the run length of the panel shall be preferred for inter panel wiring. Inter-connections to adjacent panel shall be brought out to a

separate set of terminal blocks located near the slots of holes meant for taking the inter-connecting wires.

14. BA shall be solely responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.

15. Reputed make Multi-function meter should be provided as per IS standards in control & relay panel and the current input wirings shall be ready condition for the external wirings which is coming from CT's metering core.

16. Aux relays shall be provided with wirings upto the terminal blocks for the alarm and trip inputs with min 3 output contacts as per tpwodl requirements.

17. Gland holes shall be provided inside the panel for the entry of power & Control cables.

18. Trip circuit supervision (not only trip coil), Close circuit supervision & Lockout circuit supervision to be provided in panel & wirings to be considered accordingly.

6.5 Terminal Blocks:

1. All internal wiring to be connected to external equipment shall terminate on terminal blocks. Terminal blocks shall be 1100 V grade and have 10 Amps. Continuous rating, moulded piece, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts. Markings on the terminal blocks shall correspond to wire number and terminal numbers on the wiring diagrams. All terminal blocks shall have shrouding with transparent unbreakable material.
2. Disconnecting type terminal blocks for AC/DC, current transformer and voltage transformer secondary leads shall be provided. Also current transformer secondary leads shall be provided with short circuiting and earthing facilities.
3. At least 20% spare terminals shall be provided on each panel and these spare terminals shall be uniformly distributed on all terminal blocks.
4. Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors of external cable on each side
   - All CT &PT circuits: minimum of two of 4 sq. mm copper.
   - AC/DC Power Supply Circuits: One of 4 sq. mm Copper.
   - All other circuits: minimum of one of 2.5 sq. mm Copper.
5. There shall be a minimum clearance of 250 mm between the first row of terminal blocks and the associated cable gland plate or panel side wall. Also the clearance between two rows of terminal blocks edges shall be minimum of 150mm.
6. Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal blocks is run in parallel and close

proximity along each side of the wiring-duct to provide for convenient attachment of internal panel wiring. The side of the terminal block opposite the wiring duct shall be reserved for the Owner's external cable connections. All adjacent terminal blocks shall also share this field wiring corridor. All wiring shall be provided with adequate support inside the panels to hold them firmly and to enable free and flexible termination without causing strain on terminals.

7. The number and sizes of the TPWODL's multi core incoming external cables will be furnished to the BA after placement of the order. All necessary cable terminating accessories such as gland plates, supporting clamps & brackets, wiring troughs and gutters etc. (except glands & lugs) for external cables shall be included the scope of supply.
8. All the spare terminals of relays to be wired upto TB's for future purposes and immediate access for the external wirings.
9. All TB's should be suitable for ring type lug connections.
10. For CT TB's, shorting arrangements is not required.
11. All field wirings (CT's,PT's ,AC, DC, etc.,)TB's should be provided as droppable links type.
12. For CT,PT's separate earthing droppable links are required.
13. All TB's should be press fit type on a metallic channels & all channels should be separately earthed.

6.6 Painting:

1. All sheet steel work shall be phosphate in accordance with the IS: 6005 "Code of practice for phosphate iron and steel". It should follow the seven tank process. Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning.
2. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water rinsing with a slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying.
3. The phosphate coating shall be sealed with application of two coats of ready mixed, stoved type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved. Thereafter an established painting procedure like electrostatic painting followed for powder coating the panel. The colour shade shall be Siemens grey RAL 7032.

6.7 Associated Accessories:

1. **Plug Point**: 240V, Single phase 50Hz, AC socket with switch suitable to accept 5 Amps and 15 Amps pin round standard Indian plug, shall be provided in the interior of each cubicle with ON-OFF switch.

2. **Interior Lighting:** Each panel shall be provided with an LED: lighting fixture rated for 240 Volts, single phase, 50 Hz supply for the interior illumination of the panel controlled by the respective panel door switch.
3. **Switches and Fuses:** Each panel shall be provided with necessary arrangements for receiving, distributing and isolating of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breakers (MCB). Selection of the main and sub-circuit MCB rating shall be such as to ensure selective clearance of sub-circuit faults. MCBs shall confirm to IS: 13947. Each MCB shall be provided with one potential free contact and the same shall be wired for annunciation purpose. However voltage transformer circuits for relaying and metering shall be protected by fuses. All fuses shall bee HRC cartridge type conforming to IS: 13703 mounted on plug-in type fuse bases.. Fuse carrier base as well as MCBs shall have imprints of the fuse 'rating' and 'voltage'.
4. **Space Heater**: Each panel shall be provided with a space heater rated for 240V, single phase, 50 Hz Ac supply for the internal heating of the panel to prevent condensation of moisture. The fittings shall be complete with switch unit
5. **Annunciator** : 16 windows type annunciator shall be provided in panel for the alarm & trip annunciation purposes.
6. Hooter shall be provided in panel associated with the annunciation & tripping circuits.
7. Power pack shall be provided in CRP.

6.8 Earthing :

1. All panels shall be equipped with an earth bus securely fixed. Location of earth bus shall ensure no radiation interference for earth systems under various switching Conditions of Isolators and breakers.

2. The material and sizes of the bus bar shall be at least 25 X 6 sq.mm solid flat copper bar with threaded holes at a gap of 50mm with a provision of bolts and nuts for connection with cable armours and mounted equipment etc for effective earthing. When several panels are Mounted adjoining each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply of the Contractor. Provision shall be made for extending the earth bus bars to future adjoining panels on either side.
3. Provision shall be made on each bus bar of the end panels for connecting Substation earthing grid. Necessary terminal clamps and connectors for this purpose shall be included in the scope of supply of BA.
4. All metallic cases of relays, instruments and other panel mounted equipment including gland plate, shall be connected to the earth bus by copper wires of size not less than 2.5 sq. mm. The colour code of earthing wires shall be green.
5. Looping of earth connections, which would result in loss of earth connection to other devices when the loop is broken, shall not be permitted. However, looping of earth

connections between equipment to provide alternative paths to earth bus shall be provided.

6. VT and CT secondary neutral or common lead shall be earthed at one place only at the terminal blocks where they enter the panel. Such earthing shall be made through links so that earthing may be removed from one group without disturbing continuity of earthing system for other groups.

1.9 Switches :

1. Control and instrument switches shall be rotary operated type with escutcheon plates clearly marked to show operating position and circuit designation plates and suitable for flush mounting with only switch front plate and operating handle projecting out.
2. The selection of operating handles for the different types of switches shall be as follows:
   - Breaker, Isolator: Pistol grip, black control switches
   - Selector switches: Oval or knob, black
   - Instrument switches: Round, knurled, black
3. The control switch of breaker and isolator shall be of spring return to neutral type. The switch shall have spring return from close and trip positions to "after close" and "after trip" positions respectively.
4. Instrument selection switches shall be of maintained contact (stay put) type. Ammeter selection switches shall have make-before-break type contacts so as to prevent open circuiting of CT secondary when changing the position of the switch. Voltmeter transfer switches for AC shall be suitable for reading all line- to-line and line-to-neutral voltages for non-effectively earthed systems and for reading all line to line voltages for effectively earthed systems.
5. Lockable type of switches which can be locked In particular positions shall be provided when specified. The key locks shall be fitted on the operating handles.
6. The contacts of all switches shall preferably open and close with snap action to minimize arcing. Contacts of switches shall be spring assisted and contact faces shall be with rivets of pure silver or silver alloy. Springs shall not be used as current carrying parts
7. The contact combination and their operation shall be such as to give completeness to the interlock and function of the scheme.
8. The contact rating of the switches shall be as follows:

Description (Contact rating in Amps)	24VDC	50VDC	240VAC
Make and Carry	10	10	10
Continuously Make and Carry for 0.5 sec	30	30	30
Break for resistive load	20	20	7

Inductive Load with L/R = 40ms	0.2

1.10 Indicating Lamps :

1. Indicating lamps shall be of cluster LED type suitable for panel mounting with rear terminal connections. Lamps shall be provided with series connected resistors preferably built in the lamp assembly. Lamps shall have translucent lamp covers to diffuse lights colored red, green, amber, dear white or blue as specified The lamp cover shall be preferably of screwed type, unbreakable and moulded from heat resisting material.
2. The lamps shall be provided with suitable resistors. Lamps and lenses shall be interchangeable and easily replaceable from the front of the panel. Tools, if required for replacing the bulbs and lenses shall also be included in the scope of the supply.
3. The indicating lamps with resistors shall withstand 120% of rated voltage on a continuous basis.
    - Red – Breaker ON
    - Green – Breaker OFF
    - Blue – Spring Charged
    - Amber – 86 operated
    - Blue – Breaker in test
    - Blue – Breaker in service
    - Dear white – TCS1 fail
    - Dear white – TCS2 fail

1.11 Dust Proof Environment:

All the panels in the control room and switchgear room have to be in a dust proof environment. Civil works have to be taken care in the same directions.

1.12 Energy Meters :

1. The Energy Measurements should be preferably done as per 3 wattmeter method. It shall use Potential Transformer and the Metering Core of the respective Current Transformers. The desired Metering class accuracy of 0.2s is expected for metering functions.
    a) Supply and Integration of Energy Meters with Software for centralized meter data reading shall be in Business Associate ’s scope. Supplied Software shall have independent for meter make or OEM to retrieving the meter data.
    b) Laying of Communication Cable along with conduit shall be in Business Associate ’s scope
    c) Supply and Installation of RJ11 Splitters shall be in Business Associate ’s scope

d) Supply, Installation and Configuration of TCP/IP to Serial Converter shall be in Business Associate 's scope if required.

e) Software configuration for integration of energy meters (at centralized meter data acquisition system) shall be in Business Associate 's scope. Business Associate shall have ensured the data communication.

2. The basic metering functions should be additionally supported by following:

S. No.	Description	Requirement
01	Type of the Meter	3 Phase 4 Wire, CT/PT Operated Static Meters
02	Accuracy Class of the Meter	Active Energy – Will be informed at detailed engineering stage Reactive Energy – 2 or better
03	Basic Current (Ib) & rated Max. Current (Imax)	When Ib=1A; Imax=2A When Ib=5A; Imax=10A (Ib & Imax shall as per site requirements)
04	Rated Secondary Current (I_b)	1A or 5A for 66/33kV (balanced and unbalanced load), 5A for 11kV (balanced and unbalanced load)
05	Reference conditions for testing the performance of the meter	V_{ref} = 110V ± 1% Freq = 50Hz ± 0.3% Temperature = 27°C ± 2°C
06	Operating Voltage	110V (P-P), Meter shall be operational with required accuracy from 0.6 V_{ref} to 1.2Vref
07	Operating Frequency	50Hz ± 5%
08	Power Consumption	Voltage Circuit: Max. 1.5W and 10VA, Current Circuit: Max. 1VA
09	Starting Current	0.1% of I_b
10	Short time over current	The meter shall be able to carry for 0.5s a current equal to 20 times the max. current
11	Influence of heating	Temperature rise at any point of the external surface of the meter shall not exceed by more than 20k with an ambient temperature at 45oC
12	Rated Impulse withstand voltage	6kV (Shall be applied ten times with one polarity & then repeated with the other polarity and minimum time between each impulse to be 3s)
13	AC withstand voltage for 1 min	4kV
14	Insulation resistance between	Frame & current, voltage circuits connected together: 5MΩ Each current circuit (and voltage circuit) & each and every other: 50MΩ

S. No.	Description	Requirement
15	Mechanical Requirements	Meter shall be in compliance with clause 12.3 of IS 14697
16	Resistance to Heat and Fire	The terminal block, terminal cover and Meter case shall ensure safety against spread of fire. They should not be ignited by thermal overload of live parts in contact with them as per clause 6.8 of IS 14697. Fire retardant material shall be used.
17	Protection against penetration of dust and water	Degree of Protection: IP 55, but without suction in the meter
18	Resistance against Climatic influence	Meter shall be in compliance with clause 12.6 of IS 14697
19	Electromagnetic Compatibility (EMC)	Meter shall be in compliance with clause 12.8 of IS 14697
20	Accuracy requirements	Meter shall be in compliance with clause 11.0 of IS 14697
21	Power Factor Range	Zero lag to Zero lead
22	Energy Measurement	Fundamental energy +Energy due to Harmonics. Energy meters shall preferably record. Total Harmonics distortion (THD) in voltage and current for at least 30 days
23	Connection Diagram	The connection diagram for the system shall be provided on terminal cover
24	Self-Diagnostic Feature	Self-diagnostic for calendar, RTU, Battery, all display segments and NVM.
25	Initial start up of meter	Meter shall be fully functional within 5s after reference voltage is applied to the meter terminals
26	Internal diameter of the terminal holes and Depth of terminal hole	5.5mm (min), 25mm
27	Clearance between adjacent Terminals	10mm (min)
28	Display	Backlit LCD, Scrolling, 10s for each parameter
29	History requirements	The meter shall be capable of recording the last two months data for following parameters, at the end of every month at 24:00 hrs: • Active demand (MW), import • Apparent demand (MVA), import • Reactive energy (MVArh) lag, import • Reactive energy (MVArh) lead, import

S. No.	Description	Requirement
		• Active energy (MWh), import Apparent energy (MVAh), import • Active demand (MW), export • Apparent demand (MVA), export • Reactive energy (MVA) lag, export • Reactive energy (MVArh) lead, export • Active energy (MWh), export • Apparent Energy (MVAh), export
30	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication, etc.
31	Software and Communication compatibility	The BCS and CMRI Software shall be supplied by the bidder for free of cost. Training for the use of the software shall also be provided by the bidder
32	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means.

3. Aux. Supply of Serial to TCP/IP Converter should be on Station DC Supply and usage of power converters are not allowed.
4. There should be PT selection scheme in line panel for selection of BUS-PT and Line PT for metering purpose.
5. In transformer panel PT selection scheme in the transformer panel is also required based on bus isolation selection.

6.0 NAME PLATE AND MARKING

With the other details on the name plate following should be suitably embossed on the name “PROPERTY OF TPWODL”.

a) All equipment mounted on front and rear side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. Also on the top of each panel on front as well as rear side, large and bold nameplates shall be provided for circuit/feeder designation.
b) All front mounted equipment shall also be provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
c) Each IED and meter shall be prominently marked. All relays- and other devices shall be clearly marked with manufacturer's name, manufacturer's type, serial number and electrical rating data.
d) Name Plates shall be made of anodized aluminium. Name plates shall be black with white engraving lettering.

e) Each switch shall bear clear inscription identifying its function e.g. 'BREAKER"52A`, "SYNCHRONISING" etc. Similar inscription shall also be provided on each device whose function is not other-wise identified. If any switch device does not bear this inscription separate name plate giving its function shall be provided for it. Switch shall also have clear inscription for each position Indication e.g. "Trip- Neutral-Close", "ON-OFF", "R-Y-B-OFF" etc.

f) All the panels shall be provided with name plate mounted inside the panel bearing PO No & Date, Name of the Substation & feeder and reference drawing number.

g) Continuous operating Voltage

h) Rated Voltage

i) Rated Frequency

j) Rated Normal Current

k) Manufacturer's Name

l) Guarantee period

m) ISI mark,

7.0 TEST

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by TPWODL authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessary conducted on C & R Panel.

7.1 FACTORY ACCEPTANCE TEST:

The manufacturing phase of the C&R Panel shall be concluded by the factory acceptance test (FAT). The purpose is to ensure that the Contractor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. If the FAT comprises only a certain portion of the system for practical reason. An integrated-FAT shall be conducted as per the TPWODL standard format which shall be finalised mutually during detail engineering. If the complete system consists of parts from various Business Associate s or some parts are already installed on site, in such case Business Associate will arrange the intra-communication between RTU/DC and such IEDs to meet the requirement.

7.2 SITE ACCEPTANCE TESTS:

All the relevant test at site to be conducted under the supervision of TPWODL authority satisfactorily based on approved SAT documents which are finalised mutually during detail engineering. The SAT documents to be approved from TPWODL authority.

7.3 HARDWARE INTEGRATION TESTS:

shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item shall be verified as an integral part of system. Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system. The equipment expansion capability shall also be verified during the hardware integration tests.

7.4 INTEGRATED SYSTEM TESTS:

shall verify the stability of the hardware and the software. During the tests all functions shall run concurrently, and all equipment shall operate a continuous 100 Hours period. The integrated system test shall ensure the IEDs is free of improper interactions between software and hardware while the system is operating as a whole.

8.0 TYPE TEST CERTIFICATES

1. The bidder shall furnish the type test certificates as mentioned above as per the corresponding standards.
2. All the tests shall be conducted at CPRI / ERDA as per the relevant standards.
3. Type tests should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of opening the bid.
4. In the event of any discrepancy in the test reports, i.e. any test report not acceptable same shall be carried out without any cost implication to TPWODL.
5. Bidder shall submit the test reports for the Tree Retardant properties of the insulation.

Test reports for following type tests shall be submitted for the Protection IED along with the Bid

8.1 INSULATION TEST

S. No.	Description	Standard
1	Dielectric Withstand Test	IEC 60255-5
		ANSI/IEEE C37.90-1989
		2kV rms for 1 minute between all case terminals connected together and the case earth.
		2kV rms for 1 minute between all terminals of independent circuits with terminals on each independent circuit connected together.
2	High Voltage Impulse Test, class III	IEC 60255-5
		5kV peak; 1.2/50 msec; 0.5J; 3 positive and 3 negative shots at intervals of 5s

8.2 ELECTRICAL ENVIRONMENT TESTS

S. No.	Description	Standard
1	DC Supply Interruption	IEC 60255-11 The unit will withstand a 20ms interruption in the auxiliary supply, in its quiescent state, Without de-energizing.
2	AC Ripple on DC supply	IEC 60255-11 The unit will withstand a 12% ac ripple on the dc supply.
3	AC voltage dips and short Interruptions	IEC 61000-4-11 20ms interruptions/dips.
4	High Frequency Disturbance	IEC 60255–22–1, class III At 1MHz, for 2s with 200 ohms source impedance: 2.5kV peak; 1 MHz; T = 15 μsec; 400 shots/sec; duration 2 sec between independent circuits and independent circuits and case earth. 1.0kV peak across terminals of the same circuit.
5	Fast Transient Disturbance	IEC 60255-22-4, class IV 4kV, 2.5kHz applied directly to auxiliary supply 4kV, 2.5kHz applied to all inputs.
6	Surge Withstand Capability	IEEE/ANSI C37.90.1 (1989) 4kV fast transient and 2.5kV oscillatory applied directly across each output contact, optically isolated input and power supply circuit.
7	Radiated Immunity	C37.90.2: 1995 25MHz to 1000MHz, zero and 100% square wave modulated. Field strength of 35V/m.
8	Electrostatic Discharge	IEC 60255-22-2 Class 4 15kV discharge in air to user interface, display and exposed metal work. IEC 60255-22-2 Class 3 8kV discharge in air to all communication ports. 6kV point contact discharge to any part of the front of the product.
9	Surge Immunity	IEC 61000-4-5: 1995 Level 4 4kV peak, 1.2/50ms between all groups and case earth. 2kV peak, 1.2/50ms between terminals of each group.
10	Capacitor Discharge	No change of state or any operation shall occur when a capacitor of capacitance shown below, charged to 1.5×Vn volts, is connected between any combination of

S. No.	Description	Standard
		terminals and any combination of terminals and ground. Master trip circuits - 10 μF Other protection & control circuits - 2 μF Carrier/channel interface - 0,2 μF

8.3 EMC TEST

S. No.	Description	Standard
1	Radio-Frequency Electromagnetic Field, Non-Modulated	IEC 60255–22–2, class III 10 V/m; 27 MHz to 500 MHz
2	Radio-Frequency Electromagnetic Field, Amplitude Modulated	ENV 50140, class III 10 V/m; 80 MHz to 1000 MHz; 80% AM; 1 kHz
3	Radio-Frequency Electromagnetic Field, Pulse Modulated	ENV 50140/ENV 50204 10 V/m; 900 MHz; repetition frequency 200 Hz; duty cycle 50 %
4	Disturbances Induced by Radio Frequency fields, Amplitude Modulated	ENV 50141, class III 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
5	Power Frequency Magnetic Field	EN 61000-4-8, class IV 30 A/m continuous; 300 A/m for 3 sec; 50 Hz
6	Interference Voltage, Aux. Voltage	EN 50081-* 150 kHz to 30 MHz
7	Interference Field Strength	EN 50081-* 30 MHz to 1000 MHz

8.4 ATMOSPHERIC ENVIRONMENT TEST

S. No.	Description	Standard
1	Temperature	IEC 60255-6 Operating –25°C to +50°C Storage and transit –25°C to+70°C IEC 60068-2-1 for Cold IEC 60068-2-2 for Dry heat
2	Humidity	IEC 60068-2-3 56 days at 93% RH and +40°C

8.5 MECHANICAL STRESS TEST

S. No.	Description	Standard
1	Vibration (during Operation & Transportation)	IEC 255-21-1; IEC 68-2-6 Response Class 2 Endurance Class 2
2	Shock (during Operation and Transportation)	IEC 255-21-2, class 1, IEC 68-2-27 Shock response Class 2 Shock withstand Class 1 Bump Class 1
3	Seismic Vibration (during Operation)	IEC 60255-21-3 Class 2
4	Continuous Shock (during Transportation)	IEC 255-21-2, class 1, IEC 68-2-27

9.0 PRE-DESPATCH INSPECTION

1. Material shall be subject to inspection by a duly authorized representative of TPWODL.
2. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.
3. Bidder shall grant free access to the places of manufacture to TPWODL's representatives at all times when the work is in progress.
4. Inspection by TPWODL or authorized representatives shall not relieve the Business Associate of his obligation of furnishing equipment in accordance with the specifications.
5. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL.
6. Following documents shall be sent along with material:
   a) Test report
   b) MDCC issued by TPWODL
   c) Invoice in duplicate
   d) Packing list
   e) Drawings & catalogue
   f) Guarantee / Warrantee card
   g) Brought out (raw) material test certificates
   h) Delivery Challan
   i) Other Documents (as applicable)

10.0 INSPECTION AFTER RECEIPT AT STORE

The material received at TPWODL, Odisha store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch

inspection and one copy of the report shall be sent to "Network planning, Engineering and Quality" department.

11.0 GUARANTEE:

1. Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract.
2. In the event any defect is found by the TPWODL, up to a period of 60 months from thedate of commissioning or 42 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 60/42 months could be enhanced subject to mutual agreements). Biddder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Business Associate 's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the Bidder or from the " Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for '**free replacement'** for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12.0 PACKING

1. The equipment shall be packed in crates suitable for vertical/horizontal transport, as the case may be and suitable to withstand bundling during transport and outdoor storage during transit.
2. The Business Associate shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided.
3. Any material found short inside the packing cases shall be supplied by Business Associate without any extra cost.
4. Each consignment shall be accompanied by a detailed packing, list containing the following information:-
   a) Name of the consignee.
   b) Details of consignment.
   c) P.O Number
   d) Destination
   e) Total weight of consignment.
   f) Handling and unpacking instructions.
   g) Bill of material indicating contents of each package

   The Business Associate shall ensure that the packing list and bill of material are approved by the purchaser before dispatch bidder shall ensure that all the equipment

covered under this specification shall be prepared for rail/road transport so as to protect the equipment from damage in transit.

13.0 TENDER SAMPLE

Not available

14.0 TRAINING

On the site job training to be imparted to TPWODL employees. Two man days of expert OEM employees to be considered for delivering the training.

15.0 QUILITY CONTROL

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPWODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-Business Associate 's works to carry out inspections.

16.0 MINIMUM TESTING FACILITIES

The Bidder shall have in house testing facilities for carrying outall routine tests and acceptance tests as per relevant international/Indian standards.

17.0 MANUFACTURING ACTIVITIES

The successful Bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order. Manufacturing mass quantity to start only after getting approved drawings or as per intimation from TPWODL.

18.0 SPARES, ACCESSORIES ND TOOLS

1. The bidder shall submit a recommended list for maintenance spares for smooth and trouble free operation of the C& R Panel.
2. The bidder, if at any time changes the design of the C& R Panel or discontinue manufacturing of the C& R Panel, shall provide opportunity to purchaser for purchase of spares for future use so as to ensure smooth & trouble-free functioning of the C& R Panel before such change in design or discontinue of manufacturing activity is affected.

19.0 DRAWINGS AND DOCUMENTS

Following drawings and documents shall be prepared based on TPWODL specifications and statutory requirements and shall be submitted with the bid:

a) Completely filled in Technical Particulars

b) General drawing arrangements
c) Bill of material
d) Type Test certificates.
e) Brought out (raw material) test certificates
f) Experience List

After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser. Following drawings / documents shall be submitted by the bidder for Purchaser's approval.

S.No.	Description	For Approval	For Review Information	Final Submission
1	Technical Particulars	√		√
2	General Arrangement drawings	√		√
3	Manual / catalogue		√	√
4	Installation / Commissioning Manuals		√	√
5	Instruction for use		√	√
6	Transport / Shipping dimension drawing		√	√
7	QA & QC Plan	√	√	√
8	Routine, Acceptance and Type Test Certificates	√	√	√
9	Brought out or Raw material test certificates		√	√
10	ICS	√		√
11	IFAT	√		√

*All the documents & drawings shall be in English language.

Instruction Manuals: Bidder shall furnish two softcopies and four (4) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

20.0 GUARANTEED TECHNICAL PARTICULARS

33kV & 11kV CONTROL & RELAY PANEL

S.No.	PARTICULARS	Bidder Offer
1	Manufacturer name	
2	Frequency	
3	Nominal System Voltage	
4	Maximum System Voltage	
5	Number of phases	
6	Neutral Earthing Arrangement	

S.No.	PARTICULARS	Bidder Offer
7	Fibre Optic Cable	
a.	Control Room to Switchyard/Switchgear	
b.	Within Control Room	
8	Data transmit	
a.	Cable type	
b.	Speed	
c.	Frequency	
9	Ingress protection	
10	cold rolled sheet steel of thickness	
11	Mounting	
a.	Centre lines of switches, push buttons and indicating lamps from the bottom of the panel	
b.	centre lines of relays, meters and recorders from the bottom of the panel	
12	Auxiliary supply	
13	Terminal Blocks	
i.	Voltage grade	
ii.	Current	
iii.	Cover	
iii.	Terminal block connection	
a	All CT &PT circuits	
b	All AC/DC Power Supply Circuits	
c	All other circuits	
iv.	Minimum clearance	
a	First row of terminal blocks and the associated cable gland plate	
b	Two rows of terminal blocks edges	
14	Painting	
15	Associated Accessories	
i.	Plug Point	
ii	AC socket with switch	
iii.	MCB	
iv.	HRC	
16	Interior Lighting	

S.No.	PARTICULARS	Bidder Offer
a.	Lighting fixture rated voltage	
b	Panel controlled Light	
17	Space Heater	
a	Rated Voltage	
18	Earthing Size Material and Colour	
a	Bus bar	
b	Gland plate	
c	Colour code	
19	Control and instrument switches	
20	Indicating lamps	
21	Energy Meters	
i.	Type	
ii.	Basic Current (Ib)	
iii.	Rated Max. Current (Imax)	
iv.	Rated Secondary Current (Ib)	
v.	Operating Voltage	
vi.	Power Consumption	
vii.	Starting Current	
22	19” Rack Mountable with Power Socket and Ports at rear side	
23	Compliance to IEC 61850-3, IEEE 1613 Standards	
24	Port Speed: 10Mbps/100Mbps for Station Bus and 1Gbps for Process Buss	
25	Should have minimum of 12 Ports, number of switches minimum 2	
26	LED indicators for link establishment and data transfer for each port	
27	Should support remote user setting configuration.	
28	Should own separate maintenance/console port	
29	Should support SNMP Server v1.0/v2.0/v3.0	
30	Auxiliary Power Supply: 48 VDC or 24VDC (depending upon the Station DC Voltage) with ±15% tolerance, Dual Power Supply	
31	All the cards/modules of the Switch must have conformal coating for protection against harsh and polluted environment	

S.No.	PARTICULARS	Bidder Offer
32	LIFTING arrangement.	
33	Painting	
34	Heater provision	
35	Illumination provision	
36	Make of relays	
a.	L/O	
b.	BCPU(O/C& E/f)	
c.	Trip supervision relay	
d	Differential Relay	
37	Weight	
38	Dimension (LXWXH) in mm	
39	Mounting arrangement	
40	Control cable tray provision for dressing	
41	Control cable entry provision (top/bottom)	
42	Labelling for all aux components	
43	Wires and lug as per specs	
44	Extension of earthing at both sides provision	
45	Earthing connection hardware	
46	Plug point provision	
47	Panel type (Application)	
48	Multi-function meter	
49	Power pack	

LOCKOUT RELAY (86) GTP:

PARTICULARS	REQUIREMENT	BIDDERS REMARKS
Elements	Lock-out protection (86)	
Auxiliary supply	24 V / 48 V DC +/- 10 % tolerance (As per site requirement)	
Functions	High speed tripping relays shall be provided for trip functions of various protection schemes.	
Operating Time	The operating time of the relay shall not be more than 20 ms.	
Operating Range	The pick-up value of the relay shall be in the range of 50 to 60% of rated voltage.	

Supervision	Healthiness of the tripping relays shall be supervised by suitable tripping relay supervision relay. It shall be static type	
Reset & Indication	Relay should hav Electrical reset & lovally through push button(illuminated type) & from remote facility which should be illuminated or flag type of indication.	
Contacts	Relay should have minimum 6 changeover contacts. Power contact should be capable of braking trip coil current	
Relay Hardware Requirement	Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatical conditions.	
Reset Push buttons	Relay must have electrical reset facility. Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.	
IS reference	IS 3231 amended up to date	

TCS RELAY GTP:

PARTICULARS	REQUIREMENT	
Elements	Trip Circuit Supervision	
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance (Same relay should be suitable for both the voltages)	
Functions	Pre & post trip circuit supervision. Its resistance value should be optimum during DC fluctuation it should not trip the breaker.	
LED	Should be there for indicating healthy trip circuit	
Operating Time	The operating time of the relay shall not be more than 20 ms.	
Operating Range	The pick-up value of the relay shall be in the range of 80 to 100% of rated voltage.	
Pick-up & Drop-off current at rated voltage UAux& 250 C	Should be lower than the trip coil pickup currents (0.3 - 0.7 mA)	
Burden at rated voltage – Auxiliary circuit (W) – Supervision circuit (W)	24 V 1 W 0.08 W	48V 1.4 W 0.15 W
Mechanical durability	1 Million switching operations	
Terminals	Suitable for upto 2.5 mm2 wires	
Reset & Indication	Relay should have a local reset facility which should be illuminated or flag type of indication.	

Contacts	Relay should have minimum 6 changeover contacts. Power contact should be capable of braking trip coil current
Relay Hardware Requirement	Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatical conditions.
IS reference	IS 3231 amended up to date
Contact configuration (self reset`	1 N/O +1 N/C + 2C/O
Max voltage within a contact system	250 V DC
Rated current	5A
Make and carry for 0.5 s	10A
Make and carry for 3.0 s	8A
Breaking capacity for DC with circuit time-constant L/R < 40 ms, at 48/110/220 VDC	1A/0.25A/0.15A
Electrical endurance Tested according to IEC 255-23	10,000 operations, at 110 V DC, 0.35A resistive, 360 op/hr

Note: The system DC voltage shall be confirmed in PO and subsequent during detail engineering/ drawing approval.

Signature: Seal of the Company

Designation Date:

21.0 SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH THE BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S.No.	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Signature: Seal of the Company

Designation Date:

STANDARAD TECHNICAL SPECIFICATION

For

HV FEEDER BCPU NON-DIRECTIONAL OVER-CURRENT & EARTH FAULT PROTECTION RELAY

DETAILS OF DOCUMENT REVISION:

Rev. No.	Rev. Date	Changes Made	Details of document update	Updated By	Approved By
R2	14/03/2022	Updated	Updated as per TPWODL requirements	KGR	VBN
R3	01/08/2023	Updated	Updated as per TPWODL requirements	KGR	VBN

CONTENTS

1. SCOPE:

The scope of this document is to give design and constructional features, inspection, supply, loading, forwarding and unloading of HV FEEDER NON-DIRECTIONAL OVER-CURRENT & EARTH FAULT PROTECTION RELAY to be used in TPWODL, Odisha distribution network.

2. APPLICABLE STANDARDS:

Except when they conflict with the specific requirements of this specification, the Relays at various sub-units/components mounted on the panels shall conform to the latest revisions of the following standards:

Sr No	Standard	Description
1	IS 3231 / 1986 Reaffirmed 1997	Electrical relays for power system protection
2	IEC 60255 amended up to date	Numerical biased protection relay
3	IEC 61850	Communication Protocol

3. CLIMATIC CONDITIONS:

The service conditions shall be as follows:

[a] Maximum altitude above sea level	: 1000 m
[b] Maximum ambient temperature	: 50 ° C
[c] Maximum daily average ambient air temperature	: 40 ° C
[d] Minimum ambient air temperature	: -5° C
[e] Maximum temperature attainable by an object exposed to the sun	: 60 ° C
[f] Maximum yearly weighted average ambient temperature	: 32° C
[g] Maximum relative humidity	: 100%
[h] Average no. of rainy days in a year	: 120 days
[i] Average annual rainfall	: 150 cm
[j] Maximum wind pressure	: 260 Kg/Sq.m.
[k] Average number of thunderstorm days per annum	: 70

Environmentally, the region where the equipment will be installed includes coastal areas, subject to high relative humidity, which can give rise to condensation.
Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for Relays.
Therefore, material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive, tropical and humid coastal atmosphere.

4. SYSTEM CONDITION:

PARTICULARS	DESCRIPTION
Frequency	50 Hz (±3%)
Nominal System Voltage	33 KV / 11 KV
Maximum System Voltage	36Kv / 12 KV
Number of phases	Three
Neutral Earthing Arrangement	Solidly Grounded

5. GENERAL TECHNICAL REQUIREMENT:

Particulars	Requirement
Protection Elements	3 O/C + 1 E/F + Two Stages of High set for both O/C & E/F separately + UV & OV, Circuit breaker failure (CBF) and Auto-Reclosure (79). Earth fault shall be calculated one considering phase coils in protection relay.
CT Secondary input current to relay	Selection for 1 A / 5 A through software & shall be possible at site
Operating Characteristics selectable	1. IDMT IEC – 3 Sec. 2. IDMT - 1.3 sec. 3. IEC Very Inverse 4. IEC Extremely Inverse 5. IEC Definite time 6. IEC User defined inverse 7. IEC Long time inverse
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance
IDMT O/C Plug setting	5 % to 200% in steps of 1%
IDMT E/F Plug setting	5 % to 200 % in steps of 1 %
High Set O/C setting	10 % to 2000 % in steps of 1 % (20 times)
High Set E/F setting	10 % to 2000 % in steps of 1 % (20 times)
Time multiplier setting for O/C & E/F for IDMT	0.02 to 1.0 in steps of 0.01
Time delay for High set O/C & E/F	0 sec to 10 sec in steps of 0.01 sec
Memory storage for fault information	Storing of latest 500 events with date & time stamping and storage of latest 10 fault records, fault amplitude , type of fault, faulty phase with FIFO feature (available on display & shall be retrievable through software in standard CFG format). Waveform capturable from both relay start & relay trip shall be configurable. Relay Shall have inbuilt battery back-up of at least 12 Hrs.

Broken Conductor Protection	The relay shall be capable of Broken Conductor Protection. Setting range should be I2/I1 from 0.5 to 1.0
Negative Phase Sequence Protection.	The relay shall be capable of Negative Phase Sequence Protection.
Over-voltage & Under-voltage protection	Relay shall comprise of two stage of Over-voltage protection and two stage Under-voltage protection. Single phase to ground PT voltage shall be 63.5V
*Neutral displacement protection (NDR)	Separate voltage coil (low voltage) to be considered in protection relay. (Note: This one is to be considered only for capacitor bank CRP).
*Neutral unbalance protection	Separate current coil (low/sensitive currents) to be considered in protection relay. (Note: This one is to be considered only for capacitor bank CRP).
Pre-Logic	User programmable facility to achieve customized functions, create logics with external information through DI/DO etc. TPWODL approved configuration shall be supplied as a pre-configured relay.
Configuration Method	Relay shall be configurable from HMI as well as software through Laptop.
Relay Hardware Requirement	1. Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatically conditions. 2. Relay electronic cards shall have conformal coating.
Monitoring on HMI	1. RMS Current, Voltage (Primary & Secondary) 2. Active Power 3. Reactive Power 4. Power frequency 5. Trip Circuit Monitoring Feature (TCS)
Mounting	1. Relay should be flush mounted with preferably DRAW OUT type model with CT shorting facility of make before break type. OR 2. Flush Mounted with fixed type connections shall also be Considered 3. All relay connections shall be fixed screw type terminals with adequate spacing on back side. 4. Galvanic isolation between field connection & relay hardware.
LED indications	7 programmable LEDs & 1 LED for healthy indication. Colour of LED 01- Power ON – Green colour 02- Pick up – Yellow colour 03 – L1 – Red colour 04 – L2– Red colour 05 – L3– Red colour 06 – E/F– Red colour

	07 – High set– Red colour
Push buttons	Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.
Output contacts	The relay shall have 12 no's potential free and heavy duty programmable contacts. Min 12 no's relay output contacts shall be provided for specific function outputs for alarm, trip & trip circuit supervision. All output contacts should be freely programmable. Power contact should be capable of braking trip coil current.
Contact rating	Continuous carry -5A, Make & carry for 0.2 sec-30A
Input contacts	The relay shall have 19 no's of binary input contacts with pickup value 80% of input voltage. Binary inputs pickup should be only on DC voltages & not on AC voltages.
Self-diagnosis feature	Relay should have self-diagnosis for its healthiness of functioning & should show indication in case of its failure. The relay shall have continuous automatic self-monitoring and alarming facilities. The above feature shall not affect the relay availability i.e. when an actual fault occurs in the system during the checking cycle, the above cycle shall be immediately interrupted and the relay shall check and respond to the system fault. The system shall have the following visual indications for supervision of each command channel.
Password protection	The relay should have provision password protection for the applied settings
Selectivity of primary CT current	The relay should have facility to select the primary CT current from 50A to 2000A in steps of 50A. The relay should display the CT primary current.
Operational indicator	LED
IS reference	IEC 61850, IEC 60255, IS 3231 amended up to date
LCD Display	Relay shall have minimum 4 line LCD backlit display
Features	Minimum 2 setting groups
Disturbances recorder	The DR shall capture waveforms of analogue channels, and all the DI channels & the DO channels. It shall be possible to configure and capture in DR, all the internal functions like overcurrent start etc. for better analysis of the fault information. It shall have a minimum storage of 10 records of 1 sec each. It shall have facility to record information prior to fault incidence with a pre-trigger time setting of 25 % (programmable).
Communication protocol	Numerical relays shall have a data port for local access using Hand-held device / Notebook PC (with software). All the numerical relays shall have common software. Each relay shall have IEC 61850 port which can be used for SCADA applications and relay networking for downloading DR

	waveforms. The relay communication protocol used shall support time stamping and waveform file transfer. Details of Numerical relay communication ports are as follows. Front: Ethernet port Rear: IEC 61850 (for integration of relays with SCADA and accessing DR from remote through Tata Power automation WAN) SNTP protocol support (from SCADA system). Parallel Redundancy Protocol (PRP) / Rapid Spanning Tree Protocol (RSTP) feature will provided as default with dual RJ45 or dual FO port.
Pulse Sampling Rate	Relay shall have the Scan rate of sampling each of the analog channels having the fundamental frequency of 50HZ in the order of 1000Hz or better sampling.
Special Requirement	One complete set of Relay configuration tool (Laptop, communication cable, Moxa etc) to be supplied for every 30 no's lot of Relays, and pre-configured relay software along with all device configuration software to be pre- installed.
BCPU FUNCTIONALITY	
Bay Control Elements	Circuit breaker control function should have open & close command of CB as well as status. Compatible with L/R.
Response Time	Signal type - Response time to/from HMI Digital Input - 1 Sec Analogue Input - 1 Sec Digital output - 0.75 Sec
Time Synchronization	The time synchronization of BCPU shall be in line with central SCADA master station (FEP) via data concentrator placed at substation.
Interlock Function	All bay level interlocks are to be incorporated in the Bay level unit so as to permit control from the Bay level unit/ local bay mimic panel, with all bay interlocks in place, during maintenance and commissioning or in case of contingencies.
Sequence of event	BCPU shall be capable of handling 2000 events and buffer will be on FIFO model.
Contact Bouncing	The inputs shall be acquired by exception with 1 ms resolution. Contact bouncing in inputs shall not be assumed as change of state.

System Architecture for SCADA Communication:

The above BCPU shall be configured in such a way that it will enable SAS on a decentralized architecture and on a concept of bay-oriented, distributed intelligence. Functions shall be decentralized, object-oriented and located as close as possible to the process. The main process information of the station shall be stored in distributed databases. The typical

SAS architecture shall be structured in two levels, i.e. in a station and a bay level.

At bay level, the IEDs shall provide all bay level functions regarding control, monitoring and protection, inputs for status indication and outputs for commands. The IEDs should be directly connected to the switchgear without any need for additional interposition or transducers. Each bay control IED shall be independent from each other and its functioning shall not be affected by any fault occurring in any of the other bay control units of the station.

The high-voltage apparatus within the station shall be operated from different places: Remote control centres (MCC/BCC), Local Bay controller IED (in the bays).
Operation shall be possible by only one operator at a time. The operation shall depend on the conditions of other functions, such as interlocking, synchro-check, etc. however shall report all cyclic and digital data to at least 8 masters. The priority shall always be on the lowest enabled control level.

Errors in Communication:
A significant problem to be overcome in the implementation of communication links is the possibility of electromagnetic interference. The low voltage levels that are used on most types of communication link may be prone to interference as a result. Careful design of the interfaces between the devices used and the communication bus, involving the use of opto-couplers is required to minimise the risk. Care over the arrangement of the communication cables is also required. It may also help to use a communication protocol that incorporates a means of error detection/correction. While it may not be possible to correct all errors, detection offers the opportunity to request re-transmission of the message, and also for statistics to be gathered on error rates on various parts of the system. An unusually high error rate on a part of the communication system can be flagged to maintenance crews for investigation.

Breaker Control Philosophy:
The data exchange with the Data Concentrator with bay level electronic device shall take place via the inter-bay bus. Capability to control, monitor and protect each individual bay from the respective bay level equipment in case of maintenance of Remote/ Local Work Station or if the communication to a particular bay fails should be provided. The Bay Units shall be connected directly to the inter bay -bus independent of each other and its functioning shall not be affected by any fault occurring i n any of the Bay units either in its own bay or other Bay units pertaining to other bays of the station. Clear control priorities shall prevent initiation of operation of a single switch at the same time from more than one of the various control levels i.e. Bay level & station level and there shall be interlock between various control & protection level. The priority shall always be with the lowest enabled control level. Normal operation shall be thru Remote/Local Workstation till the time centre SCADA is not in operation however failure of any equipment shall automatically transfer the control to lower level.

BKR Control From	BKR L/R	CB L/R	BCU L/R
BKR PANEL	Local		

TNC Switch	Remote	Local	
BCU Local	Remote	Local	Local
SCADA	Remote	Remote	Remote

6. MARKING:

Each Relay shall be legibly and indelibly marked to show the following:

1. Name of the Purchaser : "TPWODL"
2. Name or trade mark of the manufacturer
3. Year of Manufacturing
4. Certificate mark

7. TESTS:

All routine, acceptance & type test shall be carried out in accordance with the relevant IS/IEC. All routine, acceptance & type test (if not valid) shall be witnessed by TPWODL authorized representative. All the components shall be type tested with the relevant standard.

The Relay shall comply with following routine, type and acceptance tests as per IS 3231 / 1986 Reaffirmed 1997 and IEC 61850.

A. Type tests: (As per IEC 60255-6)

1. Functional Test (Under normal operating condition)
2. Impulse voltage test
3. High frequency interference test
4. Discharge of static electricity test
5. High energy surge voltages (Surge immunity test)
6. Power system frequency test
7. Power consumption in current circuit
8. Power consumption in auxiliary circuit
9. Dielectric test
10. Radiated radio frequency electromagnetic field immunity test
11. Fast transient disturbance test
12. Vibration response test
13. Shock response test
14. Cold test (storage & operating)
15. Dry heat test (Storage & Operating)
16. Degree of protection IP 54
17. Thermal (short time thermal withstand test)
18. Drop out , pick up , ratio test
19. DC supply interruption
20. AC ripples on DC supply
21. Voltage dips and short interruptions

B. Acceptance test:

1. Operating value test
2. Operating time test
3. Operating Principle Analysis
4. Communication/ SCADA compatibility conformance Test

C. Routine tests:

1. Operating value test
2. Operating time test
3. Communication/ SCADA compatibility conformance Test
4. Functionality Test

8. TESTING FACILITIES:

a. The Bidder must clearly indicate what testing facilities are available in the works of the manufacturer and whether the facilities, are adequate to carry out all the routine as well as type tests. These facilities should be made available to Purchaser's Engineers is deputed to carry out or witness the tests. If any tests cannot be carried out at the manufacturer's works, the reasons should be clearly stated in the tender.

b. The Bidder shall furnish detailed type test reports of the offered Relay as per clause-7 of this specification. All the above Type Tests shall be carried out at laboratories (ERDA/CPRI).

9. DRAWINGS:

Following drawings and documents shall be prepared based on Purchaser's specifications and statutory requirements and shall be submitted with the bid:

S.No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	GA Drawing	√		√
3	Installation Instruction/Manual		√	√
4	QA & QC Plan	√	√	√
5	Test Certificates	√	√	√

After the award of the contract, four (4) copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval within 08 days. Bidder shall be subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser
All the documents & drawings shall be in English language.

Instruction/Manuals: Bidder shall furnish softcopy and three (3) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices if any.

10. TEST CERTIFICATES:

1. The test shall be carried out as per the IS before dispatch and the test certificates shall be furnished for approval.
2. Copies of type test certificates of identical materials for each type with dimensional drawings shall invariably accompany the tender.
3. The type test validity shall be in accordance with CEA guidelines, May-2020.

11. SAMPLES:

Bidder shall send one sample relay for TPWODL approval after electrical test at TPWODL premises. During testing OEM engineer shall be present to resolve the query.

12. PACKING:

Each relay must be packed as per industry standard to maintain its healthiness.

13. PRE-DESPATCH INSPECTION:

Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the Purchaser.
Following documents shall be sent along with material

a) Test reports
b) MDCC issued by Purchaser

c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)

14. INSPECTION AFTER RECEIPT AT STORES:

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection.

15. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning. Bidder shall be liable to undertake to replace/rectify such defects at his own costs, within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

Latent defect clause: Bidder shall be responsible for free replacement for another 3 years period from the end of guarantee period for any latent defect if noticed or reported by the company. In case failure of IEDs during warranty period exceeds 20% of total relays of PO , this will be termed as latent defect and free replacement of all IEDs of the PO will be required without any cost implication to TPWODL

16. QUALITY CONTROL:

The bidder shall submit with the offer Quality Assurance Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

17. TRAINING:

BA shall provide training of IED functionalities, 61850 configuration, relay parameterization to owners engineers- 10 persons, 3 days at the location decided by TPWODL without any extra charges. Venue of the training shall be either bidder works or TPWODL office as per the decision of TPWODL.

Training shall cover following aspects but not limited to only these topics:

Engineering configuration of IED s per IEC 61850, interfacing with relay software, parameterisation, relay setting calculation, Project file preparation uploading/downloading of project file, downloading FDR, protection function its significance and operation, GOOSE, interoperability Data set preparation, secondary injection testing via computerized IED testing kit, Simulation of protection function and BI/BO through software/Relay HMI etc.

18. GUARANTEED TECHNICAL PARTICULARS:

GTP FOR HV FEEDER NON-DIRECTIONAL OVER-CURRENT & EARTH FAULT PROTECTION RELAY

Particulars	Requirement	
Protection Elements	3 O/C + 1 E/F + Two Stages of High set for both O/C & E/F separately + UV & OV, Circuit breaker failure (CBF) and Auto-Reclosure (79). Earth fault shall be calculated one considering phase coils in protection relay.	
CT Secondary input current to relay	Selection for 1 A / 5 A through software & shall be possible at site	
Operating Characteristics selectable	8. IDMT IEC – 3 Sec. 9. IDMT - 1.3 sec. 10. IEC Very Inverse 11. IEC Extremely Inverse 12. IEC Definite time 13. IEC User defined inverse 14. IEC Long time inverse	
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance	
IDMT O/C Plug setting	5 % to 200% in steps of 1%	
IDMT E/F Plug setting	5 % to 200 % in steps of 1 %	
High Set O/C setting	10 % to 2000 % in steps of 1 % (20 times)	
High Set E/F setting	10 % to 2000 % in steps of 1 % (20 times)	
Time multiplier setting for O/C & E/F for IDMT	0.02 to 1.0 in steps of 0.01	

Time delay for High set O/C & E/F	0 sec to 10 sec in steps of 0.01 sec	
Memory storage for fault information	Storing of latest 500 events with date & time stamping and storage of latest 10 fault records, fault amplitude , type of fault, faulty phase with FIFO feature (available on display & shall be retrievable through software in standard CFG format). Waveform capturable from both relay start & relay trip shall be configurable. Relay Shall have inbuilt battery back-up of at least 12 Hrs.	
Broken Conductor Protection	The relay shall be capable of Broken Conductor Protection. Setting range should be I2/I1 from 0.5 to 1.0	
Negative Phase Sequence Protection.	The relay shall be capable of Negative Phase Sequence Protection.	
Over-voltage & Under-voltage protection	Relay shall comprise of two stage of Over-voltage protection and two stage Under-voltage protection. Single phase to ground PT voltage shall be 63.5V	
*Neutral displacement protection (NDR)	Separate voltage coil (low voltage) to be considered in protection relay (Note: This one is to be considered only for capacitor bank CRP).	
*Neutral unbalance protection	Separate current coil (low/sensitive currents) to be considered in protection relay. (Note: This one is to be considered only for capacitor bank CRP).	
Pre-Logic	User programmable facility to achieve customized functions, create logics with external information through DI/DO etc. TPWODL approved configuration shall be supplied as a pre-configured relay.	
Configuration Method	Relay shall be configurable from HMI as well as software through Laptop.	
Relay Hardware Requirement	1. Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatically conditions. 2. All Relay electronic cards shall have harsh environment conformal coatings.	
Monitoring on HMI	1. RMS Current, Voltage (Primary & Secondary) 2. Active Power 3. Reactive Power 4. Power frequency 5. Trip Circuit Monitoring Feature (TCS)	

Mounting	1. Relay should be flush mounted with preferably DRAW OUT type model with CT shorting facility of make before break type. OR 2. Flush Mounted with fixed type connections shall also be Considered. 3. All relay connections shall be fixed screw type terminals with adequate spacing on back side. 4. Galvanic isolation between field connection & relay hardware.	
LED indications	7 programmable LEDs & 1 LED for healthy indication. Colour of LED 01- Power ON – Green colour 02- Pick up – Yellow colour 03 – L1 – Red colour 04 – L2– Red colour 05 – L3– Red colour 06 – E/F– Red colour 07 – High set– Red colour	
Push buttons	Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.	
Output contacts	The relay shall have 12 no's potential free and heavy duty programmable contacts. Min 12 no's relay output contacts shall be provided for specific function outputs for alarm, trip & trip circuit supervision. All output contacts should be freely programmable. Power contact should be capable of braking trip coil current.	
Contact rating	Continuous carry -5A, Make & carry for 0.2 sec-30A	
Input contacts	The relay shall have 19 no's of binary input contacts with pickup value 80% of input voltage. Binary inputs pickup should be only on DC voltages & not on AC voltages.	
Self-diagnosis feature	Relay should have self-diagnosis for its healthiness of functioning & should show indication in case of its failure. The relay shall have continuous automatic self-monitoring and alarming facilities. The above feature shall not affect the relay availability i.e. when an actual fault occurs in the system during the checking cycle, the above cycle shall be immediately interrupted and the relay shall check and respond to the system fault. The system shall have the following visual indications for supervision of each command channel.	

Password protection	The relay should have provision password protection for the applied settings	
Selectivity of primary CT current	The relay should have facility to select the primary CT current from 50A to 2000A in steps of 50A. The relay should display the CT primary current.	
Operational indicator	LED	
IS reference	IEC 61850, IEC 60255, IS 3231 amended up to date	
LCD Display	Relay shall have minimum 4 line LCD backlit display	
Features	Minimum 2 setting groups	
Disturbances recorder	The DR shall capture waveforms of analogue channels, and all the DI channels & the DO channels. It shall be possible to configure and capture in DR, all the internal functions like overcurrent start etc. for better analysis of the fault information. It shall have a minimum storage of 10 records of 1 sec each. It shall have facility to record information prior to fault incidence with a pre-trigger time setting of 25 % (programmable).	
Communication protocol	Numerical relays shall have a data port for local access using Hand-held device / Notebook PC (with software). All the numerical relays shall have common software. Each relay shall have IEC 61850 port which can be used for SCADA applications and relay networking for downloading DR waveforms. The relay communication protocol used shall support time stamping and waveform file transfer. Details of Numerical relay communication ports are as follows. Front: Ethernet port Rear: IEC 61850 (for integration of relays with SCADA and accessing DR from remote through Tata Power automation WAN) SNTP protocol support (from SCADA system). Parallel Redundancy Protocol (PRP) / Rapid Spanning Tree Protocol (RSTP) feature will provided as default with dual RJ45 or dual FO port.	
Pulse Sampling Rate	Relay shall have the Scan rate of sampling each of the analog channels having the fundamental frequency of 50HZ in the order of 1000Hz or better sampling.	
Special Requirement	One complete set of Relay configuration tool (Laptop, communication cable, Moxa etc) to be supplied for every 30 no's lot of Relays, and pre-configured relay software along with all device configuration software to be pre- installed.	

BCPU FUNCTIONALITY		
Bay Control Elements	Circuit breaker control function should have open & close command of CB as well as status. Compatible with L/R.	
Response Time	Signal type - Response time to/from HMI Digital Input - 1 Sec Analogue Input - 1 Sec Digital output - 0.75 Sec	
Time Synchronization	The time synchronization of BCPU shall be in line with central SCADA master station (FEP) via data concentrator placed at substation.	
Interlock Function	All bay level interlocks are to be incorporated in the Bay level unit so as to permit control from the Bay level unit/ local bay mimic panel, with all bay interlocks in place, during maintenance and commissioning or in case of contingencies.	
Sequence of event	BCPU shall be capable of handling 2000 events and buffer will be on FIFO model.	
Contact Bouncing	The inputs shall be acquired by exception with 1 ms resolution. Contact bouncing in inputs shall not be assumed as change of state.	

Name & Signature of Bidder with seal

19. SCHEDULE OF DEVITAIONS:

The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the purchaser's specifications.

SCHEDULE OF DEVIATIONS:
(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company

Name & Signature of Bidder with seal

STANDARAD TECHNICAL SPECIFICATION

For

TWO WINDING TRANSFORMER DIFFERENTIAL PROTECTION RELAY WITH INTIGRATED STANDBY EARTH FAULT RELAY

DETAILS OF DOCUMENT REVISION:					
Rev. No.	**Rev. Date**	**Changes Made**	**Details of document update**	**Updated By**	**Approved By**
R1	14/03/2022	Updated	Updated as per TPWODL requirements	KGR	VBN
R2	11/8/2023	Updated	Updated as per TPWODL requirements	KGR	VBN

CONTENTS

1. SCOPE:

The scope of this document is to give design and constructional features, inspection, supply, loading, forwarding and unloading of Two winding Transformer Differential Protection Relay with integrated Standby Earth Fault Relay to be used in TPWODL, Odisha distribution network.

2. APPLICABLE STANDARDS:

Except when they conflict with the specific requirements of this specification, the Relays at various sub-units/components mounted on the panels shall conform to the latest revisions of the following standards:

Sr No	Standard	Description
1	IS 3231 / 1986 Reaffirmed 1997	Electrical relays for power system protection
2	IEC 60255 amended up to date	Numerical biased protection relay
3	IEC 61850	Communication Protocol

3. CLIMATIC CONDITIONS:

The service conditions shall be as follows:

[a] Maximum altitude above sea level	: 1000 m
[b] Maximum ambient temperature	: 50 ° C
[c] Maximum daily average ambient air temperature	: 40 ° C
[d] Minimum ambient air temperature	: -5° C
[e] Maximum temperature attainable by an object exposed to the sun	: 60 ° C
[f] Maximum yearly weighted average ambient temperature	: 32° C
[g] Maximum relative humidity	: 100%
[h] Average no. of rainy days in a year	: 120 days
[i] Average annual rainfall	: 150 cm
[j] Maximum wind pressure	: 260 Kg/Sq.m.
[k] Average number of thunderstorm days per annum	: 70

Environmentally, the region where the equipment will be installed includes coastal areas, subject to high relative humidity, which can give rise to condensation.
Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for Relays.
Therefore, material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive, tropical and humid coastal atmosphere.

4. SYSTEM CONDITION:

PARTICULARS	DESCRIPTION
Frequency	50 Hz (±3%)
Nominal System Voltage	33 KV / 11 KV
Maximum System Voltage	36 KV / 12 KV
Number of phases	Three
Neutral Earthing Arrangement	Solidly Grounded

5. GENERAL TECHNICAL REQUIREMENTS:

PARTICULARS	REQUIREMENT
Elements	Two winding Transformer Differential Protection Relay with Integrated Standby E/F Relay. Earth fault shall be calculated one considering phase coils in protection relay. Separate current coil (low/sensitive currents) to be considered in protection relay for REF protection.
CT Secondary input current to relay	Selection for 1 A / 5 A through software & shall be possible at site
Operating Characteristics selectable for standby E/F protection	1. IDMT IEC – 3 Sec. 2. IDMT – 1.3 sec. 3. IEC Very Inverse. 4. Sensitive earth fault protection with 1% setting of CT ratio.
Differential Protection Characteristics	1. Low impedance differential protection with two slopes. 2. Low impedance REF protection.
Differential Protection Features	1. Second harmonic restraint 2. Fifth Harmonic restraint 3. Cross blocking feature 4. Zero sequence filtering 5. Compensation for different vector groups, transformation ratio and different CT ratio shall be selectable.
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance
Memory storage for fault information	Storing of latest 500 events with date & time stamping and storage of latest 10 fault records, fault amplitude, type of fault, faulty phase with FIFO feature (available on display & shall be retrievable through software in standard CFG format). Waveform capturable from both relay start & relay trip shall be configurable.

Standby Earth Fault Protection (51NS)	1. Standby Earth protection 51NS should be an integral part of Differential relay. Separate coil to be considered for the same in diff relay. 2. CT ratio for standby EF is should be separately configurable. 3. Setting range from 5% to 100% with IEC normal inverse characteristics.
Pre-Logic	User programmable facility to achieve customized functions, create logics with external information through DI/DO etc. TPWODL approved configuration shall be supplied as a pre-configured relay.
Configuration Method	Relay shall be configurable from HMI as well as software through Laptop.
Relay Hardware Requirement	1. Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatical conditions. 2. Relay electronic cards shall have conformal coating.
Monitoring on HMI	1. RMS Current, Voltage (Primary & Secondary) 2. Active Power 3. Reactive Power 4. Power frequency
Mounting	1. Relay should be flush mounted with preferably DRAW OUT type model with CT shorting facility of make before break type. OR 2. Flush Mounted with fixed type connections shall also be Considered 3. All relay connections shall be fixed screw type terminals with adequate spacing on back side. 4. Galvanic isolation between field connection & relay hardware.
LED indications	7 programmable LEDs & 1 LED for healthy indication. Colour of LED 01 – Power ON – Green colour 02 – Pick up – Yellow colour 03 – L1 – Red colour 04 – L2– Red colour 05 – L3– Red colour 06 – E/F– Red colour 07 – High set– Red colour
Push buttons	Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.
Output contacts	The relay shall have 12 no's potential free and heavy duty programmable contacts. Min 12 no's relay output contacts shall be

	provided for specific function outputs for alarm, trip & trip circuit supervision. All output contacts should be freely programmable. Power contact should be capable of braking trip coil current.
Contact rating	Continuous carry -5A, Make & carry for 0.2 sec-30A
Input contacts	The relay shall have 22 no's of binary input contacts with pickup value 80% of input voltage. Binary inputs pickup should be only on DC voltages & not on AC voltages.
Self diagnosis feature	Relay should have self diagnosis for its healthiness of functioning & should show indication in case of its failure. The relay shall have continuous automatic self-monitoring and alarming facilities. The above feature shall not affect the relay availability i.e. when an actual fault occurs in the system during the checking cycle, the above cycle shall be immediately interrupted and the relay shall check and respond to the system fault. The system shall have the following visual indications for supervision of each command channel.
Password protection	The relay should have provision password protection for the applied settings
Selectivity of primary CT current	The relay should have facility to select the primary CT current from 50A to 2000A in steps of 50A. The relay should display the CT primary current.
Operational indicator	LED
IS reference	IEC 60255 , IEC 61850, IS 3231 amended up to date
LCD Display	Relay shall have minimum 4 line LCD backlit display
Features	Minimum 2 setting groups
Disturbances recorder	The DR shall capture waveforms of analogue channels, and all the DI channels & the DO channels. It shall be possible to configure and capture in DR, all the internal functions like overcurrent start etc. for better analysis of the fault information. It shall have a minimum storage of 10 records of 1 sec each. It shall have facility to record information prior to fault incidence with a pre-trigger time setting of 25 % (programmable).
Communication protocol	Numerical relays shall have a data port for local access using Hand-held device / Notebook PC (with software). All the numerical relays shall have common software. Each relay shall have IEC 61850 port which can be used for SCADA applications and relay networking for downloading DR waveforms. The relay communication protocol used shall support time stamping and waveform file transfer.

	Details of Numerical relay communication ports are as follows. Front: Ethernet port Rear: IEC 61850 (for integration of relays with SCADA and accessing DR from remote through Tata Power automation WAN) SNTP protocol support (from SCADA system).
Special Requirement	One complete set of Relay configuration tool (Laptop, communication cable, Moxa etc) to be supplied for every 30 no's lot of Relays, and pre-configured relay software along with all device configuration software to be pre- installed.

6. MARKING:

Each Relay shall be legibly and indelibly marked to show the following:

1. Name of the Purchaser : "TPWODL"
2. Name or trade mark of the manufacturer
3. Year of Manufacturing
4. Certificate mark

7. TESTS:

All routine, acceptance & type test shall be carried out in accordance with the relevant IS/IEC. All routine, acceptance & type test (if not valid) shall be witnessed by TPWODL authorized representative. All the components shall be type tested with the relevant standard.

The Relay shall comply with following routine, type and acceptance tests as per IS 3231 / 1986 Reaffirmed 1997 and IEC 61850.

A. Type tests: (As per IEC 60255-6)

1. Functional Test (Under normal operating condition)
2. Impulse voltage test
3. High frequency interference test
4. Discharge of static electricity test
5. High energy surge voltages (Surge immunity test)
6. Power system frequency test
7. Power consumption in current circuit
8. Power consumption in auxiliary circuit
9. Dielectric test
10. Radiated radio frequency electromagnetic field immunity test
11. Fast transient disturbance test
12. Vibration response test
13. Shock response test

14. Cold test (storage & operating)
15. Dry heat test (Storage & Operating)
16. Degree of protection IP 54
17. Thermal (short time thermal withstand test)
18. Drop out , pick up , ratio test
19. DC supply interruption
20. AC ripples on DC supply
21. Voltage dips and short interruptions

B. Acceptance test:

1. Operating value test
2. Operating time test
3. Operating Principle Analysis
4. Communication/ SCADA compatibility conformance Test
5. Functionality Test

C. Routine tests:

1. Operating value test
2. Operating time test
3. Communication/ SCADA compatibility conformance Test

8. TESTING FACILITIES:

a. The Bidder must clearly indicate what testing facilities are available in the works of the manufacturer and whether the facilities, are adequate to carry out all the routine as well as type tests. These facilities should be made available to Purchaser's Engineers is deputed to carry out or witness the tests. If any tests cannot be carried out at the manufacturer's works, the reasons should be clearly stated in the tender.

b. The Bidder shall furnish detailed type test reports of the offered Relay as per clause-7 of this specification. All the above Type Tests shall be carried out at laboratories (ERDA/CPRI).

9. DRAWINGS:

Following drawings and documents shall be prepared based on Purchaser's specifications and statutory requirements and shall be submitted with the bid:

S.No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√

2	GA Drawing	√		√
3	Installation Instruction/Manual		√	√
4	QA & QC Plan	√	√	√
5	Test Certificates	√	√	√

After the award of the contract, four (4) copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval within 08 days. Bidder shall be subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser
All the documents & drawings shall be in English language.

Instruction/Manuals: Bidder shall furnish softcopy and three (3) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices if any.

10. TEST CERTIFICATES:

1. The test shall be carried out as per the IS before dispatch and the test certificates shall be furnished for approval.
2. Copies of type test certificates of identical materials for each type with dimensional drawings shall invariably accompany the tender.
3. The type test validity shall be in accordance with CEA guidelines, May-2020.

11. SAMPLES:

Bidder shall send one sample relay for TPWODL approval after electrical test at TPWODL premises. During testing OEM engineer shall be present to resolve the query.

12. PACKING:

Each relay must be packed as per industry standard to maintain its healthiness.

13. PRE-DESPATCH INSPECTION:

Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or its authorized representatives shall not relieve the bidder of

his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the Purchaser. Following documents shall be sent along with material

a) Test reports
b) MDCC issued by Purchaser
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)

14. INSPECTION AFTER RECEIPT AT STORES:

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection.

15. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 48 months from the date of commissioning or 60 months from the date of last supplies made under the contract, whichever is earlier. Bidder shall be liable to undertake to replace/rectify such defects at his own costs, within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the supplier or from the " Security cum Performance Deposit" as the case may be

16. QUALITY CONTROL:

The bidder shall submit with the offer Quality Assurance Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

18. GUARANTEED TECHNICAL PARTICULARS:

GTP FOR HV FEEDER NON-DIRECTIONAL OVER-CURRENT & EARTH FAULT PROTECTION RELAY

PARTICULARS	REQUIREMENT	BIDDERS COMMENT
Elements	Two winding Transformer Differential Protection Relay with Integrated Standby E/F Relay. Earth fault shall be calculated one considering phase coils in protection relay. Separate current coil (low/sensitive currents) to be considered in protection relay for REF protection.	
CT Secondary input current to relay	Selection for 1 A / 5 A through software & shall be possible at site	
Operating Characteristics selectable for standby E/F protection	1. IDMT IEC – 3 Sec. 2. IDMT – 1.3 sec. 3. IEC Very Inverse. 4. Sensitive earth fault protection with 1% setting of CT ratio.	
Differential Protection Characteristics	1. Low impedance differential protection with two slopes. 2. Low impedance REF protection.	
Differential Protection Features	1. Second harmonic restraint 2. Fifth Harmonic restraint 3. Cross blocking feature 4. Zero sequence filtering 5. Compensation for different vector groups, transformation ratio and different CT ratio shall be selectable.	
Auxiliary supply	24 V to 48 V DC +/- 10 % tolerance	
Memory storage for fault information	Storing of latest 500 events with date & time stamping and storage of latest 10 fault records, fault amplitude, type of fault, faulty phase with FIFO feature (available on display & shall be retrievable through software in standard CFG format). Waveform capturable from both relay start & relay trip shall be configurable.	
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Pre-Logic	User programmable facility to achieve customized functions, create logics with external information through DI/DO etc. TPWODL approved configuration shall be supplied as a pre-configured relay.	
Configuration Method	Relay shall be configurable from HMI as well as software through Laptop.	
Relay Hardware Requirement	1. Design ambient temperature for relay shall be 50 ° C and capable of installing at outdoor kiosk for Western Odisha Region climatical conditions. 2. Relay electronic cards shall have conformal coating.	
Monitoring on HMI	1. RMS Current, Voltage (Primary & Secondary) 2. Active Power 3. Reactive Power 4. Power frequency	
Mounting	1. Relay should be flush mounted with preferably DRAW OUT type model with CT shorting facility of make before break type. OR 2. Flush Mounted with fixed type connections shall also be Considered 3. All relay connections shall be fixed screw type terminals with adequate spacing on back side. 4. Galvanic isolation between field connection & relay hardware.	
LED indications	7 programmable LEDs & 1 LED for healthy indication. Colour of LED 01 – Power ON – Green colour 02 – Pick up – Yellow colour 03 – L1 – Red colour 04 – L2– Red colour 05 – L3– Red colour 06 – E/F– Red colour 07 – High set– Red colour	

Push buttons	Reset push button for resetting the relay manually. Functional keys should be available for separate trip command.	
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Operational indicator	LED	
IS reference	IEC 60255 , IEC 61850, IS 3231 amended up to date	
LCD Display	Relay shall have minimum 4 line LCD backlit display	
Features	Minimum 2 setting groups	
Disturbances recorder	The DR shall capture waveforms of analogue channels, and all the DI channels & the DO channels. It shall be possible to configure and capture in DR, all the internal functions like overcurrent start etc. for better analysis of the fault information. It shall have a minimum storage of 10 records of 1 sec each. It shall have facility to record	

	information prior to fault incidence with a pre-trigger time setting of 25 % (programmable).	
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Special Requirement	One complete set of Relay configuration tool (Laptop, communication cable, Moxa etc) to be supplied for every 30 no's lot of Relays, and pre-configured relay software along with all device configuration software to be pre-installed.	

Name & Signature of Bidder with seal

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SCHEDULE OF DEVIATIONS:
(TO BE ENCLOSED WITH TECHNICAL BID)

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S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company

Name & Signature of Bidder with seal

TITLE SHEET.

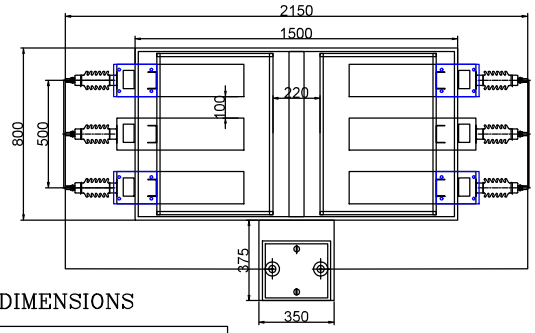
EQUIPMENT:-1984 KVAR, 12.65KV (1500KVAR, 11KV)
HT CAPACITOR BANK OUTDOOR TYPE.

CUSTOMER :- TP WESTERN ODISHA DISTRIBUTION LIMITED, ODISHA.

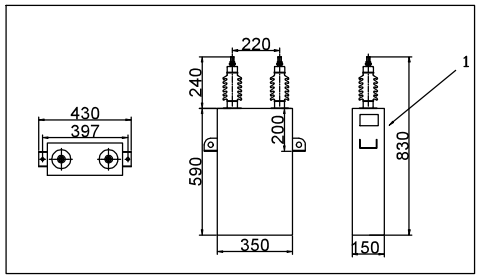
INDEX SHEET.

SR.NO	DESCRIPTION.	SHEET NO	REV.
1.	TITLE SHEET.	1 OF 9	1
2.	INDEX SHEET	2 OF 9	1
3.	HT CAPACITOR & NCT WITH STRUCTURE	3 OF 9	1
4.	11 KV HT REACTOR WITH STRUCTURE	4 OF 9	1
5.	ISOLATOR,LA,VCB & CT,RVT WITH STRUCTURE.	5 OF 9	1
6.	TOTAL LAYOUT SIDE VIEW OF CAPACITOR BANKS.	6 OF 9	1
7.	TOTAL LAYOUT TOP VIEW & SLD OF CAPACITOR BANKS.	7 OF 9	1
8.	FOUNDATION PLANE OF CAPACITOR BANKS.	8 OF 9	1
9.	BILL OF MATERIAL	9 OF 9	1

TOP VIEW

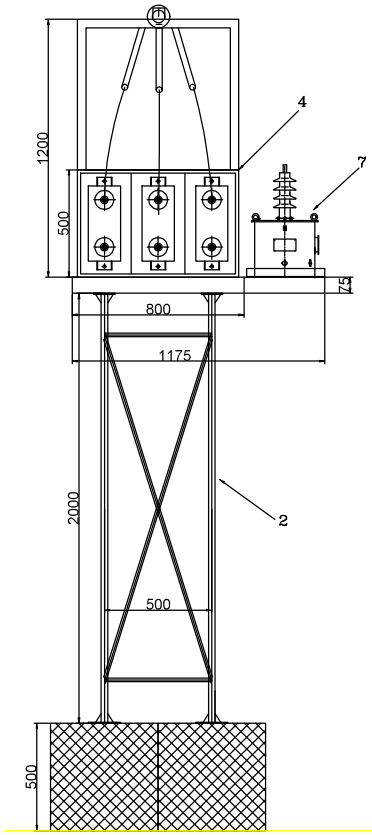


CAPACITOR DIMENSIONS

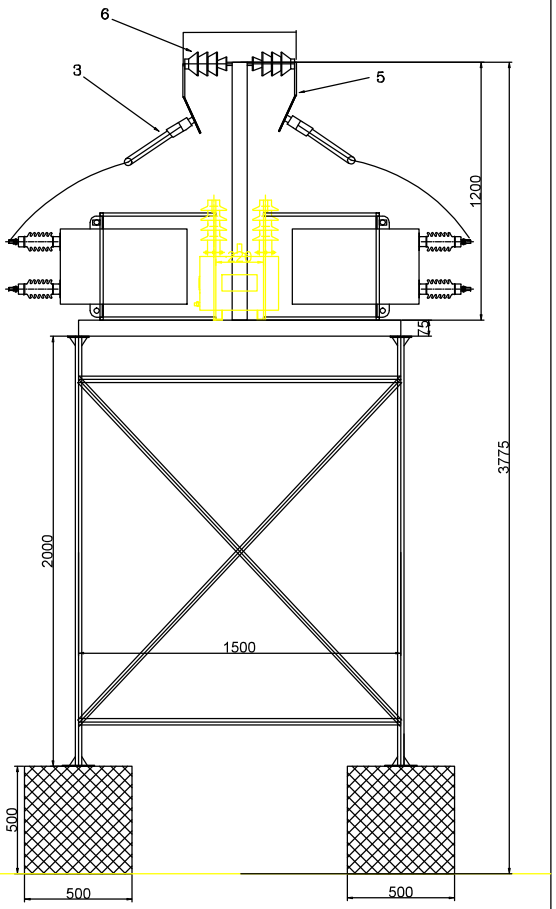


HT CAPACITOR UNIT 330.6 KVAR, 7.3KV KV,50HZ
1PH–6NOS DOUBLE STAR CONNECTED.

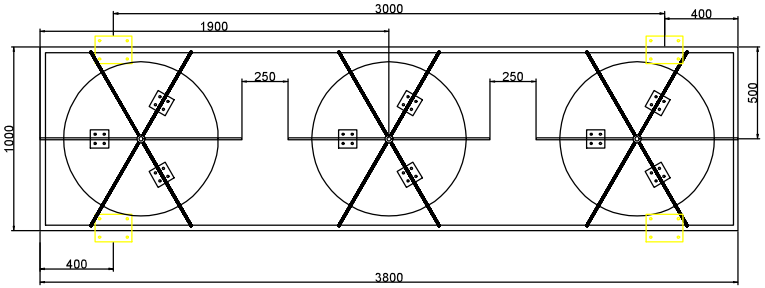
SR.NO.	DESCRIPTION.	QTY.
1	CAPACITOR 330.6 KVAR,7.3KV	6
2	MOUNTING POLE STRUCTURE	1
3	EXPULSION FUSE 55A,	6
4	CAPACITOR MOUNTING STRUCTURE.	1SET
5	AL. BUS BAR.	1set
6	POST INSULATOR 11KV	6
7	11KV NCT OUTDOOR	1



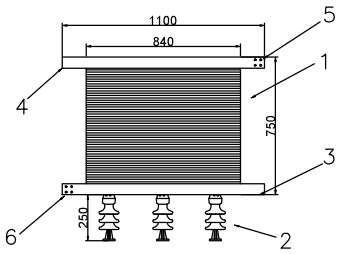
FRONT VIEW



SIDE VIEW

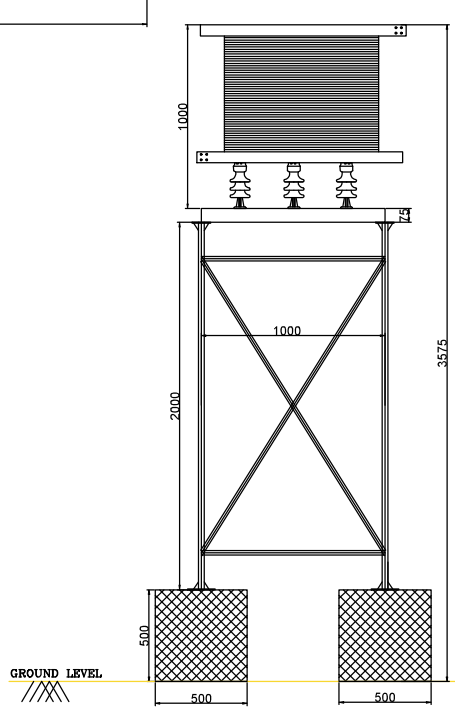


TOP VIEW

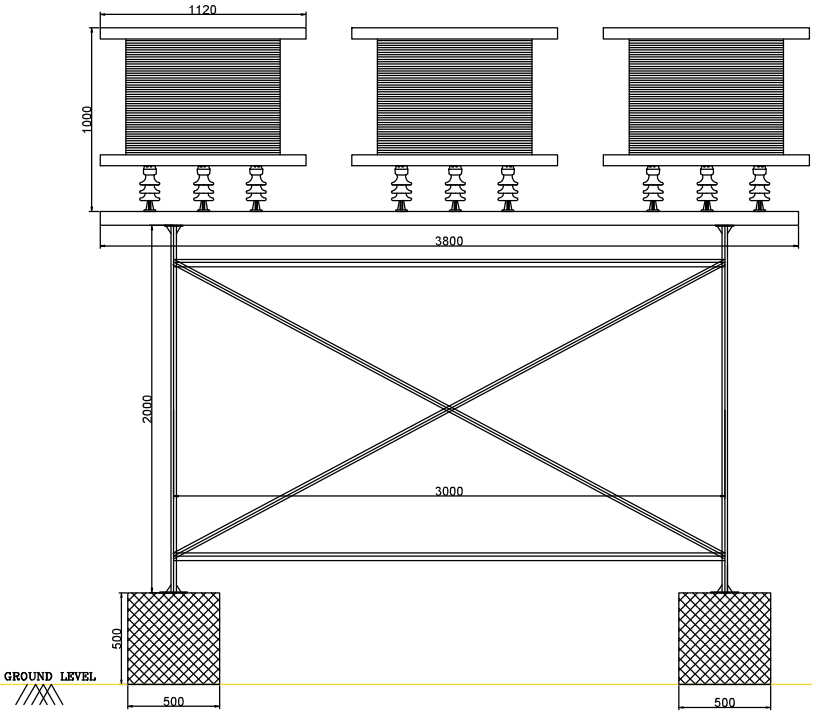


AIR CORE,SERIES REACTOR 11KV
90KVAR/3, 68.46A. AL WOUND 1P

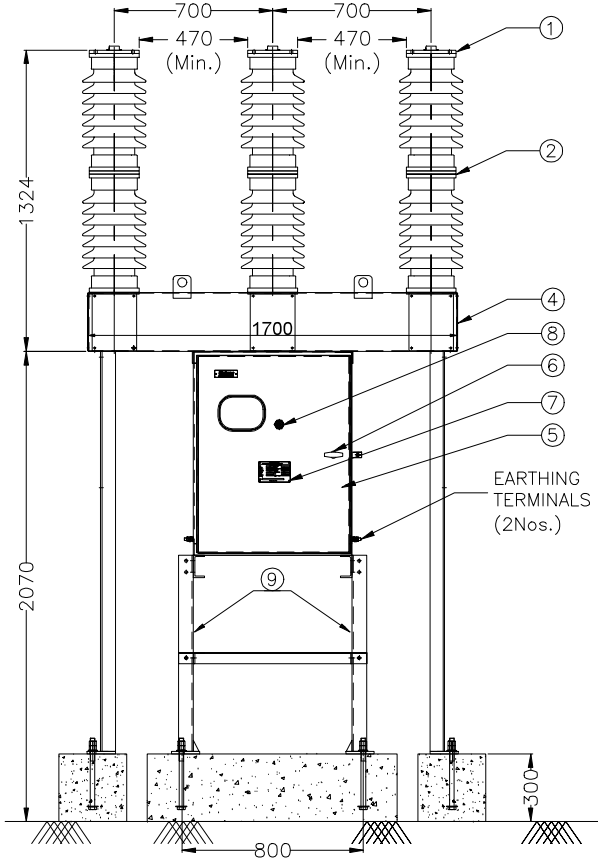
SR NO.	QTY	DESCRIPTION
1	1	AIR CORE 11KV REACTOR
2	3	SUPPORT INSULATOR 11KV
3	1	BOTTOM SPIDER (ALUMINIUM)
4	1	TOP SPIDER (ALUMINIUM)
5	1	INCOMING TERMINAL
6	1	OUTGOING TERMINAL



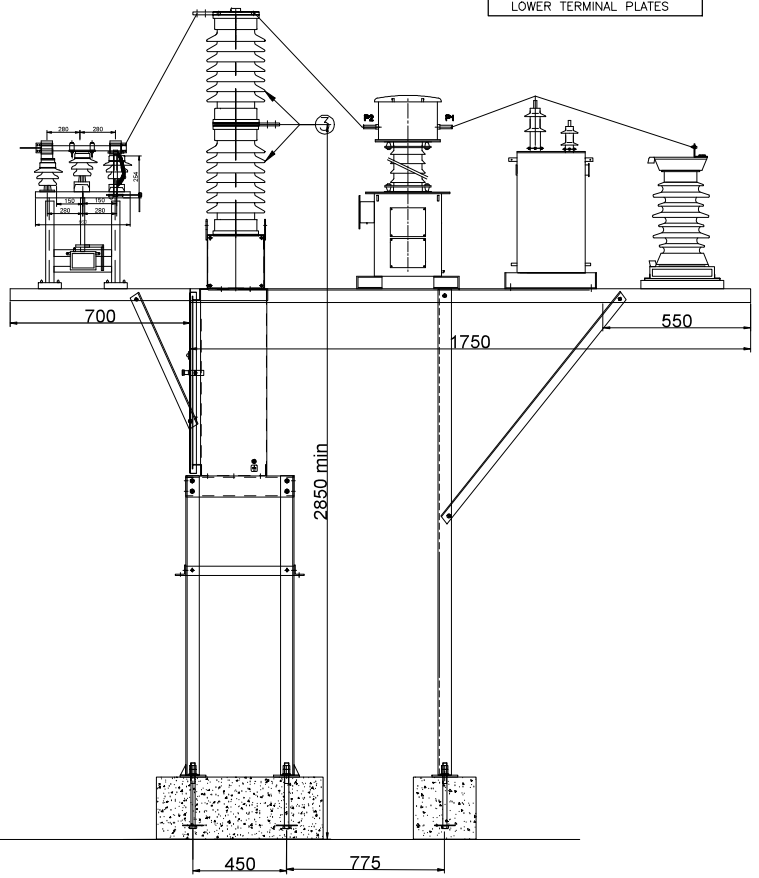
SIDE VIEW



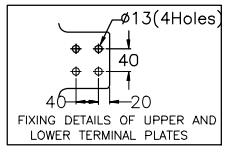
FRONT VIEW



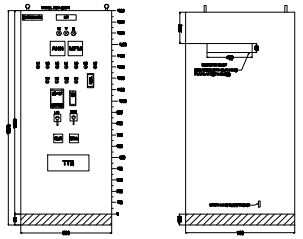
FRONT VIEW



SIDE VIEW

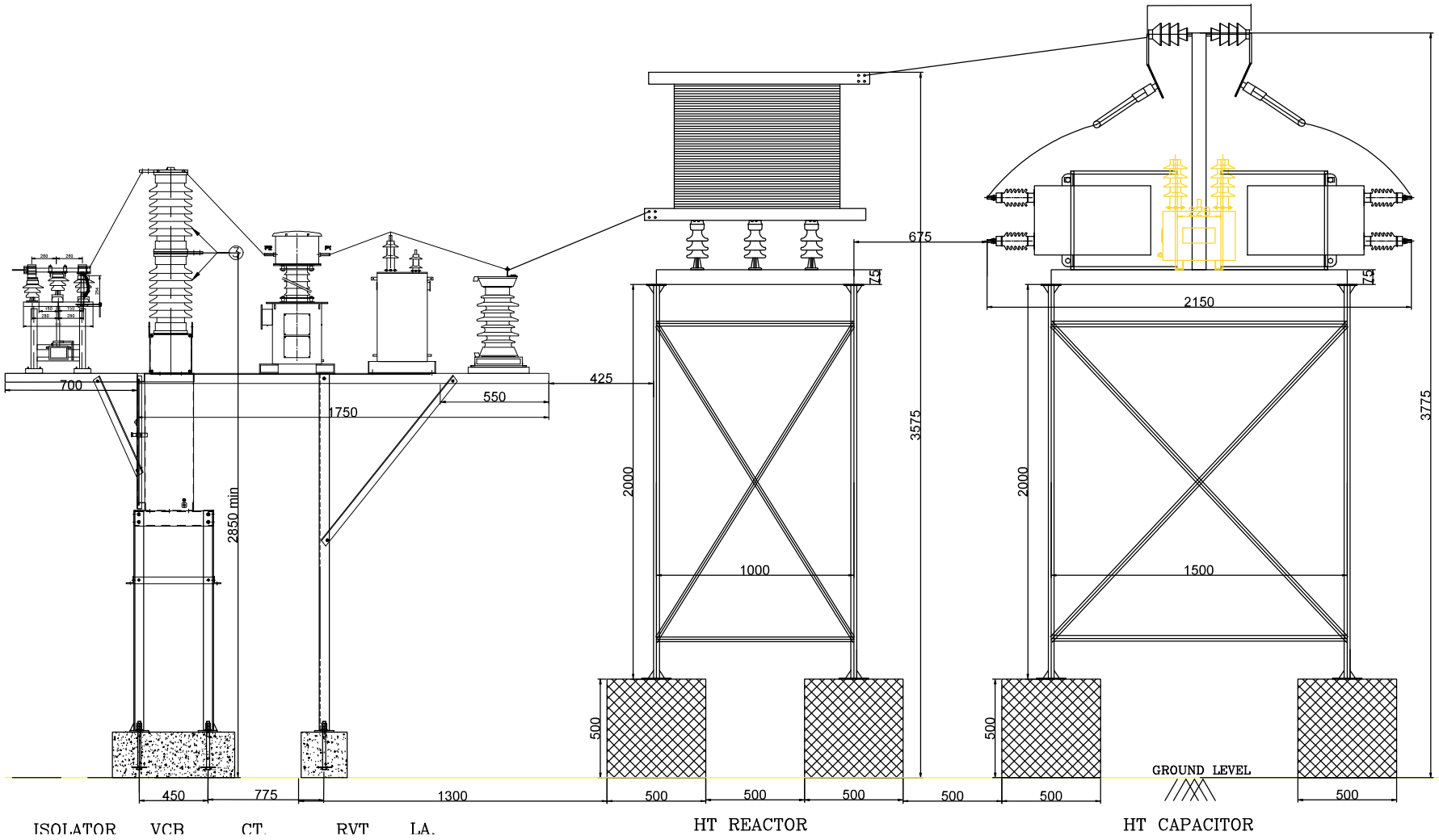


FIXING DETAILS OF UPPER AND LOWER TERMINAL PLATES



CONTROL RELAY PANEL

Item No.	Description	Material & Size	Qty.
1	TOP TERMINAL PAD	AL. ALLOY	3 Nos.
2	BOTTOM TERMINAL PAD	AL. ALLOY	3 Nos.
3	INSULATOR	PORCELAIN	6 Nos.
4	DRIVE CHAMBER	M.S SHEET-2.5mm Thick.	1 No.
5	MECHANISM BOX	M.S SHEET-2.5mm Thick.	1 No.
6	LOCK HANDLE	CAST IRON	1 No.
7	RATING PLATE	S.S	1 No.
8	EMERGENCY PUSH BUTTON	NYLON	1 No.
9	STAND (RH & LH SIDE), ANGLE (M.S HDG)	65 X 65 X 6 mm	4 Nos.
10	SUPPORT FRAM (M.S HDG)	50 X 50 X 6 mm	4 Nos.
11	FOUNDATION BOLT (M.S HDG)	M20X300mm	6 Nos.
12	CT HORIZONTAL ANGLE LEFT & RIGHT (M.S HDG)	50 X 50 X 6 mm	2 Nos.
13	CT VERTICAL ANGLE LEFT & RIGHT (M.S HDG)	65 X 65 X 6 mm	2 Nos.
14	CT &PVT CHANNEL (M.S HDG)	75 X 40 X 3 mm	4 Nos.
15	CT SUPPORT STRUCTURE (M.S HDG)	50 X 50 X 6 mm	2 Nos.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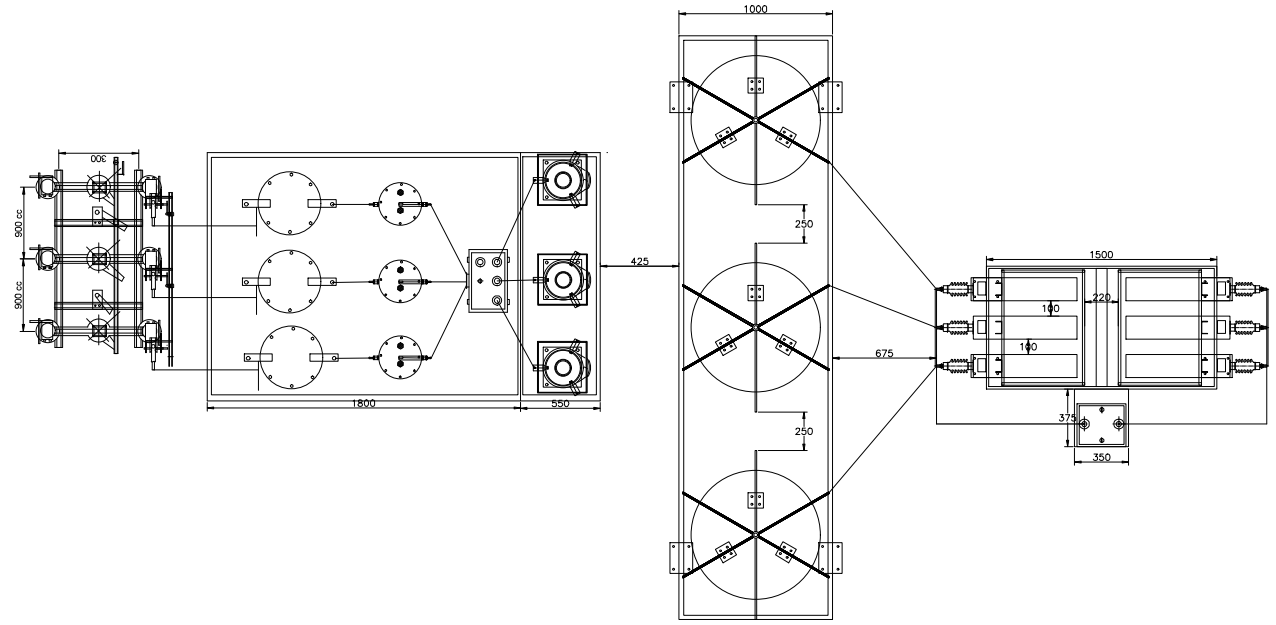
GROUND LEVEL
ISOLATOR
VCB
CT
RVT
LA
HT REACTOR
HT CAPACITOR

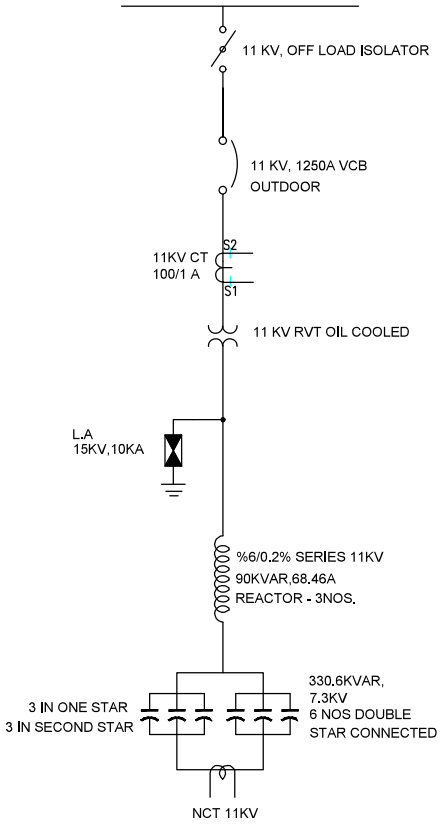
TOP VIEW OF CAPACITOR BANK



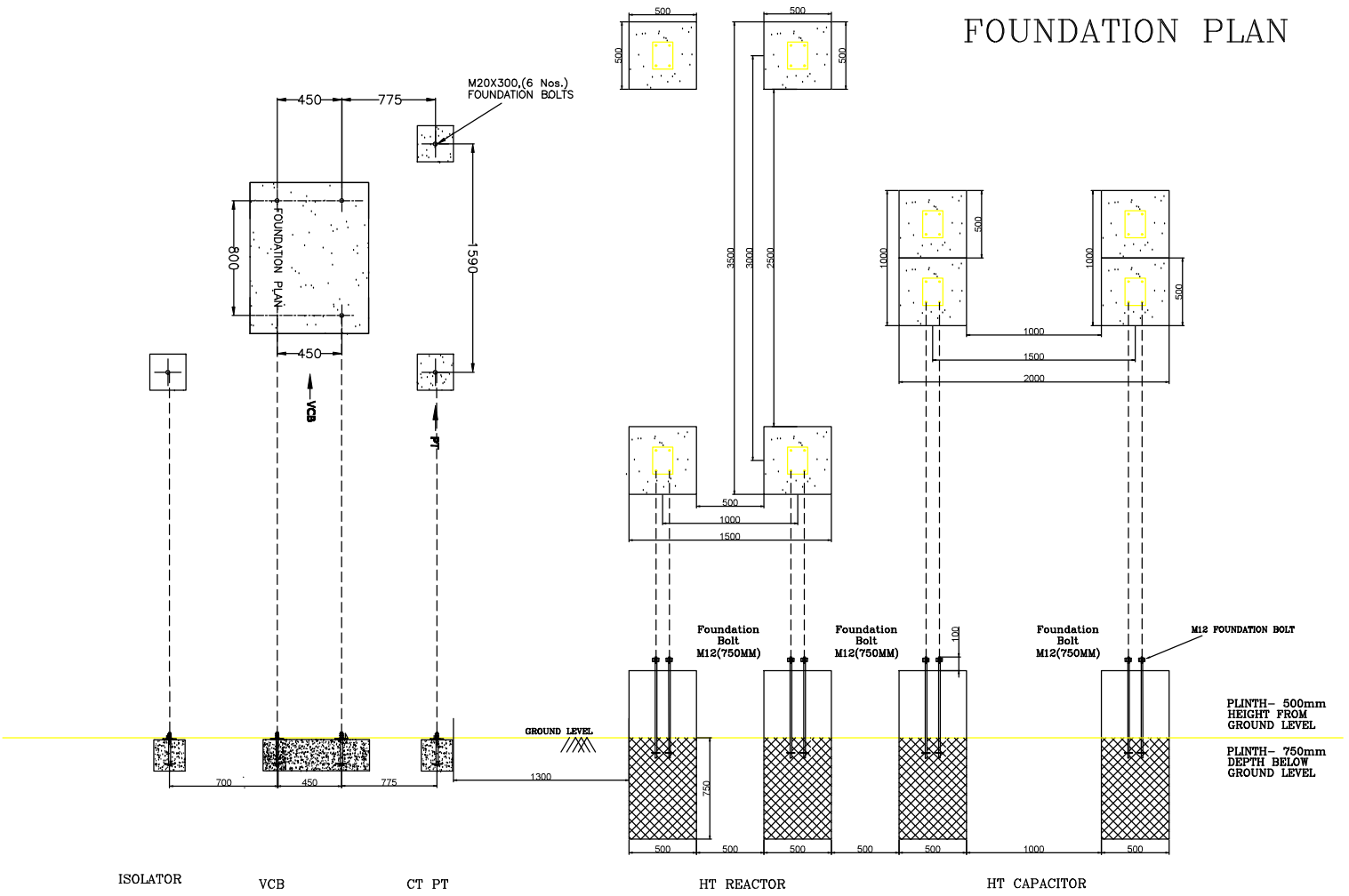
11 KV ISOLATOR 11 KV VCB 11 KV RVT 11 KV CT LIGHTNING ARRESTER HT REACTOR HT CAPACITOR & NCT

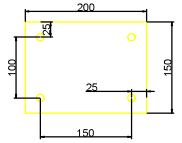
SINGLE LINE DIAGRAM

11KV, 3PHASE, 3 WIRE, 50 HZ
AC INCOMING HT SUPPLY



FOUNDATION PLAN





FOUNDARION PLATE
SCALE 1:4

BILL OF MATERIAL

SR.NO	ITEM	MAKE	QTY
1	HT Capacitor bank 1984kvar,12.65kv (1500kvar,11kv) 330.6kvar,7.3kv,50HZ , 1ph. 6 nos Double star connected.		1 Set
2	Series reactor,11kv, 6%/0.2% ,Air Core Dry type 90Kvar per phase ,68.46A, Al wound. -3Nos		1 Set (3 coil)
3	Lightning arrester outdoor, class-ll, 15kv - 3nos		1 Set
4	OFF load isolator 11kv,630A		1 nos
5	Oil cooled 11 KV neutral current Transformer 5P10		1 nos
6	Oil cooled 11 KV Residual voltage Transformer		1 NOS
7	Expulsion fuse 11kv, 130A		6 nos
8	Vacuum Circuit Breaker		1 NOS
9	Current transformer		3 nos
10	Sets of inter-connecting Al bus bars of suitable size for above items Powder coated Structure height 2 m 1. Capacitor bank & NCT 2. Reactor 3. LA 4. Post insulator 11Kv – 6 Nos 5. Post Insulator solid core 36KV – 9 Nos		1 Set

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1010

Specification Name : ENG-ELC-005- SPECIFICATION FOR 33kV XLPE ARMOURED CABLE- R1

JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	Ranjan Kumar Sahoo	VARUN BHATNAGAR	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPNODL	TPCODL	TPSODL	TPWODL	TPWODL
10-12-2022	10-12-2022	12-12-2022	12-12-2022	13-12-2022	13-12-2022

CONTENTS

1. SCOPE:

This specification covers technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store, performance of 33 kV XLPE armoured cable for trouble free and efficient operations.

Inclusive Sizes: -

3 CORE CABLE	1 CORE CABLE
3CX 35 sq.mm	1C X 300 sq.mm
3CX 50 sq.mm	1C X 400 sq.mm
3CX 70 sq.mm	1C X 630 sq.mm.
3CX 95 sq.mm	1C X 1000 sq.mm.
3C X 300 sq.mm	
3C X 185 sq.mm	
3C X 240 sq.mm	
3C X 400 sq.mm	

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IS 7098 (Part 2)	Cross-linked Polyethylene (XLPE) insulation for Cables
IS 8130	Conductors for insulated electrical cables and flexible cords
IS 10418	Specification for Drums for Electric cables
IEC 60228	Conductor for insulated cables
IS 3975	Low carbon galvanized steel wires, formed wires and tapes forarmoring of cables
IS 5831	Specification for PVC insulation sheath for electric cables
IEC-60811	Test methods for insulations and sheaths of electric cables andcords.
ASTM D 6097	Standard test method for relative resistance to vented water treegrowth in Solid Dielectric insulating materials
ICEA T 31-610	Test method for conducting longitudinal water penetrationresistance tests on blocked conductors
IS 10810	Methods of tests for cables
IS 4905	Methods for random sampling
IS 4984	High density polyethylene pipes for water supply
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds
IS 4826	Specification for hot dipped galvanized coatings on round steel wires
IS 5:2007	Colors for ready mixed paints and enamels

ASTM 2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
IEC 60754	Apparatus and procedure for the measurement of the amount of halogens evolved during the combustion of materials taken fromelectric or optical fiber cable constructions
IEC-60502 (Part-2)	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1.2 kV) up to 30 kV (Um = 36 kV) - Part 2: 22kV Cables for rated voltages from 6 kV (Um = 7.2 kV) up to 30 kV (Um= 36 kV).
IEC 332	Test on electric cables on the fire conditions
ASTM 2843	Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden.On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during thedry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces as mentioned above.

4. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Description	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Voltage grade	33 kV (Earthed system)	
2	Max System voltage	36 kV	
3	Frequency	50 Hz	
4	Variation in frequency	+/- 3%	
5	Conductor	Watertight Stranded Aluminum (compacted circular)	
6	Conductor screen	Semi conducting tape and screen	
7	Insulation	XLPE	
8	Insulation screen	Shall have three layers:	Shall have three layers:
9		a) Bonded Semiconducting, b) Semiconducting water swellable tape, c) Metallic copper tape	a) Bonded Semiconducting b)Semiconducting water swellable tape, c) Metallic copper tape d) Polyester transparent tape over copper screen
10	Core identification strip	Beneath copper screen	NA
11	Inner sheath	Pressure Extruded PVC ST- 2 with PP fillers	Extruded PVC ST-2
12	Armour	GI wire round binded with rubberized cotton binding tape	Aluminum wire binded by rubberized cotton tape
13	Outer sheath	PVC ST-2 FRLSH type of color 'Yellow Lemon shade' code: 355 asper IS 5:2007	

5. GENERAL CONSTRUCTION:

The cross-linked polyethylene insulated (XLPE) 33 kV Cable Dry cured & water cooled shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – 2)/ Relevant IEC/ International standards and its latest amendments.

All material used in the manufacturing of cables shall be new and shall be selected as the best available for the intended use.

The rating factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and different laying configuration of cables shall be provided by the Bidder.

5.1 Conductor

S.No.	Parameter	Requirement						
1	Conductor	As per IS 8130						
2	Class	Class II						
3	Material	Plain Aluminium, grade H2/H4						
4	Shape	Stranded Compacted Circular						
5	Nominal size of conductormm2	95	185	240	300	400	630	1000
6	Min. number of strands	15	30	30	30	53	53	30
7	Max. DC resistance @ 20deg C (Ohm/km)	0.32	0.164	0.125	0.1	0.0778	0.0469	0.0291
8	Conductor Short circuit current rating for 1 second (KA)	9	17.4	22.6	28.3	37.7	59.4	94.3
9	Min. weight of conductor(kg/km/core)	244	481	624	780	1080	1650	2600
10	Longitudinal water sealing ofconductor	a) Non-conductive water swellable yarn/ tape/ combination of both shall be provided in between interstices of the conductor. b) Also, this water swellable tape and yarn shall be compatible to withstand conductor continuous temperature of 90 deg C and short circuit temperature of 250 deg C without any decay. c) It shall not affect the electrical conductivity of the conductor.						

S.No.	Parameter	Requirement
11	Cleanliness and uniformity	a) Before stranding, the cross-section of the Aluminium conductor shall be circular, and shall have uniform smooth surface, free from sharp edges and free from any defects. b) Stranded Conductor shall be free from oil traces & aluminum dust. Conductor (after stranding) shall be super cleaned c) Traces of aluminum dust on conductor or conductor screen shall not be acceptable.
12	Conductor jointing	Not acceptable in any strand or in any conductor after it is stranded.
13	Raw material supplier	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta
14	Diameter of conductor	To be specified by bidder

5.2 Conductor Screen:

S. No.	Parameter	Requirement
1	Material	**1st layer:** Semi-conducting tape **2nd layer:** Semi-conducting compound
2	Configuration	**1st layer:** Semi-conducting tape shall be applied over conductor with nominal thickness of 0.2 mm. **2nd layer:** Semi-conducting compound screen shall be applied through triple extrusion process.
3	Min. thickness	Minimum thickness of semi-conducting compound screen shall be 0.5 mm at any point of measurement.
4	Resistivity	Resistivity of semiconducting conductor screen shall not exceed 1000 Ω-m
5	Uniformity on interfacial region	Interfacial region between conductor screen and insulation shall be uniform. Protrusion/ convolution/ other defects are not acceptable in the region.
6	Raw material supplier	Semiconducting compound shall be procured fromreputed raw material suppliers viz., Dow/Borealis/Hanwa

5.3 Insulation:

S. No.	Parameter	Requirement
1	Material and extrusion process	XLPE insulation shall be applied through CCV/VCVline by triple extrusion process with 'Dry Curing' and 'Water Cooling'.

2	Raw material supplier	a) XLPE compound shall be procured from reputed raw material suppliers viz., Dow/Borealis/Hanwa b) Both XLPE and semi conductive compounds shall be used from same raw material supplier.
3	Thickness and Eccentricity	a) Nominal thickness shall be 8.8 mm. b) Minimum thickness shall be 7.82 mm at any point of measurement. c) Eccentricity of insulation shall not exceed 10%.
4	Thermal stability	The insulation properties shall be stable under thermal conditions arising out of continuous operation at conductor temperature of 90 deg. C rising momentarily to 250 deg. C under short circuit conditions.
5	Cleanliness and uniformity	Interfacial region between insulation and insulation screen shall be uniform. Protrusion/convolution/ other defects are not acceptable. Core shall be free from void and contamination.

5.4 Insulation Screen & Core identification strip:

S. No.	Parameter	Requirement
1	Material	a) **1st layer:** Semi-conducting compound b) **2nd layer**: Semi-conducting water swellable tape c) **3rd layer:** Annealed copper tape

	Configuration	**a) 1st layer: Non-Metallic Part:** Extruded Insulation semiconducting screen shall be bonded type. Resistivity shall not exceed 500 Ω-meter. Surface of insulation screen shall be smooth, free from cavity/ nicks/scratches/ other visible defects. Min. thickness shall be 0.5 mm at any point of measurement. **b) 2nd layer: Water Swellable tape:** Semi-conducting water swellable tapes shall be applied over non-metallic screen. Minimum thickness of water swellable shall be 0.3 mm and minimum overlapping shall be 15%. **Core identification strip:** **For 3 Core Cable** Each of the three core identification strips shall be applied longitudinally beneath copper screen. Width of the colored strip shall be 7-10 mm. R, Y, B
		For 1 Core Cable NA c) **3rd layer: Metallic Part**: Annealed copper tape, helically wound over the water swellable tape with minimum 15% overlap. Minimum thickness shall be 0.045 mm at any point of measurement.
3	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz., Dow/ Borealis/ Hanwa
4	Diameter of cores	To be specified by bidder
5	Weight of cores/km (approx.)	To be specified by bidder
6	Weight of copper tape/km (approx.)	To be specified by bidder

5.5 Fillers:

S. No.	Parameter	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Material	Virgin Polypropylene fibers of natural color	NA
2	Configuration	Virgin Polypropylene fibers shall be tightly filled in empty space asfillers.	

5.6 Inner Sheath:

S. No.	Parameter	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Material	Black colored Polyvinyl chloride (PVC) type ST-2 compound	
2	Configuration	The laid-up cores shall be provided with *pressure extruded* Polyvinyl chloride (PVC) type ST- 2 compound conforming to IS: 5831 with latest amendments. Pressurized extrusion is required to remove any gaps remaining in between the fillers and to make the cable as circular as possible. It shall be applied to fit closely on to the laid-up cores and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.	Extruded PVC ST-2 type conforming to IS: 5831. It shall be applied to fit closely and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.
3	Raw material supplier	PVC compound shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam. PVC compound from cable manufacturer shall be considered only after factory evaluation for the same.	
4	Min. thickness at any point of measurement	**3 CORE CABLE**	

35 sq. mm.	50 sq. mm..	70 sq. Mm.	95 sq.mm.	185 sq.mm	240 sq.mm	300 sq.mm.	400 sq.mm.
0.7mm	0.7mm	0.7mm	0.7 mm	0.7mm	0.7mm	0.7 mm	0.7 mm

1 CORE CABLE			
300 sq.mm.	400 sq.mm.	630 sq.mm.	1000 sq.mm.
0.5mm	0.5 mm	0.6 mm	0.7 mm

5.7 Armour:

S. No.	Parameter	Requirement	
		3 CORE CABLE	**1 CORE CABLE**
1	Material	Low carbon annealed hot dippedgalvanized round steel wires	H4 Grade Aluminium wires
2	Compliance to Standard	It shall comply with the requirements ofIS 3975 along with latest amendments.Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires. Zinc coating shall be 290 g/m2 as per IS 4826:1979.	It shall comply with the requirements of IS 8130 alongwith latest amendments.

3	Nominal Dimensions				**3 Core cable**				
		35 sq.mm	50 sq.mm	70 sq.mm	95 sq.mm	185 sq.mm	240 sqmm	300 sq.mm	400 sq.mm
		3.15 (GIWire	3.15 (GI Wire)	3.15 (GI Wire)	3.15 (GI Wire)	4.00 (GI Wire)	4.00 (GI Wire)	4.00 (GI Wire)	4.00 (GI Wire)

S. No.	Parameter	Requirement					
		3 CORE CABLE			**1 CORE CABLE**		
		1 Core cable					
		300 sq.mm	400 sq.mm	630 sq.mm	1000 sq.mm		
		2 mm (Aluminum wire)	2 mm (Aluminum wire)	2.5 mm (Aluminum wire)	3.15 mm (Aluminum wire)		
4	Approx. Armor Short circuit rating in kA for 1 sec	**3 Core cable**					
		95 sq.mm		185 sq.mm	240 sq.mm	300 sq.mm.	400 sq.mm
		9		20	20	20	20
		1 Core cable					
		400 sq.mm		630 sq.mm	1000 sq.mm		
		20		20	20		
		Fault current for the armour with minimum 90 % coverage.					

5	Jointing in the armour wires	Not acceptable in any armour wire	
6	Laying of armour	The armor wires shall be applied as closely as practicable. Shall not be less than 90% of total circumference.	
7	Binding	The rubberized cotton binding tape shall be applied to bind the armor wires such that it shall not affect the electrical properties of the armor wires and the overall cable.	
8	Weight of armor	To be furnished by Bidder	
9	Raw material supplier	Steel armour shall be procured fromreputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL	Aluminium armour shall be procured from reputed raw material suppliers viz., TATA/ BALCO/ HINDALCO/ NALCO/ Vedanta

5.8 Outer Sheath

S.No.	Parameter	Requirement							
1	Material	Polyvinyl chloride (PVC) ST-2 **FRLSH** type compound with **'lead naphthenate'** additive							
2	Configuration	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with **'lead naphthenate'** additive as 'termite & rodent repellent' applied by extrusion process.							
3		**3 CORE CABLE**							
	Min. Thickness at any point of measurement	35 sq.mm	50 sq.mm	70 sq.mm	95 sq.mm	185 sq.mm	240 sq.mm	300 sq.mm	400 sq.mm
		2.52 mm	2.52 mm	2.68 mm	2.68 mm	3.0 mm	3.0 mm	3.0 mm	3.0 mm
		1 CORE CABLE							
		300 sq. mm.		400 sq.mm		630 sq.mm		1000 sq.mm	
		2.04 mm		2.04 mm		2.36 mm		2.52 mm	
4	Color	Yellow Lemon color, color code: 355 as per IS 5:2007.							
5	Surface uniformity	Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.							
6	Raw material supplier	PVC compound shall be procured from reputed raw materialsuppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam. PVC compound from cable manufacturer shall be considered onlyafter factory evaluation for the same.							

7	Weight of outer sheath/km	To be provided by bidder

5.9 Sealing End Cap:

S.No.	Parameter	Requirement
1	Material	Adhesive coated polyolefin heat shrinkable
2	Configuration	Adhesive coated polyolefin heat shrinkable end cap shall be provided at both ends of the cable.
3	Additional requirements	2 nos. additional cable end caps shall be provided with each drum and placed in the drum.

5.10 Other Requirements:

S.No.	Parameter	Requirement
1	Overall diameter of cable in mm	To be provided by bidder
2	Weight of Overall cable in kg/km	To be provided by bidder

6. MARKING:

Steel drums shall be provided. Drum shall be free from sharp edges and visual defect.

Stencil plate on one flange side of the drum and laminated paper sheet on other side flange of drum.

Cable length on one drum shall be 250 meters max. +/- 5%. As per PO terms

I. Following details shall be provided on flanges of drum:

a) Manufacturer's name
b) Type of Cable
c) Size of Cable
d) Voltage Grade
e) Length of the cable on the drum
f) Direction of the rotation of the drum
g) Gross mass
h) Country of manufacture
i) Year and month of manufacture
j) Purchase Order no.
k) Drum No.

II. Following details shall be embossed on the outer sheath:

At interval of every 1 meter, following details to be embossed:

i) TPWODL/ TPCODL/ TPNODL/ TPSODL

ii) Manufacturer name
iii) Month & Year of Manufacture
iv) Voltage grade
v) Size of the cable
vi) Purchase Order no.
vii) Cable code

Note: - Sequential meter marking shall be printed.

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer:

7.1 ACCEPTANCE TESTS

Test on Conductor

- Conductor resistance test
- Test for non-conductivity of water swellable tape/yarn of conductor
- Visual inspection for conductor cleanliness
- Conductor water penetration test

Test on Conductor Screen

- Thickness of semi-conducting tape over conductor
- Test for conductivity of semi-conducting tape over conductor
- Resistivity of extruded semi-conducting conductor screen
- Thickness of extruded semi-conducting conductor screen

Test on Insulation

- Tensile strength & Elongation at break (before ageing)
- Insulation thickness
- Eccentricity and Ovality of insulation
- Hot set test
- Volume resistivity
- Void & contamination test on core (by silicon oil dip method)
- Surface smoothness of insulation

Test on Insulation Screen

- Resistivity of insulation screen
- Thickness of insulation screen
- Visual inspection for any convolution/ protrusion between conductor screen and XLPE insulation, XLPE insulation and insulation screen
- Thickness & % Overlapping of semi-conducting water swellable tape
- Thickness & % Overlapping of copper tape

Test on Inner Sheath

- PVC thickness
- Color of inner sheath

Test on Armour (For 3 Core)

- Tensile test
- Mass of zinc coating
- Uniformity of zinc coating
- Adhesion test
- Diameter and no. of wires
- Coverage %

Test on Armour (For 1 Core)

- Tensile test
- Wrapping test
- Resistance test
- Diameter and no. of wires
- Coverage %

Test on Outer sheath

- Thickness
- Tensile strength and Elongation at break (before ageing)
- Color of outer sheath
- Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void, nick, cavity

- Presence of lead naphthenate in PVC outer sheath
- Flammability test
- Oxygen index
- Temperature index
- Acid gas generation
- Smoke density

Test on Complete Cable

- Partial discharge test
- High voltage test
- Raw material consumption verification

7.2 ROUTINE TESTS

- Conductor resistance test
- Partial discharge
- High voltage test with power frequency
- Resistance test for Aluminium armour

7.3 TYPE TESTS

Tests on Conductor

- Conductor resistance test
- Conductor water penetration test

Tests on Insulation

- Tensile strength & Elongation at break (before ageing)
- Ageing in air oven
- Tensile strength & Elongation at break
- Tests for thickness of insulation
- Eccentricity and Ovality of insulation
- Hot set test
- Shrinkage test
- Gravimetric test (Water absorption)
- Volume resistivity/ Insulation Resistance

Tests on Inner Sheath

- PVC thickness

Tests on Extruded semi-conducting screen

- Volume resistivity test of conductor screen
- Volume resistivity test of core screen

Tests on Outer Sheath (PVC)

- Flammability test for outer sheath
- Thickness
- Tensile strength and Elongation at break (before ageing)
- Tensile strength and Elongation at break (after ageing)
- Variation due to ageing
- Loss of mass test
- Shrinkage test
- Hot deformation test
- Heat shock test
- Thermal stability test
- Flammability test
- Oxygen index
- Temperature index
- Acid gas generation
- Smoke density

Tests on Armour for 3 Core Cable

- Tensile test
- Torsion test
- Wrapping test
- Resistance test
- Mass of zinc coating
- Uniformity of zinc coating
- Adhesion test

Tests on Armour for 1 Core Cable

- Tensile test
- Torsion test
- Wrapping test
- Resistance test

Tests on complete cable

- Partial discharge test
- Thermal ageing test
- Bending test
- Dielectric power factor test
- High voltage test
- Heat cycle test
- Impulse withstand test

Additional Tests

- Raw material consumption
- Color coding identification over copper screen (for 3C cable)
- Sequential marking check
- Cable drum length verification
- Packaging of cable on cable drum
- Weight of conductor/km
- Diameter of Conductor
- Weight of XLPE insulation plus semiconducting screen (of conductor & insulation)/ km
- Diameter over core
- Weight of core
- Weight of copper tape/km
- Diameter over inner sheath
- Weight of armour/ km
- Cable sealing end caps
- Weight of outer sheath/ km
- Diameter of complete cable

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA as per relevant IS. Type tests should have been conducted during the period not exceeding 10 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPWODL/ TPCODL/ TPNODL/ TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPWODL/ TPCODL/ TPNODL/ TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and theequipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPWODL/ TPCODL/ TPNODL/ TPSODL's representatives at alltimes when the work is in progress. Inspection by the TPWODL/ TPCODL/ TPNODL/ TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL/ TPCODL/ TPNODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPWODL/ TPCODL/ TPNODL/ TPSODL
c) TPWODL/ TPCODL/ TPNODL/ TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPWODL/ TPCODL/ TPNODL/ TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copyof the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an

integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by TATA utilities.

12. PACKING:

a) **Standard length of Cable:** The cable shall be supplied in continuous standard length of 250 (3 cores) & 500 (Single core) running meters with +/- 5% tolerance.

b) **Filling condition:** Drum shall not be overfilled.

c) **Cable drum:** The cable shall be wound on non-returnable steel drums without any extra cost to TPWODL/ TPCODL/ TPNODL/ TPSODL as per IS 10418 and its latest amendments.

d) **Sealing of cable ends:** The ends of the cable shall be sealed by means of heat shrinkable polyolefin end caps. Additional 2 nos. end caps shall be provided with each drum.

e) **Requirements for Cable drums:** Cable drums shall be so constructed as to have required mechanical strength so that the drum flanges and other components do not break during transport, in actual use or in storage. The flanges and the outside surface of the barrel shall be free from protruding materials/projections/ unevenness/ sharp edges that can damage the cable or hands of the operator during rotation of drums.
A metal preservation shall be applied to the entire drum.

f) Bottom end of cable should be clamped on drum by jute or nylon rope.

g) All ferrous metal parts used shall be treated with a suitable rust-free finish or coating to avoid rusting during transit or storage. The drums shall withstand normal handling and transport.

h) **Rail/ Road transportation:** The bidder shall ensure that the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.

i) **Packaging shall be as per climate change perspective. Cable wound on cable drum shall be covered by recyclable PVC sheet for dust proof.**

13. TENDER SAMPLE:

Not Applicable

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
b) Work Experience details
c) Type test certificates.
d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder to submit clause wise compliance.

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1014

Specification Name : Technical Specification for 33kV and 11kV Outdoor Potential Transformer

SWARUP NAYAK	Jyoti Ranjan Sahu	SHANTAPRIYA JENA	JYOTIPRAKASH MOHANTY	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPSODL	TPNODL	TPWODL	TPCODL	TPCODL
11-01-2023	13-01-2023	17-01-2023	17-01-2023	17-01-2023	19-01-2023

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-EHV-1014 **Specification Name:** Technical Specification for 33kV and 11kV Outdoor Potential Transformer

CONTENTS

1 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at store/site of 11KV and 33 KV Voltage transformers units for metering & Protection purpose complete with all accessories for efficient and trouble free operation.

2 APPLICABLE STANDARDS

The equipment covered by this specification shall conform to the requirements stated in latest editions of relevant Indian/ IEC Standards and shall conform to the regulations of local statutory authorities.

IS: 3156-1992 : Specification for Voltage transformer
IS: 5621-1980 : Specification for hollow insulators for use in Electrical equipment
IS: 2099-1986 : Specification for bushings for AC Voltages above 1000 Volts
IS: 335-1983 : Specification for new insulating oil
IS: 8603- 2008 : Dimensions for Porcelain Transformer Bushings for use in Heavily Polluted Atmospheres
IS 11322-1985 : Method for partial discharge measurement in instrument transformers
IEC 60044-2 Ed. 1.0 b : Instrument transformers - Part 2 Inductive voltage transformers

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPSODL/TPWODL service area has **heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph**. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS

SL. NO	TECHNICAL PARAMETER	REQUIREMENTS	
		11 KV	**33KV**
1	Type	Single phase, Outdoor, Oil filled & hermetically sealed	Single phase, Outdoor, Oil filled & hermetically sealed
2	Rated Voltage	12 KV	36 KV
3	Service Voltage	11 KV	33 KV
4	Frequency	50Hz	
5	Rated One minute Power Freq Dry withstand Voltage	28 KV ON SECONDARY :3KV rms	70 KV
6	Rated One minute Power Freq Wet withstand Voltage	rt2 * 28 kVp	rt2 * 70kVp
7	Rated Lightning Impulse withstand voltage	75 KVp	170 KVp
8	Class of Insulation	Class A	
9	Creepage Distance	25KV/mm	
10	Ratio	11000/√3: 110/√3 Volt	33000/√3: 110/√3 Volt
11	Winding Connection for PT	Star-Star	
12	Class of Accuracy	3P/3P/0.2	3P/3P/0.2

13	Burden	100VA	100VA
14	Voltage factor	1.2 Continuous, 1.5 times for 30 Sec	
15	Application	Instrumentation, Metering and Protection	
16	Limit of Voltage (ratio) error	+/- 0.2	
17	Limit of Phase Displacement (Minutes)	+/- 10	
18	Max Temo rise over ambient Temp	55 deg C as per IS 3156 Part-1	
19	Place of installation	Out Door, Structure mounted, Dead Tank	
20	Primary terminal connector	Rigid type suitable for PT Stud to ACSR Panther Conductor	Rigid type suitable for PT Stud to ACSR Zebra Conductor
21	Fixing hole dimension	During Detailed Engineering	
22	Painting	Paint shed: Battleship gray as per IS 5 Paint thickness: 60 micron (minimum)	
23	Tank	Fabrication with GI (3mm)	
24	Secondary terminal box	IP 55	
25	Suitability	Should be suitable for upright mounting on Steel Structure in outdoor Switch yard with matching to TPCODL/TPNODL/TPSODL/TPWODL's Standard base structure	

5.0 GENERAL CONSTRUCTIONAL REQUIREMENTS:

5.1 Potential Transformer

Design and construction of potential transformer shall be sufficient to withstand the thermal and mechanical stresses resulting from the specified short circuit currents. The core lamination shall be of high grade steel or other equivalent alloy. The exciting current shall be as low as possible and the potential transformer shall be capable of maintaining its rated accuracy for burden and saturation limits specified in the technical requirement.

Potential transformers shall be of dead tank design. The material of the tank shall be GI with 3 mm thickness. PT shall be supplied complete with required quantity of insulating oil for installing at site. The insulating oil shall comply to IS: 335. P1 and P2 markings shall be permanently riveted. The alignment and centre line of PT primary terminals shall be correct

so as to avoid bending connections. The primary terminals of PT shall be of silver coated I tinned Copper.

Potential transformers shall be provided with a capacitance test.tap in the HV lead to enable future monitoring of conditions of HV insulation. Suitable earthling arrangement to be provided for the tap point. Potential transformers shall be provided with nameplate showing the particulars and diagram of the connections. PTs shall be provided with suitable lifting arrangement on all the sides .

PT characteristics shall be such as to provide satisfactory protection for burdens ranging from 25% to 100% of rated burden in case of metering PTs and up to the accuracy limit factor/ knee point voltage in case, of protective PTs. PTs shall be complete with accessories such as grounding lugs, filing and drain plugs, oil sight glass (prismatic type), weather proof terminal box, wedge type terminal connector etc.

5.2 Terminal Box

The secondary terminals shall be brought in a weather proof terminal box with IP-55 protection. The terminal box shall be provided with glands suitable for 1100 V grade, steel wire armored and PVC sheathed multicore 6 sq. mm. stranded copper conductor cables. The secondary terminal box shall also include necessary HRC fuses for protecting the secondary circuit. Further for the purpose of fuse supervision on remote panel both terminals of fuse shall be brought to the terminal box. Polarity marks shall be indelibly marked on the primary terminals of the potential transformer and on the secondary lead terminations at the associated terminal block.

5. 3 Bushings:

Bushings shall be made of homogeneous, vitreous, porcelain of high mechanical and dielectric strength. Glazing of porcelain shall be of uniform brown or dark color, with a smooth surface arranged to shed away rain water. Suitable arrangement shall be provided for indicating oil level. The bushings shall be of Oil filled condenser type. Oil filled bushings shall be hermetically sealed to prevent ingress of moisture. Cast metal and caps for bushing shall be of high strength, hot dip galvanized malleable iron. They shall have smooth surface to prevent discharge taking place between the metal parts and porcelain as a result of ionization.

5. 4 Grounding terminals:

Two grounding terminals shall be provided on the tank of potential transformers on opposite sides, for connecting to station earthing grid with suitable marking. Earthing terminals on secondary junction box for secondary winding of PT shall be of link type. The earthing terminals shall be readily accessible and so placed that the earth connection of the voltage transformer is maintained even when the cover or any other movable part is removed. The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. Under no circumstances shall a movable metal part of the enclosure be insulated from the part carrying the earthing terminal when the movable part is in place. The earthing terminal shall be identified by means of the symbol "3⏚ marked in a legible and indelible manner on case or frame to be earthed; adjacent to the terminals. The terminal of high voltage winding intended to be earthed shall be brought out through a bushing, insulated from case or frame to be earthed by a separate connection.

5. 5 Paint:

All interior and exterior of tanks, and other metal parts shall be thoroughly cleaned to remove all rust, corrosion, grease or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating varnish. Steel surfaces exposed to the weather shall be

given a priming coat of zinc chromate and two coats of final paint of shade RAL 7032/ Shade 631 as per IS-5. All metal parts not accessible for painting shall be made of a corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped, or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off or wrinkle or to be removed by abrasion due to normal handling. Bolts and nuts exposed to the atmosphere shall be of galvanized steel.

6.0 NAME PLATE AND MARKING:

Units shall have a name plate clearly visible and effectively secured against removal. Indelibly and distinctly marked with all essential particulars as per relevant standards along with the following.

i) Manufacturer's name and Country
ii) Serial Number and Type designation
iii) Rated primary and secondary voltage
iv) Rated frequency
v) Rated output (burden) and corresponding accuracy
vi) Highest system voltage
vii) Rated insulation level
viii) Rated Voltage factor and corresponding rated time
ix) Number of phases and method of connection
x) Earthed or unearthed
xi) Month and Year of manufacture
xii) Number of relevant standard

7.0 TESTS:

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards. For bushings all the tests as defined in IS 2099 shall be conducted. Following tests shall be necessarily conducted in addition to the tests specified in IS/IEC:

7.1 Routine Test

i) Verification of terminal marking and polarity
ii) Power frequency dry withstand tests on primary windings
iii) Power frequency dry withstand tests on secondary windings
iv) Partial Discharge measurement
v) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class

7.2 Acceptance test:

i) Verification of terminal marking and polarity
ii) Power frequency dry withstand tests on primary windings
iii) Power frequency dry withstand tests on secondary windings
iv) Partial discharge measurement
v) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class

7.3 Type test:

1) Temperature rise test

ii) Lightning impulse test for voltage transformers for service in electrically exposed installation

Ur) High voltage power frequency wet withstand voltage tests on outdoor voltage transformers up to and including 245 kV

iv) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class

7.4 Optional tests:

The following optional tests where applicable, shall be carried out by mutual agreement between the purchaser and bidder.

i) Chopped lighting impulse test as a type test
ii) Short circuit withstand capability test as a type test
iii) Commissioning test on non-earthed voltage transformers of up to and including 36 kV

8.0 TYPE TESTS CERTIFICATES:

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

9.0 PRE-DISPATCH INSPECTION:

Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordancewith the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the Purchaser.

Following documents shall be sent along with material

a) Test reports
b) MDCC issued by the Purchaser
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)

10.0 INSPECTION AFTER RECEIPT AT STORE:

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11.0 GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the

purchaser up to a period of at least 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract whichever is later, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the Company, failing which the purchaser will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

Bidder shall further be responsible for free replacement for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the purchaser.

12.0 PACKING:

Bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit.

13.0 TENDER Sample: NA

14.0 QUALITY CONTROL:

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished.
The Purchaser's engineer or its nominated representative shall have free access to the bidder's/manufacturer's works to carry out inspections.

15.0 MINIMUM TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16.0 MANUFACTURING ACTIVITIES:

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart shall be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

17.0 SPARES, ACCESSORIES & TOOLS: Special Tools (if any) required for maintenance/ Troubleshooting in scope of customer .

18.0 DRAWINGS:

Following drawings & Documents shall be prepared based on the Purchasers specifications and statutory requirements and shall be submitted with the bid:

a. Completely filled-in Technical Parameters.
b. General arrangement drawing of the PT
c. Terminal Block and connection drawing
d. Foundation plan and loading details

e. General description of the equipment and all components with makes and technical requirement
f. Type Test Certificates
g. Experience List
h. Manufacturing schedule and test schedule

Drawings/documents to be submitted after the award of the contract:

S. No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	General Arrangement drawings	√		√
3	Terminal block and Connection drawings	√		√
4	Foundation plan and loading details	√		√
5	Manual/Catalogues		√	
6	Installation/Commissioning Manuals		√	
7	Instructions for use		√	
8	Transport/ Shipping dimension drawing		√	√
9	QA &QC Plan	√	√	√
10	Routine, Acceptance and Type Test Certificates	√	√	√

All the documents & drawings shall be in English language. Supplier shall furnish two softcopies (CD) and four (4) hard copies of nicely bound manuals covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

19. SAMPLE DRAWING

20. GUARANTEED TECHNICAL PARTICULARS

SL No	Description	Units	As specified by the Bidder
1	Application		
2	Rated voltage	KV rms	
3	Service voltage	KV rms	
4	Rated Frequency	Hz	
5	Rated Lightning Impulse withstand voltage	KV peak	
6	Rated One minute power frequency dry		
	a)On Primary	KV rms	
	b)On Secondary	KV rms	

7	Rated One minute power frequency wet	KV Peak			
8	Rated Transformation				
9	Core details		Core-1	Core-2	Core-3
9.1	Rated Output (VA burden)	VA			
9.2	Accuracy Class				
10	Winding connection for PT				
11	Rated Voltage factor and time				
12	Minimum Creepage	mm/ KV			
13	Limit of Voltage (ratio) error				
14	Limit of phase displacement	minutes			
15	Maximum temperature rise over ambient temperature	Deg C			
16	Gauge of the tank	mm			
17	Both terminals of fuse shall be brought to the terminal box.				
18	Total weight of	Kg			
19	Dimensions of	mmXmmXmm			
20	Weight of core and winding of VT	Kg			
21	Resistance of winding at 75°C per phase at HV				
22	Resistance of winding at 75°C per phase at LV				
23	Bushing distance between metal part and earth	mm			
24	Clearance between HV to	mm			
25	Lifting				

21. SCHEDULE OF DEVIATIONS
(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1015

Specification Name : Technical Specification for 33kV and 11kV Outdoor Current Transformer

SWARUP NAYAK	Jyoti Ranjan Sahu	JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPSODL	TPWODL	TPNODL	TPCODL	TPCODL
11-01-2023	13-01-2023	16-01-2023	18-01-2023	21-01-2023	31-01-2023

CONTENTS

1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturers works, packing, forwarding, supply and unloading at store/site of 11KV & 33 KV Outdoor Current Transformer complete with all accessories for efficient and trouble free operation of rating.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with latest revisions of relevant Indian/IEC/other applicable standards shall confirm to the regulations of local statutory authorities.

IS 2705-1992/IEC 60044-1	Specification for Current Transformer
IS 5621-1980	Specification for Hollow insulator for use in Electrical Equipment
IS 2099-1986	Specification of Bushings for AC Voltage above 1000 Volts
IS 335-1983	Specification for new insulation oil
IS 11322-1985	Method for partial discharge measurement in instrument transformer
IS 8603-2008	Dimensions for Porcelain Transformer Bushing for use in heavily polluted atmosphere.

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g

10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS

GENERAL TECHNICAL REQUIREMENTS									
S.	**Description**	**As specified by TPCODL/TPNODL/TPSODL/TPWODL**							
1	Service	**33 KV**				**11 KV**			
2	Rated voltage	36 KV				12 KV			
3	Rated	50 Hz				50 Hz			
4	Rated Lightning	170 KVp				75 KVp			
S	Rated primary	800-400-200 A				800-400-200 A			
6	Rated Power frequency dry	70 kV rms				28 KV rms			
7	Rated Power frequency Wet	70 kV rms				28 KV rms			
8	Transformation Ratio (CT	800-400-200/1-1-1A				800-400-200/1-1-1A			
9	Rated continuous	1.2 times of primary current				1.2 times of primary current			
10	Short time thermal	25 kA for 3 sec				25 kA for 3 sec			
11	Rated dynamic	2.5 times of short time thermal current rating				2.5 times of short time thermal current rating			
12	Core details	Core-1	Core-	Core-		Core-1	Core-2	Core-3	
12.	Accuracy	PS	0.2s	5P20		PS	0.2s	5P20	
12.	Rated burden	---	30VA	30VA		---	30VA	30VA	
12.3	Knee point voltage (Vk) min.	> 500V at 400/1	-- -	---		> 500V at 400/1	-- -	---	
12.4	Resistance of Secondary winding,	<6				<6			

12.5	Maximum Exciting Current mA at Vk/2	<30mA				<30mA			
12.6	Instrument security factor		<5				<5		
13	Tan Delta Value	Shall be within 0.7% for new and shall remain less than 1% for at least 5 years							
14	Limits of Current (ratio) Error and phase displacement for metering purpose	IS Per IS 2705							
15	Limits of Current (ratio) Error and phase displacement for protection core	Ratio error +/-1% and Phase displacement +/-60deg							
16	Limits of Current (ratio) Error for PS class	Ratio error +/- 0.25%							
17	Maximum temperature rise over ambient temperature	55 deg C as per IS 2705-1							
18	Minimum creepage for HT bushing	25 mm/ KV							
19	Gauge of the tank	3 mm							

20	Dimension of CT Base LXB Hole Centre-Centre Distance (mm)	450 X 450	310 X 310
21	Oil Details		
a	BDV of Oil (KV)		
b	Standard of oil		
c	Color of oil		
d	Qty of oil (L)		
22	Bushing details:		
a	Make		
b	IS standards		
c	Total creepage (mm)		

5. GENERAL CONSTRUCTIONS

5.1 CURRENT TRANSFORMER

Design and construction of current transformer shall be sufficient to withstand the thermal and mechanical stresses resulting from the specified short circuit currents. The core lamination shall be of high grade steel or other equivalent alloy. The exciting current shall be as low as possible and the current transformer shall be capable of maintaining its rated accuracy for burden and saturation limits specified in the technical requirement.

Current transformers shall be of dead tank design. The tank material shall be made of GI with 3 mm thickness and painted. The current transfer area of the terminals shall be adequate enough to meet the temperature rise requirements as per IS: 2705. CT shall be supplied complete with required quantity of insulating oil for installing at site. The insulating oil shall comply to IS: 335. P1 and P2 markings shall be permanently riveted. The alignment and center line of CT primary terminals shall be correct so as to avoid bending connections. The primary terminals of CT shall be of silver coated / tinned Copper.

Current transformers shall be provided with a capacitance test tap in the HV lead to enable future monitoring of conditions of HV insulation. Suitable earthing arrangement to be provided for the tap point. Current transformers shall be provided with nameplate showing the particulars and diagram of the connections. CTs shall be provided with suitable lifting arrangement on all the sides.

CT characteristics shall be such as to provide satisfactory protection for burdens ranging from 25% to 100% of rated burden in case of metering CTs and up to the accuracy limit factor/ knee point voltage in case of protective CTs. CTs shall be complete with accessories such as grounding lugs, filing and drain plugs, oil sight glass (prismatic type), weather proof terminal box, wedge type terminal connector etc.

5.2 TERMINAL BOX

The secondary terminals shall be brought in a weather proof terminal box (IP-55). The terminal box shall be provided with glands suitable, steel wire armored and PVC sheathed multicore 6 sq. mm. stranded copper conductor cables. For Tan Delta testing separate terminals shall be provided in the terminal box. The value of Tan Delta test shall be within 0.7% for new CTs and shall remain less than 1% for at least 5 years and if the said criterion is not fulfilled than the Bidder shall be liable to replace the CTs without any additional cost to the purchaser. Polarity marks shall be indelibly marked on the primary terminals of the current transformer and on the secondary lead at the associated terminal block. Suitable facility shall be provided for short circuiting and grounding the CT secondary at the terminal blocks.

5.3 BUSHINGS

Bushings shall be made of homogeneous, vitreous, porcelain of high mechanical and dielectric strength. Glazing of porcelain shall be of uniform brown or dark color, with a smooth surface arranged to shed away rain water. Suitable arrangement shall be provided for indicating oil level. The bushings shall be of Oil filled condenser type. Oil filled bushings shall be hermetically sealed to prevent ingress of moisture. Cast metal and caps for bushing shall be of high strength, hot dip galvanized malleable iron. They shall have smooth surface to prevent discharge taking place between the metal parts and porcelain as a result of ionization.

5.4 GROUNDING TERMINALS

Two grounding terminals shall be provided on the tank of current transformers on opposite sides, for connecting to station earth grid. Earthing terminal shall also be provided in the secondary junction box for earthing of secondary winding of CT. The earthing terminals shall be readily accessible and so placed that the earth connection of the current transformer is maintained even when the cover or any other movable part is removed. The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. Under no circumstances shall a movable metal part of the enclosure be insulated from the part carrying the earthing terminal when the movable part is in place. The earthing terminal shall be identified by means of the symbol " ⏚"marked in a legible and indelible manner on case or frame to be earthed; adjacent to the terminals.

5.5 TERMINAL CONNECTOR

Suitable bimetallic connector in scope of Bidder
ACSR Zebra conductor used for 33KV equipment connection
ACSR Panther conductor used for 11KV equipment connection.

5.6 PAINT

All interior and exterior of tanks, and other metal parts shall be thoroughly cleaned to remove all rust, corrosion, grease or other adhering foreign matter. All steel surfaces in contact with

insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating varnish. Steel surfaces exposed to the weather shall be given a priming coat of zinc chromate and two coats of final paint of shade RAL 7032/ Shade 631 as per 15-5. All metal parts not accessible for painting shall be made of a corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound 'and suitably wrapped, or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale of or wrinkle or to be removed by abrasion due to normal handling. Bolts and nuts exposed to the atmosphere shall be of hot dip galvanized steel.

6. NAME PLATE & MARKING

The equipment shall be provided with durable and legible name plate. A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each current transformer in a visible position and shall carry all the information as specified in the standards. The terminal markings shall also be in line with relevant standards. The letters on the rating plate shall be engraved black on the white/silver background. Fixing screws for outdoor use shall be of stainless steel or any other corrosion resistant metals. The Name plate shall be embossed with "PO no. with date" & "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL".

The following information shall be mentioned on the Name Plate

i) Manufacturer's name and Country
ii) Type designation
iii) Serial number
iv) Month and Year of manufacture
v) Rated primary and secondary current
vi) Rated frequency
vii) Highest system voltage
viii) Rated insulation level
ix) Rated short time thermal current
x) Rated dynamic current
xi) Rated output and corresponding accuracy class
xii) Warrantee/guarantee clause
xiii) PO no. & date
xiv) "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL"
xv) Relevant standards

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components and fittings shall also be type tested as per the relevant standards. For Bushings all the tests as defined in IS 2099-1986 shall be conducted. For current transformers following tests shall be necessarily conducted in addition to the tests specified in IS/IEC:

7.1 ROUTINE TEST

a) Verification of terminal marking and polarity
b) Power frequency dry withstand tests on primary windings
c) Power frequency dry withstand tests on secondary windings

d) Over voltage inter-turn tests
e) Partial discharge measurement
f) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class

Optional tests:
The following optional tests where applicable, shall be carried out by mutual agreement between the purchaser and bidder.
g) Chopped lightning impulse test as a type test.

7.2 ACCEPTANCE TESTS

i) Verification of terminal marking and polarity
ii) Power frequency dry withstand tests on primary windings
iii) Power frequency dry withstand tests on secondary windings
iv) Over voltage inter-tum tests
v) Partial discharge measurement
vi) Determination of errors or others characteristics according to the requirements of the appropriate designation or accuracy class.
vii) Tan Delta test as specified in Clause 4

All acceptance tests shall be witnessed by the Purchaser's or his authorized representative.
The above mentioned test shall be made on the 100% of arresters to be supplied.

7.3 TYPE TEST

a) Short time current tests
b) Temperature rise test ,
c) Lightning impulse test for voltage transformers for service in electrically exposed installation.
d) High voltage power frequency wet withstand voltage tests on outdoor current transformers.
e) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.

8. TYPE TEST CERTIFICATES

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

9. PRE DISPATCH INSPECTION

Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to Purchaser's representatives at all times when the work is in progress. Inspection by the Purchaser or its

authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the Purchaser.

Following documents shall be sent along with material :

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee.! Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORES

The material received at Purchaser store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering.

11. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs within the mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company

12. PACKING

Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit.

13. TENDER SAMPLE

NA

14. QUALITY CONTROL

The bidder shall submit with the offer, quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and after finishing, bought out items and fully assembled component and equipment including

drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The purchaser's engineer or its nominated representative shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

15. MINIMUM TESTING FACILITIES

The Bidder shall have in house testing facilities for carrying out all routine tests and acceptance tests as per relevant international/Indian standards.

16. MANUFACTURING ACTIVITIES

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart shall be in line with the Quality assurance plan submitted with the offer. The bar chart will have to be submitted within 15 days from the release of the order.

17. SPARES, ACCESSORIES AND TOOLS

1) Double compression gland 25mm dia for each CT unit. (1 no's)
2) Suitable size lugs for each CT unit. (10 no's)

18. DRAWINGS AND DOCUMENTS

Following drawings and documents shall be prepared on Purchaser's specifications and statutory requirements and shall be submitted with the bid:

a) Completely filled in Technical Particulars
b) General arrangement drawing of the CT
c) General arrangement drawing of Primary terminal assembly
d) Terminal Block and connection drawing
e) Foundation Plan and loading details
f) General description of the equipment and all components with makes and technical requirement
g) Type Test Certificate.
h) Experience List.
i) Manufacturing schedule and test schedule

Drawings/documents to be submitted after the award of the contract.

S.No.	Description	For Approval	For Review Information	For Final Submission
1	Technical Particulars	✓		✓
2	General Arrangement drawings	✓		✓
3	Terminal block and Connection Drawing	✓		✓

4	General arrangement drawing of Primary terminal assembly	✓		✓
5	Foundation Plan and loading details on Cantilever arrangement of CR	✓		✓
6	Manual/catalogue		✓	
7	Installation/Commissioning Manuals		✓	
8	Instruction for use		✓	
9	Transport I Shipping dimension drawing		✓	
10	QA & QC Plan	✓	✓	✓
11	Routine, Acceptance and Type Test Certificates	✓	✓	✓

All the Documents and Drawings shall be in English Language.
Instruction Manuals: Bidder shall furnish two (2) soft copies and Three (3) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

19. SAMPLE DRAWING

NA

20. GUARANTEED TECHNICAL PARTICULARS

GENERAL TECHNICAL REQUIREMENTS			
S.	Description	11kV	33kV
1	Service		
2	Rated voltage		
3	Rated		
4	Rated Lightning		
S	Rated primary current		
6	Rated Power frequency dry withstand voltage		
7	Rated Power frequency Wet withstand voltage		

8	Transformation Ratio (CT								
9	Rated continuous thermal current								
10	Short time thermal current rating for 1 second								
11	Rated dynamic current								
12	Core details	Core-1	Core-2	Core-3		Core-1	Core-2	Core-3	
12.1	Accuracy class								
12.2	Rated burden								
12.3	Knee point voltage (Vk)								
12.4	Resistance of Secondary winding,								
12.5	Maximum Exciting Current mA at Vk/2								
12.6	Instrument security factor								
13	Tan Delta Value								
14	Limits of Current (ratio) Error and phase displacement for metering purpose								
15	Limits of Current (ratio) Error and phase displacement for protection								

	core (As per IS/IEC)		
16	Limits of Current (ratio) Error for PS class (As per IS IEC)		
17	Maximum temperature rise over ambient temperature		
18	Minimum creepage for HT bushing		
19	Gauge of the tank		
20	Dimension of Tank (mm)		
21	Total Weight of Tank (kg)		
22	Weight of core and winding of CT (Kg)		
22	Bushing Distance between Metal Part and Earth		
23	Clearance Between HV to Earth (mm)		
24	Lifting Attangement		

21. SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature
Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1019

Specification Name : Technical Specification of Center rotating, Double Break Type Isolator - 33KV (1250 Amp) & 11KV (630 Amp)

SATYA PRASAD NAYAK	SHANTAPRIYA JENA	JYOTIPRAKASH MOHANTY	Ranjan Kumar Sahoo	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
18-01-2023	18-01-2023	19-01-2023	19-01-2023	21-01-2023	31-01-2023

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-EHV-1019 **Specification Name:** Technical Specification of Centre rotating, Double Break Type Isolator - 33KV (1250 Amp) & 11KV (630 Amp)

CONTENTS

1. SCOPE

Scope covers design, manufacture, assembly, inspection, testing at manufacturer's works, supply and delivery of 33 kV 1250 & 11 KV 630 A Horizontal Operated, Center rotating, Double Break type gang-operated air-break alternating current Isolator (with and without earth switch), with Insulators, Terminal Connectors, auxiliary contact switches, position indicating device, base frames, operating mechanism box, control cabinet, arcing horns (wherever necessary) etc. and other devices whether specifically mentioned herein or not, but required for efficient and trouble free operation.

2. APPLICABLE STANDARDS

Isolators covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with latest revisions of following relevant Indian Standards and shall conform to the regulations of local statutory authorities:

IS: 9921(Part 1-V)	:	Alternating current Disconnector (Isolators) and Earthing switches for voltages above 1000V
IS: 2544:	:	Porcelain post insulators for systems with nominal voltages greater than 1000V
IS: 2147	:	Degree of protection provided by enclosures for low voltage switchgear and control gear
IS:4691	:	Degree of protection provided by enclosure for rotating electrical machinery
IS: 2629:	:	Recommended practice for hot dip galvanizing of iron & steel
IS: 4759	:	Hot-dip zinc coatings on structural steel and other allied products
IS: 2633	:	Method of testing weight, thickness & uniformity
IS: 1573	:	Electroplated coatings of zinc on iron & steel
IS: 6735	:	Fasteners - Spring lock washers for screws with cylindrical heads
IS: 2016	:	Plain washers
IS 1771	:	Electroplated coatings of silver and silver alloys for general engineering purposes
IEC 62271	:	High voltage switchgear and control gear
IEC 60129	:	Alternating Current Disconnectors and Earthing switches

3. SERVICE CONDITIONS

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GUARANTEED TECHNICAL REQUIREMENTS

The equipment covered in this specification shall meet the technical requirements listed below. The Isolator must be Double Break, center pole rotating type

Sl.No	Type	33KV	11KV
1	Main switch	Double break, Centre post rotating, gang operated	
2	Service	Outdoor	
3	Applicable standard	IS : 9921 / IEC-129/IEC-62271-102	
4	Pole	3 pole gang operator	
5	Rated voltage nominal/ Maximum	33/36 kV	11/12 kV
6	Rated Frequency	50 Hz	
7	System earthing	Solidly earthed	
8	Temperature rise	As per relevant IS/IEC publication	

9	Insulation level impulse with stand voltage		
	a) Across Isolating distance	195 kVpeak	85 kVpeak
	b) To earth & between poles	170 kVpeak	75 kVpeak
10	1 minute power frequency with stand voltage		
	a) Across Isolating distance	80 kVpeak	32 kVpeak
	b) To earth & between poles	70 kVpeak	28 kVpeak
11	Rated current in Amp	1250	630
12	Short time current for 3 sec	25kA	25kA
13	Rated Peak withstand Current	62.5KAp	62.5KAp
13	a). Operating mechanism: I. Isolator: Motorized/Manual	To be decided during Tendering Stage	To be decided during Tendering Stage
	II. Earth Switch	Manual	Manual
	b). Gear Box and Control Wiring for Motorized Operation	To be decided during Tendering Stage	To be decided during Tendering Stage
14	Auxiliary voltage		
	a) Control & Inter lock	24/48V DC (80% to 110%)	
	b)For Heater Lamp and Socket	1ph 240V	
15	Safe duration of overload		
	a)150% of rated current	5 minute	
	b)120% of rated current	30 minute	
16	Minimum creepage distance of support and Rotating insulator	25mm/KV	
17	Mounting structure	Upright on G.I structure	
18	Terminal connector type	Bimetallic clamp Zebra	Bimetallic clamp Panther

19	Control	Local/Remote	
20	Auxiliary Contact		
	Main Isolator	6 NO / 6 NC	
	Earth Switch	4 NO / 4 NC	
	Control Voltage and Current Rating of Contacts	24 / 48V DC and 10 Amp.	
21	Cantilever Strength Support	700Kg	
22	Current Density of Copper	1.75 Amp/Sq.mm	
23	Control Cabinet		
	Thickness of sheet Metal	3mm	
	Enclosure Protection	IP55	
	Paint	50-60 Microns inside & 70-80 Microns Outside Powder Coated shade 631 as per IS-5	
	Material of the Box	Stainless Steel	
24	Material of Moving and Fixed Contact	Copper Silver Plated (min 25 microns)	
25	Operating Rod Earthing with flexible copper braid of suitable length	25X6 sqmm	25X6 sqmm
26	The moving arm and current carrying contacts/joints to be covered in box type arrangement	Required	Required
27	Interlock		
	Mechanical	Castel Key Interlock	Castel Key Interlock
	Electrical	Solenoid	Solenoid
28	Mounting Condition	On Galvanised Steel Structure	
29	Type of Support Insulator	Solid Core Porcelain post insulator	
30	Minimum Clearance in Air (mm)		
	When switch is closed		
	(a) Between adjacent Pole of different Phases(Centre-Centre)	1500	900

	(b)Between Live Parts and Earth	508	254
	When switch is open		
	Between Poles of the same Phase (Centre to Centre)	440	300
	Between adjacent poles of different phases (Centre-Centre)	1500	900
31	Minimum Height of Insulator Stack (mm)	508	254

5 GENERAL CONSTRUCTION

5.1 General Arrangement

Type :
Center Rotating, outdoor, gang operated type, with blades rotating in horizontal plane

Base Frame:
All ferrous parts shall be hot dipped galvanized steel structure. Size of base channel shall be 100 mm X 50 mm. Galvanization thickness min (100 Microns) & Mass of Zn coating (705 Gm/M^2)

Insulators:
3 nos, porcelain post insulators per phase (Total nos. 9) with creepage length as per GTP.

Gang operated rods:
Galvanized steel rods connected to common operating mechanism.
Gang operated links shall be so designed that all phases shall make and break simultaneously.

Mounting arrangement:
Vertical and Horizontal Mounting: Isolator (with conductive terminals, main contacts, gang-operated operating rod, and insulators) shall be suitable for mounting on galvanized steel structure. Also provision for standing of maintenance personnel shall be provided along with mounting structure.

Limiting pins/Stopper arrangement: Adjustable limiting pins shall be provided to limit over travel of moving post.
Stopper arrangement shall be provided for controlling of opening of isolator main blades for all the three phases. All the interlocks shall have locknut with bush arrangement type provision.

Accidental prevention design/ Dead center interlocking: Isolators shall be constructed such that it cannot be dislodged by gravity, wind pressure, vibrations, shocks, accidental touching, breaking of the connecting rods of the operating mechanism, or open under influence of short circuit.

5.2 Hardware items:

Nuts, bolts & washers:
Shall be hot dip galvanized. Sufficient length of bolts shall be provided for current carrying parts

Teflon washer :
Shall be provided between operating rod & arrangement of tandem & coupling pipes.

Spring washer :.
Phosphorus bronze spring washers shall be used in current carrying parts

5.3 Contacts(male and female):

Material : All non-ferrous current carrying parts/ contacts shall be of high conductivity, corrosion resistance, hard-drawn electrolytic copper or copper alloy of proper thickness and contact area with current density of 1.75 A per sq. mm. (max.) with silver plating at the contacts.

Contacts:
a) Heavy duty, self-aligning, high pressure and self-cleaning type high pressure contacts. The contacts shall wipe the contact surface during opening and closing without causing any abrasion on the contact surface.
c) All contacts shall be replaceable at site
d) Contact resistance - 50 micro-ohms, and up to permissible limit as defined in IS:9921(part-IV)
e) All movable parts shall be shunted by flexible copper conductor of specified cross-section and capacity
f) All contact blades of moving arm should have proper contact on the main current carrying rod.
g) The fixed and moving contacts shall be able to carry the rated current continuously and the maximum fault current as per GTP for 3 seconds without any appreciable rise in temperature.

FC spring:
Material: The springs shall be made of durable and nonrusting type stainless steel.

Vibration and Impact:
The blades shall be self-latching in the closed position or provided with a safety latch to prevent maloperation due to impact gravity, vibration, wind pressure, electromagnetic forces or shocks.

Temperature Rise Limit:
The contacts and other current carrying parts shall be so designed that their temperature rise under different operating conditions shall not exceed the value specified in IS: 99241.

Corona & RIV Corona avoidance:
Corona and Radio interference Voltages Shall be avoided by eliminating sharp edges, points or loose metal fittings on energized parts.
The design shall be such that it is free from visible corona discharge in both closed and open positions.

5.4 Terminal Connectors:

Material:
High conductivity electrolytic grade copper.
The live parts shall be so designed that as far as possible, sharp points, edges and other corona producing surface are eliminated.

Weight withstand capacity:
The terminal connectors shall be designed to withstand load due to dead weight of Aluminium tube/ACSR conductor connected to it and alignment of the isolator main blade shall not be disturbed..

Suitable for Conductor sizes :
Zebra/Panther conductor .To be finalised during detailed engineering.

Current Carrying Capacity:
Terminal pad (moving arm and contact joints) shall be capable of carrying the rated continuous current as well as short circuit current as specified in GTP without exceeding temperature specified for the main blades.

5.5 Insulator:

Conformance:
Shall conform to 1S:2544 and/or IEC-61109

Material :
Porcelain
Glazing: Shall be uniform glazed of.brown colour free from blisters, burns and other defects which may affect the mechanical and dielectric quality of the insulators

Type:
Shall be solid core type, homogeneous, free from cavities, tough and impervious to moisture

End fittings :
All ferrous parts shall be of high grade cast steel or malleable steel with smooth surface and shall be hot dip
Galvanized. The porcelain and metal parts shall be assembled in such a manner that any thermal expansion difference between the metal and the porcelain part throughout the range of temperature variation should not create any space and undue internal stresses which may affect the electrical or mechanical strength and rigidity.

5.6 Bearings:

Type:
Shall be ball or roller type and shall be protected from weather by means of housing arrangement /covers and grease retainers.
All bearings shall be-sealed type such that no lubrication or maintenance is required.
The design and construction of various bearings shall comply all the features required to withstand climatic condition specified, to ensure effective operation even after long period of un-operability of isolators.

5.7 Manual Operating Mechanism: Control Cabinet of Isolator or Earth Switch:

Housing/Enclosure:
Material: Stainless steel
Degree of protection: IP 55
Housing/Enclosure Sloping rain hood shall be provided to cover all sides.
Thickness of sheet: min. 3 mm.
The cabinet shall be suitable for mounting on support structure.

Earthing terminals:
2 Nos. M12 size

Gland plates:
Control cabinet shall be provided with removable gland plate at the bottom of the box with double compression type brass cable glands shall be provided with each
operating mechanism for connection of cables.

Internal wiring:
Size of wire: 2.5 sq.mm. FRLS
Material: Copper stranded conductor, 1100 V grade

Hinges:
Hinges on the door of the box shall be concealed. Hinged door shall be provided with padlocking arrangement.

TOM (Top Operating mechanism)
Shall be provided with nylon nut and check nut

Auxiliary Switches:
(i) Each isolator shall be provided with a mechanically driven auxiliary switch with all necessary contacts for control, indication and interlocking purposes with 6 NO and 6 NC contacts and 4 NO and NC contacts for earth switch.
(ii) All isolator and earthing switches shall be provided with auxiliary switches suitable for 24/48V DC
(iii) Mechanically coupled auxiliary contacts shall not slip during smooth operation of the isolator.
(iv) Remote status monitoring & electrical interlocking:
The contacts of the auxiliary switches shall be used for remote indication of open or close position in the control panel as well as for electrical interlock with other equipments.

Terminal Block and wiring:
(i) All auxiliary switches, interlocks and other terminals shall be wired up to 'terminal block' housed in the mechanism box.
(ii) The spare contacts shall also be bought out on to the terminal block. The terminal block shall have at least 20% extra terminals.
(iii) it shall be possible to change normally open contacts into normally closed contacts and vice-versa at site if required.
(iv) Stud type terminals of Elemax or equivalent make of 1100 V grade having washers, nuts & check nuts shall be provided for terminating the control cables/ wire.

Indicator:
Indication of isolator opening & closing shall be provided with direction

Fuse for DC supply :
Fuses for control supply shall be provided

Castile key Provision:
Shall be provided

Fixing bracket:
Of MS HDG shall be provided on the top of the mechanism box

Operating pipe:
Shall be min. of 40 NB dia. GI pipe. Thickness: 3MM
Length of Operating Down Pipe: 2.5Mtr/ 4.5Mtr: Final Length of the pipe will be decided during detailed engineering as per the site requirement

Tandem pipe :
3 mm thick
Outer dia — 34 mm
Inner dia ~ 28 mm

Flange:
With 14 holes

Gasket:
EPDM rubber/ Neoprene gaskets shall be provided on a all 4 sides at front between hinged door and cabinet.

Space heater:
Space Heater thermostatically controlled, suitable for single phase 240 V AC supply shall be provided to Space heater prevent condensation. A switch and fuse/llink shall be | provided in the operating mechanism.

Switch and Plug :
One 230 V combined 5A/15A AC plug with socket and arrangement switch shall be provided.

Lamp arrangement :
Switch, HRC fuse and holder suitable for a 240 V LED lamp shall be provided in manually operated mechanism box with protective fixture.
Cubicle illumination lamp with door switch shall be provided.

Limit switches:
Limit switch shall be separate from auxiliary switch.
Limit switch for contro! shail be fitted on the isolator shaft within the cabinet to sense the open and close positions of the isolators and earth switches. Limit switches shall be of reputed make.

Push button :
Local/Remote selector switch:
A set of open/close push buttons shall be provided on the control cabinet of the isolator to permit its operation through local or remote. Provision shall be made in the control cabinet to disconnect power supply to prevent local/remote power operation.

Operating handle:
Length shall be 180 mm. The operating rods and pipe shall be rigid enough to maintain control under adverse conditions to withstand all torsional and bending stresses arising from operation.

Safety feature:
Isolator shall be self-locking in open and closed positions

Operation: Manual / Motorized to be decided during Tender Stage.
For Motorized Operation: Gear Box, other control wirings is required
For Manual Operation: No Gear Box is required

Rotating parts:
a) All rotating parts shall be provided with grease packed roller or ball bearings in sealed housings designed to prevent ingress of moisture, dirt or other foreign material.
b) Bearing pressure shall be kept low to ensure long life and ease of operations.
c) Bearings used shall be permanently lubricated and no further lubrication will be required for complete life span.

Reduction Gear mechanism:
The disconnector may be required to operate after considerably long idle intervals. Special care shall be taken for selection of material for gear and lubrication of gears to meet this requirement. The gears shall be made out of aluminium bronze or forged material and suitably chosen (rust free) to avoid bending/jamming on operation after a prolonged nonoperation and lubricated for life with graphite or better quality non-draining and non-hardening type grease. Wherever necessary automatic relieving mechanism - shall be provided. Complete details of components, material, grade, self-lubricating arrangement, and grade of lubricants, details of jig, fixtures and devices used for quality check shall be furnished by bidder in this offer.

5.8 Earth Switch (wherever required):

Material:
Earth switch material shall be silver plated copper of electrolytic grade.
Spring in female contact: Stainless steel

Mechanical Interlock with isolator:
Earth switch shall form an integral part of each pole of the isolator. Each earth switch shall be mechanically interlocked with its own main switch to prevent closure of the earth blades when the main blades are closed and vice versa.

Common earth connection:
Multiple flexible tinned copper strips 1 mm thick shall be suitably attached to the earthing connector for common earth connection

Gang Operation:
Three phase operation shall be conducted via gang operation. Earth switch shall be provided with gang operated operating rod mechanism mechanically connected to Earth Control Cabinet

Hot dip galvanization:
The entire ferrous contro! mechanism shail be hot dip galvanized and design and material shall match in quality with that of the main isolators

Auxiliary contacts :
4 NO+4 NC

5.9 Interlock

Mechanical interlock with circuit breaker:
Provision for mechanical interlock (castle key type) shall be incorporated for interlocking with associated circuit breaker. The key shall be released only when the isolator is fully closed or fully opened.
Interlocking to be compatible with LOTO arrangement.

Electrical interlocking between isolator and circuit breaker:
Sufficient quantity of locks, identical to the one fitted on the isolator, shall be supplied for fixing on the circuit breaker. Exact type and quantity shall be finalized during Tender check. In addition, an electrical interlock also shall be provided.

Mechanical Interlocking of Isolator with Earth Switch:
Earth switches for the line isolators shall be so designed to provide mechanical interlocking to prevent closure of earth switch blades when the isolator in in closed position. Interlocking to be compatible with LOTO arrangement.
All interlocks shall be designed to prevent mat-operation. Failure of supply to any electrical interlocks shall not permit mal operation.

Electrical interlocking of Isolator with Earth Switch:
Electrical interlock shall be through a solenoid operated by AC 110V/230V. Necessary relays shall be provided to attain interlock.

Counter balance spring:

Counter balance springs, cushions etc., shall be provided to prevent impact at.the end of travel both on opening and closing of the isolator. The springs shall be made of durable and non-rusting type alloy.

5.10 Performance Requirement:

During the course of normal operation, it is likely that the isolator may be left in the open/closed position for long periods of time. They shall be designed to operate satisfactorily even after being kept in one position for long period,

The isolator shall be capable of breaking the magnetizing current of associated power transformer.

5.11 Earthing Pads:

a) Each pole of the isolator shall be provided with 2 nos. earthing pads of noncorrosive material at opposite ends and brazed at the base.

b) Flexible tinned copper braid of adequate size shall be provided for connecting operating handles, earthing switches for the earthing system.

5.12 Temperature rise:

The temperature rise of any part of the isolator and associated equipment shall not exceed the maximum permissible temperature rise values as stipulated in the applicable standard of latest issue corresponding to ambient temperature.

5.13 Special Requirements:

a) All joints in link mechanism exposed directly to external environment should not require any periodic lubrication and shall not create jamming which can result into loss of setting of complete isolator or deformation in links and levers.

b) Provision of continuous adjustment/alignment of insulator should be provided to compensate permitted tolerances of insulator and structure or base frame assembly. Adjustment/alignment using shim washers are not allowed.

c) Bottom bearing assembly of base frame shall be sealed such that there cannot be ingress of dust/dirt water etc. Whole assembly shall be lubricated for lifelong service.

d) Terminal head of isolator arms where conductor will be terminated shall be strong and robust. it should have 360 degree freedom of rotation and should have built-in cover to eliminate deposition of dust or foreign particles.

e) Isolators and Operating mechanisms should not require periodic maintenance for any periodic lubrication/adjustments in linkages, bearings, bush-pins, hinges. Bidder shall enclose test reports for additional extended mechanical endurance test, which justifies that there are no undue wear & tear and Joss of adjustment
after large number of operations.

f) Link mechanism shall have ‘Dead center interlocking’ to prevent any change in end position of disconnector due to external forces on the arm (e.g. Earthquake, Short line fault, Wind etc.) even when the drive is de-coupled from disconnector.

5.14 Duty Requirement:

Isolator and Earth Switch in their closed position shall be capable of withstanding dynamic and thermal effect of maximum short circuit current of the system. They shall be so constructed such that they do not get open under influence of short circuit current.

5.15 Completeness of Supply:

Any fittings, accessories or apparatus which may not have been mentioned in this specification but which are necessary for efficient operation / performance shall deemed to be included in the contract.

6.0 NAME PLATE AND MARKING

Following details shall be suitably embossed on a stainless steel name plate fixed on the operating mechanism box:

a) Name of manufacturer
b) Property of TPCODL
c) PO No.
d) Month/Year of manufacture
e) Type of Isolator
f) Rated Voltage
g) Rated Normal Current
h) Serial No.
i) Weight
j) Rated insulation level
k) Short time current for 3 sec
|) Operating mechanism type
m) DC Control voltage
n) Guarantee period
o) Frequency

7.0 TESTS:

All Routine, Acceptance & Type tests shall be carried out in accordance with relevant IS/IEC.
All Routine and Acceptance tests shall be witnessed by TPCODL authorized representative.
All the components should also be type tested as per the relevant standards.
Following tests shall be necessarily conducted on the Isolator:

7.1 ROUTINE TESTS

a) Power Frequency test on Control and Auxiliary circuit
b) Voltage control tests on auxiliary circuit
c) Operation Tests
d) Measurement of resistance of main circuit.
e) Mechanical Operating Tests.
f) Galvanizing Measurement.
g) Tinning Thickness Measurement.

7.2 ACCEPTANCE TESTS:

a) Verify the Insulation level, including withstand tests at Power frequency voltages on auxiliary equipments.
b) Voltage tests on auxiliary circuit
c) Operation Tests
d). Measurement of resistance of main circuit
e) Visual checks
f) Dimensional checks
g) Alignment check of post insulator check
h) Galvanization test
i) Mechanical operation test

7.3 Type Tests for Isolator:

a) Lightning impulse voltage test(Dry)
b) Power frequency voltage withstand test(Dry)
c) Power-frequency voltage withstand test(Wet)
d) Short time withstand current test
e) Peak withstand current test
f} Temperature rise test
g) Measurement of contact resistance
h) Short time withstand current test for Earth Switch
i) Peak withstand current for Earth Switch
j) Satisfactory Operation & Mechanical endurance test

8.0 TYPE TEST CERTIFICATES:

Bidder shall submit Type test Certificates for the tests as mentioned above. All the tests should have been conducted during the period not exceeding five years from the date of opening the bid and at **CPRI/ ERDA** as per the relevant standards.
In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPCODL.

9.0 PRE-DISPATCH INSPECTION:

The Material shall be subject to inspection by a duly authorized representative of the TPCODL. Inspection may be made at any stage of manufacture at the discretion of the Purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL's representatives at all times when the work is in progress. Inspection by the TPCODL or its authorized representatives shall not relieve the Bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL.
Following documents shall be sent along with material

a) Test reports
b) MDCC issued by TPCODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card

g) Delivery Challan
h) Other Documents (as applicable).

10.0 INSPECTION AFTER RECEIPT AT STORES:

The material received at TPCODL site/store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Projects department.

11.0 GUARANTEE:

Supplier shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 36 months from the date of commissioning or 42 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs within mutually agreed timeframe, and to the entire satisfaction of TPCODL, failing which TPCODL shall be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus TPCODL own charges(@ 20% of expenses incurred), from the supplier or from the " Security cum Performance Deposit" as the case may be.

12.0 PACKING:

The equipment shall be packed in crates suitable for vertical/horizontal transport, as the case may be and suitable to withstand bundling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Any material found short inside the packing cases shall be supplied by Supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing, list containing the following information:-

a) Name of the consignee.
b) Details of consignment.
c) Destination.
d) Total weight of consignment.
e) Handling and unpacking instructions.
f) Bill of material indicating contents of each package.

The supplier shall ensure that the packing list and bill of material are approved by the purchaser before dispatch.

13.0 TENDER SAMPLE: NA

14.0 QUALITY CONTROL:

The Bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and

equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPCODL shall reserve the sole rights for the type test of a random sample from the lot and in case of any discrepancy or deviation from the Type test certificates submitted along with the Bid, the complete Lot shall be rejected.
The Purchaser's engineer or its nominated representative shall have free access to the Bidder's works to carry out inspections.

15.0 MINIMUM TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out the following test at the factory.

a. Power frequency voltage test
b. Voltage tests on auxiliary circuit
c. Operation Tests
d. Measurement of resistance of main circuit.
e. Temperature rise test
f. Mechanical endurance test.

16.0 Manufacturing Activities:

The successful Bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

17.0 SPARES, ACCESSORIES AND TOOLS:

The bidder shall submit a recommended list of maintenance spares, tools and accessories for smooth and trouble free operation of the isolator.
The bidder, if at any time changes the design of the isolator or discontinue manufacturing of the isolator, shall provide opportunity to TPCODL for purchase of spares for future use so as to ensure smooth & trouble free functioning of the isolators before such change in design or discontinuing of manufacturing activity. The bidder shall arrange for service engineer for proper alignment at the time of erection and testing of isolators.

18.0 Drawings and Documents:

Following drawings and documents shall be prepared based on Purchaser's specifications and statutory requirements and shall be submitted with the bid:

a) Completely filled in Technical Particulars
b) Bill of material
c) Fault Calculations for Corrugated Aluminum Sheath.
d) Type Test certificates.
e) Detailed dimensional cross-sectional drawing of the cable
f) Experience List

After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser.
Following drawings / documents shall be submitted by the bidder for Purchaser's approval.

S.No.	Description	For Approval	For Review Information	Final Submission
1	Technical Particulars	√		√

2	General Arrangement drawings	√		√
3	Terminal and connection Drawing	√		√
4	Drawing showing Mechanical Interlocks b/t line & Earth Switch and Wiring diagram	√		√
5	Manual / catalogue		√	
6	Installation / Commissioning Manuals		√	
7	Instruction for use		√	
8	Transport / Shipping dimension drawing		√	
9	QA & QC Plan	√		√
10	Routine, Acceptance and TypeTest Certificates	√		√
11	Sectional view & descriptive detailsfor blades, contacts, arms, contact pressure, contact support bearing, housing of bearing, balancing of heights, phase coupling pipes, base plate, operating shaft, guides swivel joints, operating mechanism& its component etc	√	√	√

All the documents & drawings shall be in English language.
Instruction Manuals: Bidder shall furnish two softcopies and four (4) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

19.0 GUARANTEED TECHNICAL PARTICULARS

To be furnished by Bidder

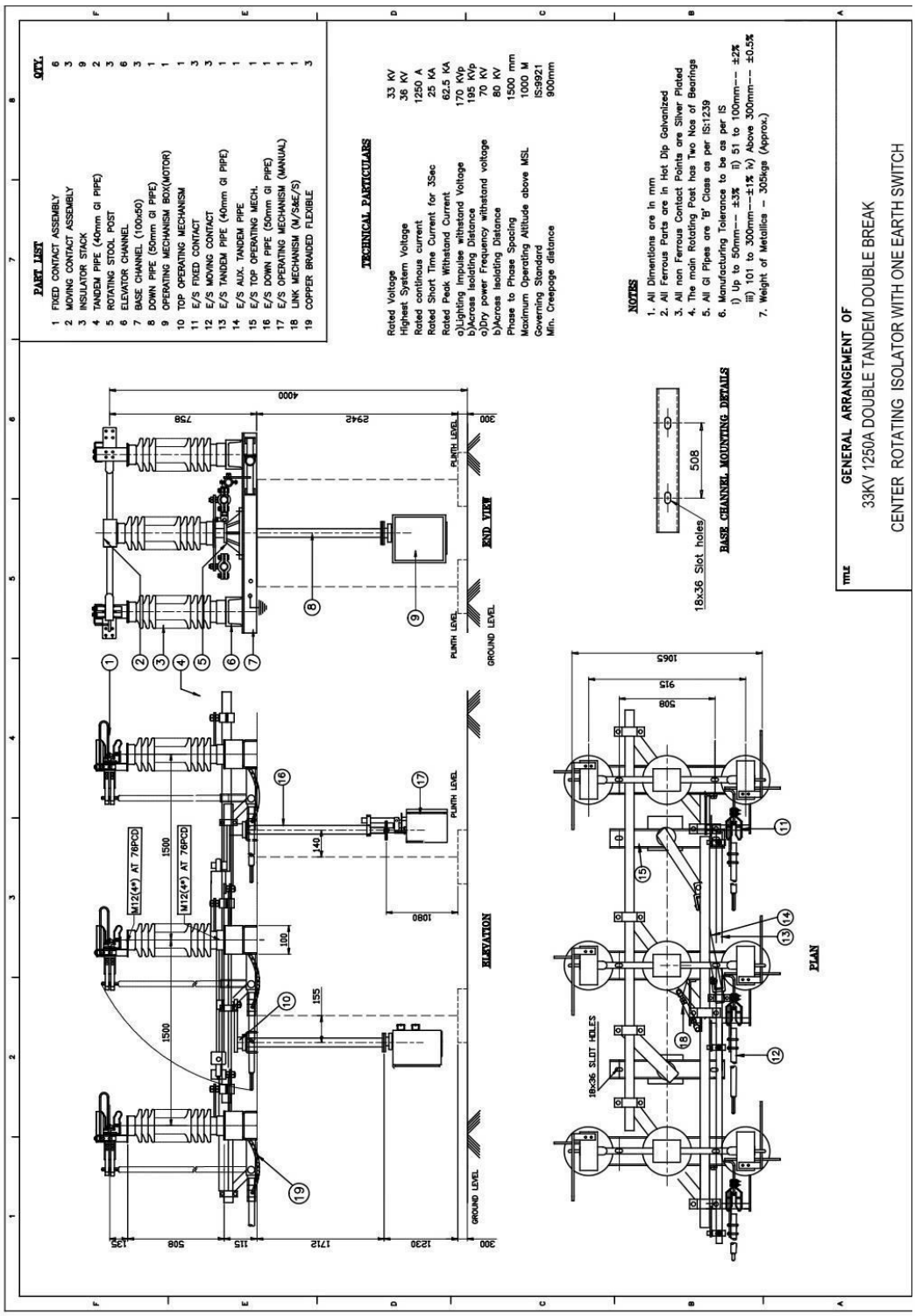
Sl.No	**Type**	**33KV**	**11KV**
1	**Main switch**		
2	**Service**		
3	**Applicable standard**		
4	**Pole**		
5	**Rated voltage nominal/ Maximum**		
6	**Rated Frequency**		
7	**System earthing**		
8	**Temperature rise**		
9	**Insulation level impulse with stand voltage**		
	a) Across Isolating distance		

	b) To earth & between poles		
10	**1 minute power frequency with stand voltage**		
	a) Across Isolating distance		
	b) To earth & between poles		
11	**Rated current in Amp**		
12	**Short time current for 3 sec**		
13	**Rated Peak withstand Current**		
13	**Operating mechanism**		
14	**Auxiliary voltage**		
	a) Control & Inter lock		
	b)For Heater Lamp and Socket		
15	**Safe duration of overload**		
	a)150% of rated current		
	b)120% of rated current		
16	**Minimum creepage distance of support and Rotating insulator**		
17	**Mounting structure**		
18	**Terminal connector type**		
19	**Control**		
20	**Auxullary Contact**		
	Main Isolator		
	Earth Switch		
	Control Voltage and Current Rating of Contacts		
21	**Cantilever Strength Support**		

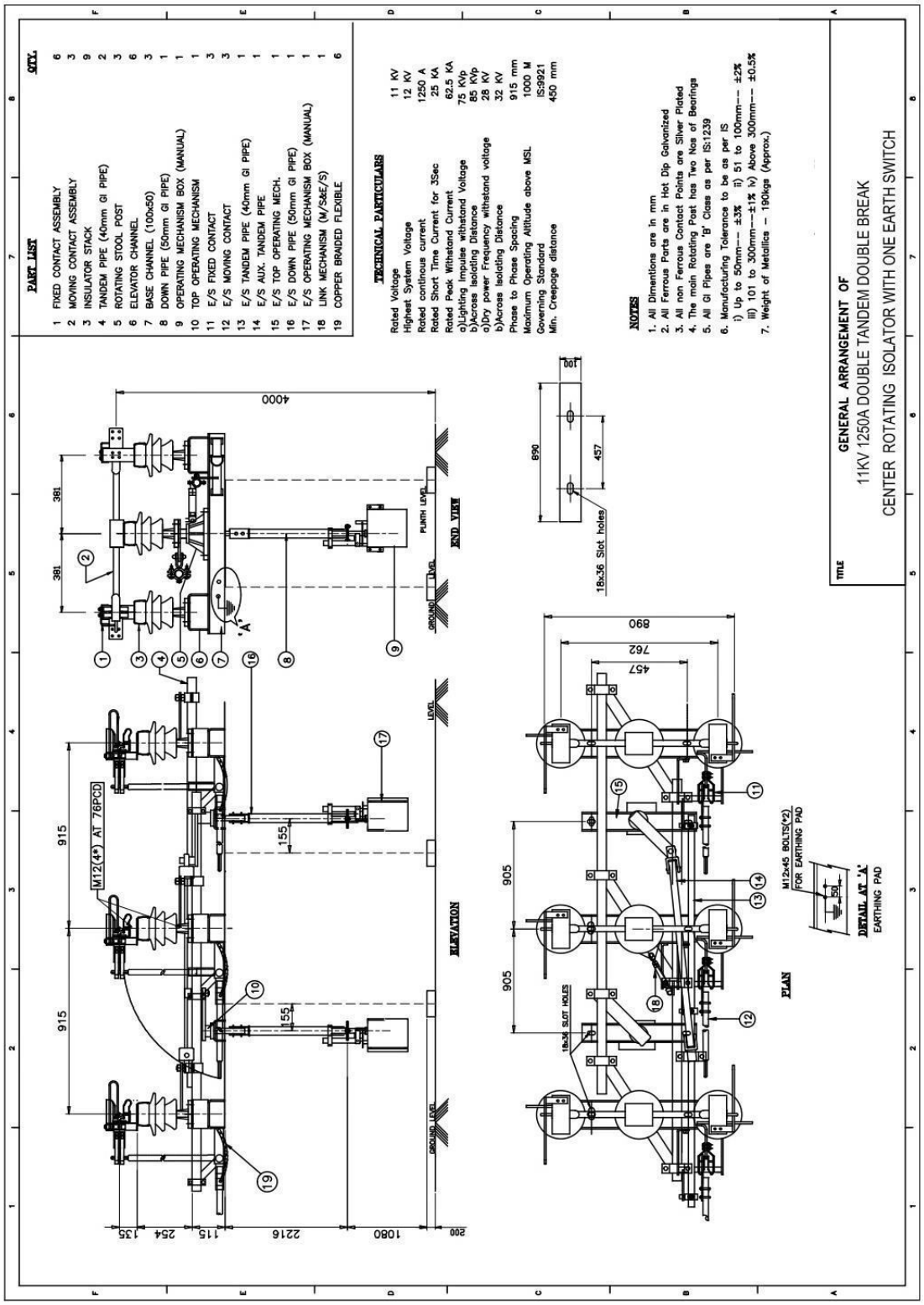
22	**Current Density of Copper**		
23	**Control Cabinet**		
	Thickness of sheet Metal		
	Enclosure Protection		
	Paint		
	Material of the Box		
24	**Material of Moving and Fixed Contact**		
25	**Operating Rod earthing with flexible copper braid of suitable length**		
26	**The moving arm and current carrying contacts/joints to be covered in box type arrangement**		
27	**Interlock**		
	Mechanical		
	Electrical		
28	**Mounting Condition**		
29	**Type of Support Insulator**		
30	**Minimum Clearance in Air (mm)**		
	When switch is closed		
	(a) Between adjacent Pole of different Phases(Centre-Centre)		
	(b)Between Live Parts and Earth		
	When switch is open		

	Between Poles of the same Phase (Centre to Centre)		
	Between adjacent poles of different phases (Centre-Centre)		
31	**Minimum Height of Insulator Stack (mm)**		

20. Sample Drawings (For Tendering Purpose only .**Dimensions are for reference purpose only and may change as per Manufacturers Type Tested Design**. **Design Subject to change during detailed engineering)**



TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-EHV-1019 **Specification Name:** Technical Specification of Centre rotating, Double Break Type Isolator - 33KV (1250 Amp) & 11KV (630 Amp)



21. SCHEDULE OF DEVIATIONS
(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1020

Specification Name : Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1250 A)

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
SWARUP NAYAK	SURYAKANTA MOHANTY	SANTOSH KUMAR PATRA	Susavan Biswas	KHAJAN BHARDWAJ	POURUSH GARG
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
26-05-2023	26-05-2023	01-06-2023	02-06-2023	23-06-2023	24-06-2023

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-EHV-1020 **Specification Name:** Technical Specification for 33KV Outdoor Vacuum Circuit Breaker (1250 A)

CONTENTS

1. SCOPE:

This specification This specification covers technical requirements of design, manufacture, construction, performance, testing at manufacturer's works, packing, forwarding, supply and unloading at stores/site of 33KV Outdoor VCB of 1250 Amps. completed with all accessories for trouble free and efficient performance.

2. APPLICABLE STANDARDS:

a) IS 13118: Specification for High Voltage Alternating Current Circuit Breakers
b) IS 12063: Classification of degrees of protection provided by enclosures of electrical equipment
c) IS 2099: Bushings for alternating voltages above 1000 Volts
d) IS 2629: Recommended Practice for Hot-Dip Galvanizing of Iron and Steel : Methods for testing uniformity of coating of zinc coated articles
e) IS 2633: Hot Dip Zinc coatings on structural steel and other allied products
f) IS 4759: High-voltage switchgear and control gear
g) IEC 62271-100 Alternating current circuit breakers
h) IEC 62271-1-: High-voltage switchgear and control gear - Part 1: Common specifications
i) ISO 1460: Metallic coatings - Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area
j) BS 729 : Specification for Hot dip galvanized coatings on iron and steel articles

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	100%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	180 KMPH
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	180 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPWODL/TPSODL service area has **heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto** 180 **Kmph**. The atmosphere is

generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS

S. No.	Particulars	Requirements
		33 kV
4.1	Application	Outdoor
4.2	Type	VCB
4.3	Rated voltage	36 kV
4.4	Service voltage	33 kV
4.5	Rated Frequency	50 Hz
4.6	Number of phases	3
4.7	Rated insulation level	
4.7.1	Rated Lightning impulse withstand voltage	
a	To earth and b/w Poles	170 kVp
b	Across the isolating distance	195 kVp
4.7.2	Rated short duration power frequency withstand voltage	
a	To Earth and between Poles (Dry test for 1 Min)	70 kV
b	To Earth and between Poles and across the isolating distance (Wet test for 10 Sec)	75 kV
c	Across Open Switching Device	75 kV
4.8	Rated normal current	1250 A
4.9	Rated load breaking current (sym)	25 kA (rms)
4.1	Percentage DC component	<50 %
4.11	Rated short circuit withstand current for 3 seconds	25 kA (rms)
4.12	Rated short circuit making current	62.5 kA
4.13	First Pole to Clear factor	1.5 for Terminal fault
		1 for Short line fault
		2.5 for Out of phase fault
4.14	Rated capacitive switching currents	
4.14.1	Rated line charging breaking current	10 A (rms)
4.14.2	Rated cable charging breaking current	50 A (rms)
4.14.3	Rated single capacitor bank breaking current	400 A (rms)

4.14.4	Capacitor Banks with series reactors switching capacity	Suitable for 14.4 MVAR Capacitor Banks with series reactors
4.15	Maximum switching over voltages for cable charging & capacitor bank breaking current	2.5 p.u.
4.16	Rated operating sequence	0-0.3sec-CO-3min-CO
4.17	Total Break time(max)	65 ms (Shall not change during operating life)
4.18	Closing time (max)	85 ms (Shall not change during operating life)
4.19	Rated supply voltage of control circuits	48V/24V DC
4.19.1	Range for satisfactory operation of Trip circuit	70% to 110%
4.19.2	Range for satisfactory operation of closing & other circuits	85% to 110%
4.2	Transient recovery voltages	As per IEC 62271-100
4.21	No. of auxiliary contacts	10 NO & 10 NC
4.22	Clearance in air	
4.22.1	Between phases	420 mm
4.22.2	phase to earth	320 mm
4.23	Min. Creepage distance of insulator	31mm per kV
4.24	Degree of Protection	IP 55
4.25	Operating mechanism	Spring charged by universal motor.
4.26	Operation	Gang operated
4.27	Temp. rise at rated normal current	As per IEC 62271-100
4.28	Minimum Vertical clearance of live conductor from ground level	As per manufacturer's type tested design
4.29	Mechanical Endurance	M2
4.3	Electrical Endurance	E2 Class without Auto-Reclosing
4.31	Restriking Class	C2
4.32	Class	S2
4.33	Material of main contact	As per Manufacturer's Type Tested Design
4.34	Interrupter	Vacuum Interrupter should be of same make as that of Breaker manufacturer. Representative shall visit Interrupter manufacturing Facility during Factory Inspection.

4.35	Interrupting Capacity at nominal system voltage	1500 MVA

Circuit Breaker shall be suitable for switching capacitor bank of rating 14.4 MVAR for 33 kV with capacitor bank star point undergrounded and series reactors (rating 6% of capacitor bank rating if connected on line side & 0.2 % if connected on neutral side of the capacitor bank rating). The circuit breakers should withstand capacitor bank inrush currents.

5. GENERAL CONSTRUCTIONS

5.1 GENERAL:

5.1.1 Control cabinets shall be of the dust, moisture, vermin proof and free standing floor mounting out door type. Control Cabinets shall be CRCA or better, surface treated for anti-oxidation/corrosion and power coated with epoxy highly suitable for outdoor installations (test reports shall be submitted).

5.1.2 Sheet steel shall be at least 2.5 mm thick. 15mm thick neoprene gaskets shall be provided to ensure degree of protection of IP 55.

5.1.3 Control cabinets shall be provided with hinged door and padlocking arrangement. The door hinges shall be of union joint type to facilitate easy removal.

5.1.4 Door shall be properly braced to prevent wobbling. Cable entry from bottom.

5.1.5 All wiring in the control cabinet shall be carried out with 1100V grade single core multi strand flexible copper conductor wires of size not less than 2.5sq.mm with HRPVC insulation and shall be flame retardant, vermin and rodent proof.

5.1.6 Suitable heaters shall be mounted in the housing to prevent condensation. On-off switch and fuse shall be provided. Heater shall be suitable for 240V single- phase 50 Hz AC supply. Electrical and Mechanical indications for ON-OFF to be provided which is visible from the front.

5.1.7 Terminal boards shall be furnished in the mechanism housing. All the terminal blocks shall be of disconnecting type links. Terminals for DC and AC shall be isolated from each other. A minimum of 20% spare terminals for control wiring shall be provided. All wiring in the housing shall be stranded and the insulation shall be vermin proof. Insulation shall be such that it shall not support combustion. Suitably rated switches shall be provided to enable the control supply to the breaker to be cut off from the mechanism housing. Requisite number of cable entries shall be provided at the bottom of the operating cabinet to receive purchaser's control cables. Number and size of cable glands will be intimated to the bidder. A light point with a control switch shall be provided inside the housing of the breaker.

5.1.8 Height of operating box of the CB shall be specified. The height of manual operating handle shall not be more than 1500mm from ground level. The operating box shall be provided with T-N-C switch "Pistol Grip" type for local operation. Separate terminal box below the main operating box to accommodate the terminal blocks shall be provided..

5.1.9 No external damping circuit shall be acceptable with the CB. Breaker tripping curve to be provided by the bidder. Bidders providing breakers with contact resistance <30 micro ohms and range for satisfactory operation of Trip circuit as 70 % to 110 % shall be given preference. The closing time and opening time shall not change during operating life. And the Contact resistance shall not change by ±10% during operating life.

5.1.10 Breaker shall be supplied with Two Tripping Circuit. Provision for Pre & Post Trip Circuit supervision is required in both circuits.

5.2 OPERATING MECHANISM:

5.2.1 Circuit breaker shall be power operated through a motor compressed spring charging mechanism. Spring operated mechanism shall be complete with motor, opening spring, closing spring and all necessary accessories to make the mechanism a complete operating unit. Spring_ charging motor shall be universal type with overload protection and overload relay with contacts for annunciation. Each mechanism shall be so designed as to enable a continuous sequence of circuit breaker opening and closing operations to be obtained by the control switch as long as power is available to the motor, and at least one circuit breaker opening and closing after failure of power supply to the motor. Also, the Circuit breaker shall have suitable provision for manual spring charging. Anti-pumping feature shall be provided.

5.2.2 Operating mechanism shall normally be operated by remote electrical control. Provision shall be made for local electrical control and a "local/remote" selector switch shall be provided in the operating mechanism cubicle. A conveniently located manual tripping lever or button shall also be provided for tripping the breaker and simultaneously opening the reclosing circuit. A manual closing device that can easily be operated by one person standing on the ground shall also be provided for maintenance purposes. Each circuit breaker unit shall be provided with operation counter.

5.2.3 A closing release shall operate correctly at all values of voltage between 70% and 110% of the rated voltage. A shunt trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70% and 110% of rated voltage.

5.2.4 Working parts of the mechanism shall be of corrosion resisting material. Bearing which require greasing shall be equipped with pressure type grease fittings. Bearing pins, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the breaker.

5.2.5 Main poles of each breaker shall be connected together and operated by a common mechanism and shall be so adjusted and arranged that interrupting contacts of all phases can be readily adjusted to touch and part simultaneously.

5.2.6 Provision shall be made to enable electrical & Castel Key interlocking with the opening or closing of the isolator when breaker is closed. All electrical and mechanical interlocks, which are necessary for safe and satisfactory operation, shall be furnished.

5.2.7 Floor clamps, Foundation bolts, Lifting hooks and one manually operated tank lifting & lowering device for frame-mounted tanks shall be provided. All similar parts, particularly removable ones shall be interchangeable with one another. Exposed live parts shall be placed high enough above ground to meet the statutory requirements and local safety codes. All Terminal blocks shall be stud type. Bidder shall give suitable

provision in CB such as space, auxiliary contact with wiring etc. for providing castle lock by purchaser.

5.3 CONTACTS:

Main contacts shall have sufficient area and contact pressure for carrying the rated current and the short time rated current of the breaker without excessive temperature rise that may cause pitting or welding. Contacts shall be adjustable to allow for wear, easily replaceable and shall have a minimum of movable parts and adjustments to accomplish these results. Main contacts shall be the first to open and the last to close.

5.4 BUSHINGS:

Porcelain used in bushing manufacture shall be a single piece and homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Glazing of the porcelain shall be of uniform brown colour free from blisters, burns and similar other defects. Bushings shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used. All bushings of identical ratings shall be interchangeable. Insulation of bushings shall be coordinated with breaker insulation so that impulse flashovers will occur outside the tank. Puncture strength of bushings shall be greater than the dry flashover value. When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulation or supports by the formation of substances produced by chemical action. No radio disturbance shall be caused by the bushings when operating at the normal rated voltage. Iron parts shall be preferably hot-dip galvanized, all joints shall be airtight. Surfaces of the joints shall be trued up; porcelain parts by grinding and metal parts by machining. Bushing design shall be such as to ensure a uniform compressive pressure on the joints.

5.5 PRIMARY TERMINALS:

Primary terminals shall be suitable for wedge type connectors with ZEBRA conductors. Successful bidder shall supply connectors. It should have Primary — terminals (connected at Fixed contact) on Single side at top in case of bypassing CB.

5.6 GALVANIZING:

All galvanizing shall be carried out by the hot dip process, in accordance with IS 2629/ ISO 1460 amended to date. However, high tensile steel nuts, bolts and spring washers shall be electro -galvanized to service condition four. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.

The minimum mass of Zinc coatings shall be as per IS 4759. After galvanizing no drilling or welding shall be performed_ on the galvanized parts of the equipment except that nuts may be threaded after galvanizing.

To avoid the formation of white rust, galvanized material shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization. The galvanized steel shall be subjected to tests as per IS-2633/ BS 729 amended to date.

5.7 EARTHING:

Suitable grounding terminals shall be provided on the circuit breaker on opposite sides, for connecting to earth pit. The earthing terminals shall be readily accessible and so placed that the earth connection of the circuit breaker is maintained even when the cover or any other movable part is removed. GI strip for earthing shall be of size 50 mm X 6mm, approx. The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. The earthing terminal shall be identified by means standard symbol marked in a legible and indelible manner on case or frame to be earthed adjacent to the terminals.

5.8 CT Mounting Arrangement:

CT Mounting Arrangement shall be in scope of supplier. Supplier has to provide the detailed calculation for selection of all Load Bearing Components . Components shall be GI.

CT Base shall be 450 X 450 mm (Hole Centre to Centre)
Minimum weight to be considered: 150kg per CT.

5.9 24V DC LED Type Indicating Lamps shall be mounted inside control cubicle which shall be visible from outside through glass of cubicle door.

a. Breaker ON - Red
b. Breaker OFF – Green
c. Spring Charged - Blue

6. MARKING

Circuit breaker and its operating devices shall be provided with durable and legible nameplates containing all technical parameters. Name plate for Circuit breaker shall be embossed with "PO No. with date", "PROPERTY OF TPCODL/TPNODL/TPWODL/TPSODL", along with the following information:
Manufacture's name, Type designation and serial number

1. Year of manufacture
2. Relevant standard
3. Rated voltage
4. Rated lightning impulse withstand voltage
5. Rated switching impulse withstand voltage
6. Rated normal current
7. Rated duration of short circuit
8. Rated short circuit breaking current
9. DC time constant of the rated short circuit breaking current if different from 45 ms
10. DC component of the rated short circuit breaking current at contact separation corresponding to the dc time constant of the rated short circuit breaking current
11. Rated operating sequence
12. Classification

Name plate for the operating device shall be provided with following information:

1. Manufacturer's name
2. Type designation and serial number
3. Relevant standard

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the Purchaser/his authorized representative. Following tests shall be necessarily conducted in addition to others specified in relevant standards.

7.1 Routine tests:

1. Dielectric tests on the main circuit
2. Tests on auxiliary and control circuits
3. Measurement of the resistance of the main circuit
4. Tightness tests
5. Design and Visual checks
6. Mechanical operating tests

7.2 Type tests:

1. Dielectric Tests
2. Measurement of the resistance of the main circuits
3. Temperature rise tests
4. Short time withstand current and peak withstand current tests
5. Additional tests on auxiliary and control circuits
6. Mechanical operation test at ambient temperature
7. Short circuit making and breaking tests
8. Verification of the degree of protection
9. Tightness tests
10. Mechanical tests
11. Out of phase making and breaking tests
12. Electrical endurance tests
13. Double earth fault tests
14. Capacitive Current switching tests

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.
The above tests must not have been conducted on the equipment within time frame as per latest CEA Guidelines
In case of any change in design/type of Breaker already type tested and the one offered against this specification, the owner reserves the right to demand repetition of type tests, without any extra cost.

8. TYPE TEST CERTIFICATES

The Bidder shall furnish the type test certificates of the Item for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA/CESI/KEMA/KERI/PEHLA as per the relevant standards. Type tests should have been conducted in certified Test laboratories during the period not exceeding years as per CEA Guidelines from the date of opening the bid. In the event of any discrepancy in the test reports,

i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPWODL/TPSODL.

9. PRE DISPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPDCOL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPWODL/TPSODL representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPWODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPWODL/TPSODL.

Following documents shall be sent along with material

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPWODL/TPSODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORES

The material received at TPCODL/TPNODL/TPWODL/TPSODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 36 months from the date of commissioning or 48 months from the date of last supplies made under the contract, whichever is earlier, bidder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for “Free Replacement” for another period of THREE years from the end of the guarantee period for any “Latent Defects” if noticed and reported by the company.

12. PACKING:

Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit.

13. TENDER SAMPLE : Not required

14. QUALITY CONTROL:

The bidder shall submit with the offer, assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction,

components during manufacture and after finishing, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's/ Consultant's engineer shall have free access to the manufacturer/sub bidder's works to carry out inspections.

15. MINIMUM TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES:

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

17. SPARES, ACCESSORIES & TOOLS SPARES:

Following spares shall be supplied along-with CB. 10% spare to be considered. Bidder should quote unit rates for spares. Exact quantity to be finalized during tendering.

1. Trip Coil
2. Closing coil
3. Spring charging motor
4. Vacuum interrupter (For VCB type)
5. T-N-C Switch
6. .Local / remote selector switch
7. LED Indicator (Red and Green)
8. Contactor/Relay for Control Circuit
9. Breaker aux contact

In addition to above bidder shall submit recommended list of spares for 3 years, if any with unit prices and recommended quantity.

ACCESSORIES: The circuit breakers shall be provided with the following accessories, in addition to those needed for normal operation and control

1. Breaker position indicator
2. Breaker Operation counter
3. T-N-C switch
4. A local mechanical emergency trip device with necessary shrouds
5. Castle key & Lock (Series will be finalized during detail engineering)
6. Electrical & Mechanical interlocks with isolators
7. A heater rated 230 volts AC, 50 Hz for the operating mechanism housing heater current monitors

SPECIAL TOOLS & GAUGES: A list of complete set of special tools and gauges required for erection & maintenance and installation procedure shall be submitted

18. DRAWINGS AND DOCUMENTS

Following documents shall be prepared based on TPCODL/TPNODL/TPWODL/TPSODL specifications and statutory requirements with complete BOM and shall be submitted with the bid:

a) Completely filled in Technical Particulars.
b) General description of the equipment and all components including brochures.

c) Type test Certificates
d) Experience List/Performance Certificates from end users.
e) Foundation Plan
f) Operation & Maintenance Manual

After the approval of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, test certificates shall be submitted after the final approval of the same to the purchaser

Following Drawings/Documents shall be submitted after the award of the contract

S. No	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	GA Drawings	√		√
3	Internal Wiring Diagram		√	√
4	Foundation Plan		√	√
5	Installation Instruction		√	√
6	Transport/Shipping dimension Drawing		√	√
7	QA & QC Plan	√	√	√
8	Test Certificate	√	√	√

All the Documents and Drawings shall be in English Language.

Instruction Manuals: Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

19. GUARANTEED TECHNICAL PARTICULARS

S. No.	Description	Units	To Be Furnished by Bidder
			33 kV (VCB)
1	Application		
2	Type		
3	Rated voltage	kV	
4	Service voltage	kV	
5	Rated Frequency		
6	Number of phases		
7	Rated insulation level		
7.1	Rated Lightning impulse withstand voltage		
a	To earth and b/w Poles	kVp	
b	Across the isolating distance	kVp	
7.2	Rated short duration power frequency withstand voltage		

a	To earth and b/w Poles (dry test for 1 min)	kV	
b	Across the isolating distance(dry test for 1 min)	kV	
c	To earth and b/w Poles and across the isolating distance(wet test for 10 sec)	kV	
8	Rated normal current	A	
9	Rated load breaking current (sym)	kA (rms)	
10	Percentage DC component		
11	Rated short circuit withstand current for 3 seconds	kA	
12	Rated short circuit making current	kA	
13	First Pole to Clear factor		
14	Rated capacitive switching currents		
14.1	Rated line charging breaking current		
14.2	Rated cable charging breaking current	A	
14.3	Rated single capacitor bank breaking current	A	
14.4	Capacitor Banks with series reactors switching capacity	MVAR	
15	Maximum switching over voltages for cable charging & capacitor bank breaking current	p.u.	
16	Rated operating sequence		
17	Total Break time(max)	ms	
18	Total closing time	ms	
19	CO time	ms	
20	Pole discrepancy	ms	
21	Rated supply voltage of control circuits	V	
21.1	Range for satisfactory operation of Trip circuit		
21 2	Range for satisfactory operation of closing & other circuits		

20	Transient recovery voltages		
21	No. of auxiliary contacts		
22	Clearance in air		
22.1	Between phases	mm	
22.2	phase to earth	mm	
23	Min. Creepage distance of insulator	mm	
24	Degree of Protection		
25	Operating mechanism		
26	Anti pumping feature		
27	Spring charging time		
28	Temp. rise at rated normal current	Deg C	
29	Vertical clearance of live conductor	mm	
30	Mechanical Endurance		
31	Electrical Endurance		
32	Restriking Class		
33	Class		
34	Main Contacts		
34.1	Type		
34.2	Material		
35	Arcing Contacts		
35.1	Type		
35.2	Material		
36	No. of operations		
36.1	At rated normal current		
36.2	At rated capacitor bank breaking current		
36.3	At rated short circuit breaking current		
37	No. of breaks per phase		
38	Minimum contact resistance		
39	**FOR VCB Type**		
39.1	Type of indication for contact erosion		
39.2	Rating of interrupter		
39.3	Make of interrupter		
40	Connectors		
41	Type test certificates		
42	Test for Re-strike free for VCB		
43	Total weight of breaker (Kg)		
44	Dimensions (mm)		

20. SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

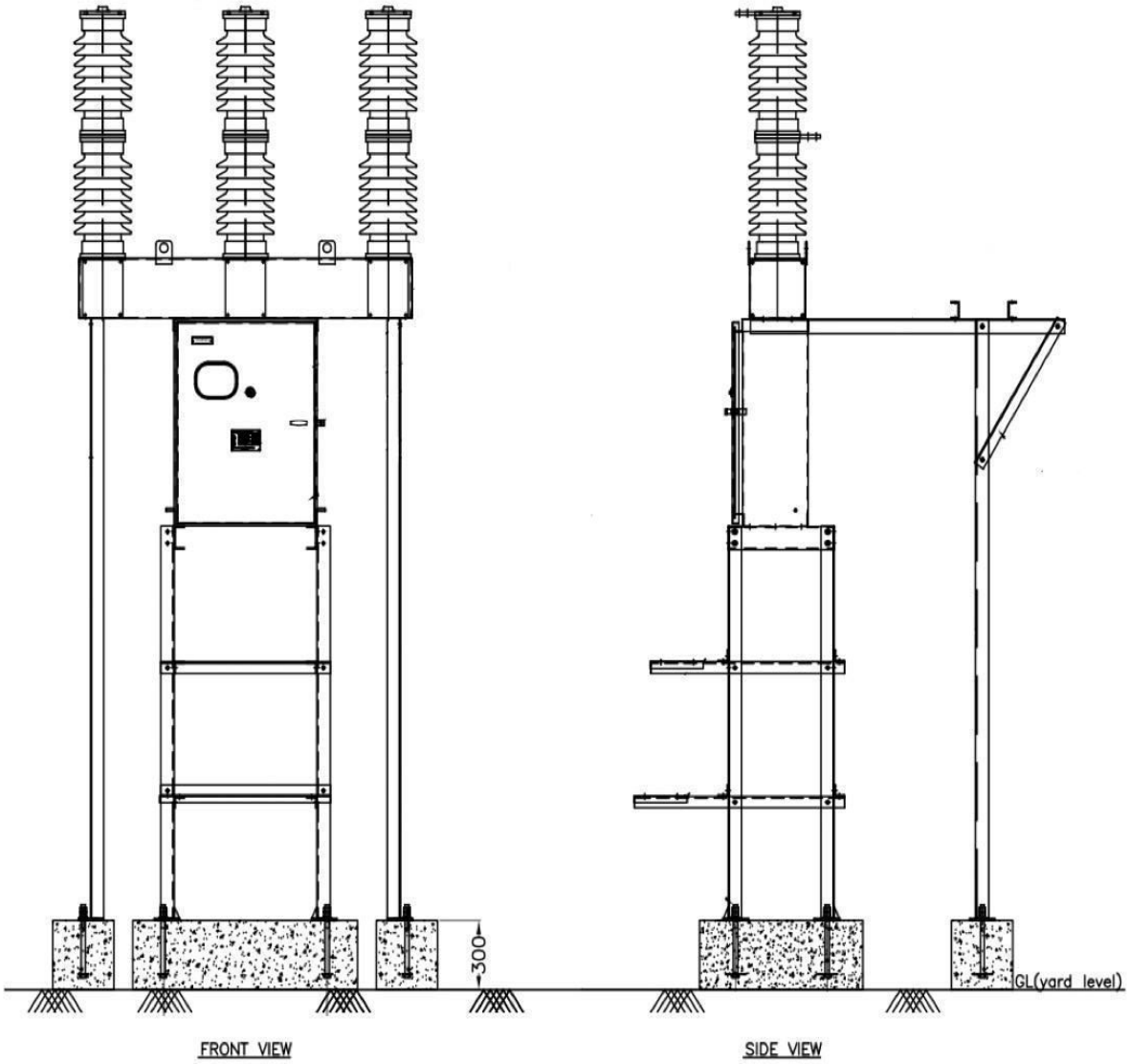
We confirm that there are no deviations apart from those detailed above

Seal of the Company:

Signature

Designation

21. SAMPLE DRAWING (For Tender purpose only)



STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1021

Specification Name : Technical Specification for 33KV Lightening Arrester (10 KA)

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
SRASTANTH MOHANTY	DEEPAK BADATYA	SMARANIKA ACHARYA	Vijender Goyal	KHAJAN BHARDWAJ	POURUSH GARG
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
21-01-2023	23-02-2023	01-03-2023	04-03-2023	18-03-2023	18-03-2023

CONTENTS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of 33kV,10kA, Station class-SL, (Station class-II) and 33 KV ,10 KA –SM (class –III), Metal Oxide Gap less Polymeric Lightning Arrester. The specific requirements are covered in the enclosed technical data sheet. Some of the parts that may have not been specifically included, but otherwise form part of the Lightening arrester as per standard practice or necessary for proper operation, will be deemed to be also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. Scope also includes transportation & unloading at store / site.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IEC 60099-4	Specification for surge arrestor without gap for AC System
IS 15086	Specification for Metal Oxide Gap less Lightning arresters for alternating current System
IS 6209	Method of Partial Discharge Measurement
IS 8704 & IS 731	Guide for selection of creepage distance of polymeric housing insulator.
ISO 48	Rubber, vulcanized or thermoplastic -- Determination of hardness (hardness between 10 IRHD and 100 IRHD).
IEC 60721-3-2	Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Transportation
IEC 60071	Insulation co-ordination -- Part 1 definitions, principles and rules; -- Part 2: Application Guide
IEC 60815-1	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions –Part 1: Definitions, information and general principles
IS 2629	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
IS 2633	Methods for testing uniformity of coating of zinc coated articles
IS 4759	Hot-dip zinc coatings on structural steel and other allied products

3. CLIMATIC CONDITIONS:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	1500mm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPWODL/TPNODL/TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
1	Installation	Outdoor
2	Reference standards (Latest Amend.)	IS 15086:Part.4(2017), IEC 60099
3	Arrester Type and Housing	Metal Oxide Gapless Cage type with Polymeric housing
4	Normal System Voltage	33 kV
5	Highest System Voltage	36 kV
6	Rated Frequency	50 Hz
7	Maximum Continuous Operating Voltage (M.C.O.V)	25 kV (rms)
8	Arrester Rating	30 kV (rms)
9	**Discharge Current**	
a	Nominal Discharge Current	10 kA
b	Switching impulse discharge current	0.5kA

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
10	Short Circuit rating	40 kA
11	**Voltage Withstand on Arrester Housing**	
a	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	70kV (rms)
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	170kV (Peak)
12	Lightning Impulse Protection Level (at 10kA)	115 kV
13	**Long Duration Current**	
a	Peak Current	400A
b	Virtual duration of Peak T	2000 T (Micro Sec)
14	High Current impulse Operating Duty	100 kA (Peak)
15	Creepage Distance of Arrester Housing	1116 min or 31mm/KV
16	Partial Discharge at 1.05 times M.C.O. V	<10 pc
17	Energy Absorption capacity (KJ/KV)	>=4KJ/KV
18	Repetitive charge transfer withstand (coloumbs),Qrs	>=1.0
19	**Temporary over voltage (TOV)**	
a	1 sec	51kVp
b	10 sec	49kVp
20	**Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave**	
a	at 5kA	85kVp
b	at 10kA	90kVp
c	at 20kA	100kVp
21	Maximum switching current impulse residual voltage in kVP at 500 A	73.2 KVp
22	Max. Cantilever Strength	325 kgF
23	Total height of the arrester	To be specified by bidder
24	Total weight of the arrester	To be specified by bidder
25	No. of Metal oxide blocks in arrester	To be specified by bidder
26	Rating of individual ZnO blocks used for assembly	To be specified by bidder
27	Power Losses of the Arrester in watt	To be specified by bidder
28	Type of Mounting	Pedestal
29	Material of Insulating base	UV resistant Fire retardant DMC
30	Insulating Terminal Cap	Polyolefin
31	Material of Nuts and bolts	Stainless Steel

SL. NO.	TECHNICAL PARTICULARS (Class-SM,Class-III)	DESIRED VALUE
1	Installation	Outdoor
2	Reference standards (Latest Amend.)	IS 15086:Part.4(2017), IEC 60099
3	Arrester Type and Housing	Metal Oxide Gapless Cage type and Polymeric housing
4	Normal System Voltage	33 kV
5	Highest System Voltage	36 kV
6	Rated Frequency	50 Hz
7	Maximum Continuous Operating Voltage (M.C.O.V)	25 kV (rms)
8	Arrester Rating	30 kV (rms)
9	**Discharge Current**	
a	Nominal Discharge Current	10 kA
b	Switching impulse discharge current	1kA
10	**Short Circuit rating**	40 KA
a	Reduced Short circuit currents	25 kA
b	Low short circuit current with a duration of 1 sec	600±200 kA
c	Prospective symmetrical fault current	40 kA for min 0.2 sec
11	**Voltage Withstand on Arrester Housing**	
a	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	70kV (rms)
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	170kV (Peak)
12	Lightning Impulse Protection Level (at 10kA)	115 kV
13	**Long Duration Current**	To be provided by bidder
a	Peak Current	To be provided by bidder
b	Virtual duration of Peak T	2400 T (Micro Sec)
14	High Current impulse Operating Duty	100 kA (Peak)
15	Creepage Distance of Arrester Housing	1116 min or 31mm/KV
16	Partial Discharge at 1.05 times M.C.O. V	<10 pc
17	Energy Absorption capacity (KJ/KV)	>=7KJ/KV
18	Repetitive charge transfer withstand (coloumbs),Qrs	1.6 Coloumbs
19	**Temporary over voltage (TOV)**	
a	1 sec	51kVp
b	10 sec	49kVp
20	**Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave**	
a	at 5kA	85kVp
b	at 10kA	90kVp

SL. NO.	TECHNICAL PARTICULARS (Class-SM,Class-III)	DESIRED VALUE
c	at 20kA	100kVp
21	**Maximum switching current impulse residual voltage in kVP** At 500 Amps	73.2KVp
22	Max. Cantilever Strength	325 kgF
23	Total height of the arrester	To be specified by bidder
24	Total weight of the arrester	To be specified by bidder
25	No. of Metal oxide blocks in arrester	To be specified by bidder
26	Rating of individual ZnO blocks used for assembly	To be specified by bidder
27	Power Losses of the Arrester in watt	To be specified by bidder
28	Type of Mounting	Pedestal
29	Material of Insulating base	UV resistant Fire retardant DMC
30	Insulating Terminal Cap	Polyolefin
31	Material of Nuts and bolts	Stainless Steel

5. GENERAL CONSTRUCTION:

5.1 Assembly:

The surge arresters shall conform in general to IEC-60099-4 ed 3.0

Surge arrester shall be supplied along with the insulating base, terminal connector, insulating terminal cap (Polyolefin) and necessary hardware. The Assembly consists of a stack of Metal Oxide elements arranged in a cage type design. All metal parts shall be of non-rusting and non corroding metal (All ferrous parts shall be Hot Dip Galvanized i.e. HDG). All nuts & bolts shall be with double spring washers. Bolts, screws and pins shall be provided with lock washers. Surge arrester construction shall be suitable to withstand Seismic Loading, Short Circuit Forces and wind load and the force exerted on the arrestor base and to the terminal imposed by the line conductor. All similar parts, particularly removable ones, shall be interchangeable.

Arresters shall be completely molded units with absolutely no air volume inside.

Arresters of tubular construction i.e arresters assembled in hollow core insulators with enclosed gas volume are not acceptable due to abrupt short circuit performance and poor sealing mechanism.

a) Housing shall be polymeric to provide thermal dissipation of heat generated in the metal oxide elements during over voltage and line discharge. Polymeric housing shall be free from flaws affecting the mechanical and electrical strength of the arrestor. Housing shall be capable to withstand the desired pollution stresses without flashover.Housing shall be capable to

withstand the temperature rise due to the non uniform field distribution, caused by the pollution on the surface of the housing. The rain sheds / petticoats shall be of polymeric material and shall confirm to IEC 60815.

b) The arrestor shall have thermal stability to withstand the heat generated from ZnO element due to continuous operating voltages and surges. It shall remain in undamaged condition, capable protective function.

c) Arrestors shall incorporate anticontamination feature to prevent arrestor failure,consequent to uneven voltage gradient across the stack in the event of contamination of the arrestor insulating material. These features shall be described in detail when submitting the Bid. Arrestors shall be capable of discharging over voltages occurring during switching of unloaded transformers, capacitors banks and long lines. No radio interferences shall be caused by the arrestors operating at the normal rated voltage.

d) MO resister diameter shall be mentioned by the bidder at the time of bidding along with its rating . MOV blocks shall have full metallization to have full face contact and to reduce contact resistance between adjacent discs.

e) Surge arresters shall be of cage type construction with no gas volume to ensure that the arrester does not explode during the short circuit test condition. The MOV blocks should be housed in cage of FRP rods appropriately crimped at both end fittings. The housing should be directly molded on stack of MOV blocks without any intermediate interface.

f) The end fittings shall be non-magnetic and of corrosion proof material. The end fittings used in polymer arrester shall be made from aluminum through machining process/pressure die-casting process. Sand casted and gravity casted end fittings are not acceptable due to poor microstructure and porosity issues.

5.2 EARTHING PADS:

Suitable earthing pads shall be provided in the lightning arrester and surge counter for earthing.

5.3 MECHANICAL STRENGTH:

a) The Lightning Arrester and it base shall withstand rated mechanical terminal load and electromagnetic forces without impairing their operational reliability.

b) The Lightning Arrester shall not come out of their positions by gravity, wind pressure, vibrations or reasonable shocks.

5.4 SURGE COUNTER :

a) Cyclometric 5 digit, non-resetting type counter, dial type surge counter shall be provided for each lightning arrestor for automatically recording the number of discharges. Each counter shall have a continuous leakage current indicator and shall not require an external power source of

operation. The value of leakage current beyond which the operation is abnormal shall be clearly marked in red colour on the detector.

b) Surge arrestor shall include a milli ammeter to monitor the leakage current. the milli –ammeter usually bare a red mark at the higher scale regions. Increase of leakage current to the red marked zone is essentially an indication that the arrestor is likely to attain the thermal runway condition. The qualitative information regarding the arrestor the arrestor health, obtained from the milli-ammeter, helps the user to take preventive measures before the arrestor failure.

c) Discharge counters and milli-ammeters shall be suitable for mounting on structure and shall be mounted at approximately 1.5 meters above ground level.The reading of the milli-ammeter and counters shall be visible through an inspection glass panel. The terminals shall be of robust and adequate size and shall be so located that incoming and outgoing connections are made with minimum possible bends.

d) The connecting conductor from lightning arrester earth terminal to the discharge counter incoming terminal shall be insulated for a minimum of 1.1 kV and this insulated conductor shall be supplied along with the arrester by the bidder. The surge arrester surge counter connection shall be done by means insulated multi strand copper cable of minimum size 35 sq.mm to withstand the fault currents during severe operating conditions. Length of the each cable should be considered as 3.5 mtr (min.). This copper cable shall be of black color and shall have fire retardant & UV resistance properties. Approved Make for this Cable is Polycab/KEI/KEC/Sterlite/Finolex/Havells. The cable shall have copper lugs at both ends.Bimetallic strips must be provided along with Surge Counter for bimetallic connections.

e) The surge arrester shall be designed to operate/ withstand without damage or change in performance for the high current impulse, long duration current impulse corresponding to the discharge class of the surge arrester and nominal discharged current corresponding to the discharge current of the surge with which it is used.

f) The external and internal parts of the surge monitor shall be hermetically sealed to withstand the atmospheric variation of temperature and humidity, rain and dust encountered in station in which they are installed. RTV silicon sealant to be used.The surge Monitor line terminal shall be solidly connected to the ground terminal of the surge monitor through an inbuilt metal oxide element satisfying the operational requirement.

5.5 CONNECTORS:

Aluminum terminal to be provided for Surge Arrestor. This terminal shall be connected via Standard bolted type connector (L-Shaped) connector with the network equipment via AAAC Panther Conductor. Therefore terminal connector shall be part of Surge Arrestor.

6. MARKING:

A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each Lightning Arrester in a visible position and shall carry all the information as specified in the standards. The letters on the rating plate shall be engraved black on the white/silver background. Fixing screws for outdoor use shall be of stainless steel or any other corrosion resistant metals. The Name plate shall be embossed with "PO no. with date" & "TPCODL/TPWODL/TPNODL/TPSODL",

The following information shall be mentioned on the Name Plate

a) Continuous operating Voltage
b) Rated Voltage
c) Rated Frequency
d) Nominal Discharge Current
e) Pressure relief rated current in kA r.m.s.
f) Manufacturer's Name
g) Type and Identification of the complete
h) Year/Month of Manufacture
i) Serial Number.
j) Warrantee/guarantee clause

7. TESTS:

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components and fittings shall also be type tested as per the relevant standards. Following tests shall necessarily be conducted on lightning arrestor in addition to others specified in IS/IEC standards: -

7.1 ACCEPTANCE TESTS

Acceptance test shall be as per cl. 9.2 of IEC 60099-4 ed 3 as mentioned below:

a) Measurement of reference voltage test.
b) Residual Voltage test on complete arrestor.
c) Partial Discharge Test
d) Visual Inspection
e) The resistive current drawn by the arrester at rated voltage
f) Peel off test (removal of housing) shall be performed on 1 random samplesfrom supplied lot to confirm cage design
g) Measurement of power-frequency voltage on the arrester at the reference current
h) Lightning impulse residual voltage on the arrester at nominal discharge current (wet power frequency voltage test)

All acceptance tests shall be witnessed by the Purchaser's or his authorized

representative. The above mentioned test shall be made on the nearest lower whole number to the cube root of the number of arresters to be supplied as per IEC-60099-4.

7.2 ROUTINE TESTS

Routine test shall be as per cl. 9.1 of IEC 60099-4 ed 3 as mentioned below:

a) Measurement of reference voltage test
b) Residual Voltage Test on complete arrester
c) Internal partial discharge test.
d) The resistive current drawn by the arrester at rated voltage
e) The power-frequency voltage

7.3 TYPE TESTS

a) Insulation Withstand Test of Housing (Lightning impulse – (cl. 8.2.8; IEC 60099-4 ed.3))
b) Residual voltage test (cl. 8.3.2, cl. 8.3.3., cl 8.3.4; IEC 60099-4 ed.3)
c) Long duration current impulse withstand test (cl. 8.4; IEC 60099-4 ed.3)
d) Operating duty test (cl. 8.7; IEC 60099-4 ed.3)
e) Short circuit test (Low (600A)/High Current (40kA) (cl. 8.10; IEC 60099-4 ed.3)
f) Test for Bending moments (cl. 8.11; IEC 60099-4 ed.3)
g) Weather aging test on full arrester 1000 hrs (cl. 8.12 and annexure-C; IEC 60099-4 ed.3)
h) Partial Discharge Test (cl. 8.15; IEC 60099-4 ed.3)
i) Wet power frequency voltage test (cl. 8.2.8; IEC 60099-4 ed.3)
j) Power frequency (voltage VS time curve) (cl. 8.8; IEC 60099-4 ed.3)
k) Test to verify repetitive charge transfer withstand (cl. 8.5; IEC 60099-4 ed.3)
l) Heat Dissipation behavior verification of test sample (cl. 8.6; IEC 60099-4 ed.3)

8. TYPE TEST CERTIFICATES:

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

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPWODL/TPNODL/TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPWODL/TPNODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPWODL/TPNODL/TPSODL or its authorized

representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPWODL/TPNODL/TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPWODL/TPNODL/TPSODL
c) TPCODL/TPWODL/TPNODL/TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPWODL/TPNODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for ' free replacement' for another period of THREE years from the end of gurantee period for any 'latent defects' if noticed by the company.

12. PACKING AND TRANSPORT:

Bidder shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at

site. The material should be packed in vertical position in individual box in such a way that the shape of rain shed does not get deformed during transportation and storage.

13. TENDER SAMPLE:

NA

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

The successful bidder will have to submit technical compliance document and drawing as per RC line items for getting approval before mass manufacturing.

Manufacturing shall start only after getting CAT-B approved drawings or as per intimation from TPCODL/TPWODL/TPNODL/TPSODL. .

17. SPARES, ACCESSORIES AND TOOLS

Spares:Not applicable.

Service Level Agreement

- In case of any failure vendor shall report to site, within 24 hours of receipt of reporting of failure occurrence.
- Vendor shall provide detailed root cause analysis of the fault within 15 days from the date of occurrence of the fault/ failure.
- Any spare part replacement, testing and its commissioning to be done by the vendor only, without any price implication to the purchaser.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on

TPCODL/TPWODL/TPNODL/TPSODL specifications and statutory requirements and shall be submitted with the bid:

a) Completely filled in Technical Particulars
b) General description of the equipment and all components including brochures
c) General arrangement drawing for Surge Arrestor (SA)
d) Bill of material
e) Experience List
f) Type test certificates

Drawings / documents to be submitted after the award of the contract are as under:

List of Drawings/Parameters to be submitted:

S.No.	Description	For Approval	For Review Information	For Final Submission
1	Technical Particulars	✓	✓	✓
2	General Arrangement drawings including cross sectional view, mounting arrangement, Zno Block drawing, Surge Counter drawing, Name plate along with detailed Bill of Material)	✓	✓	✓
3	Terminal and Connection Drawing	✓	✓	✓
4	Manual/catalogue	✓	✓	✓
5	Installation/Commissioning Manuals	✓	✓	✓
6	Instruction for use	✓	✓	✓
7	Transport / Shipping dimension drawing	✓	✓	✓
8	QA & QC Plan	✓	✓	✓
9	Routine, Acceptance and Type Test Certificates	✓	✓	✓

Additional Documents to be submitted:

a) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer.
b) Type test certificates of the raw materials and bought out accessories.
c) The successful Bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish all relevant drawings/parameters/calculation to TPCODL/TPWODL/TPNODL/TPSODL for approval.

Instruction Manuals:

Bidder shall furnish softcopies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings

pertaining to the main equipment as well as auxiliary devices.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

	GENERAL TECHNICAL PARTICULARS		
SL. NO.	**TECHNICAL PARTICULARS**	**SM Class (Class-III)**	**SL Class (Class-II)**
1	Installation		
2	Reference standards (Latest Amend.)		
3	Arrester Type and Housing		
4	Normal System Voltage		
5	Highest System Voltage		
6	Rated Frequency		
7	Maximum Continuous Operating Voltage (M.C.O.V)		
8	Arrester Rating		
9	**Discharge Current**		
a	Nominal Discharge Current		
b	Switching impulse discharge current		
10	Short Circuit rating		
11	**Voltage Withstand on Arrester Housing**		
a	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165		
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)		
12	Lightning Impulse Protection Level (at 10kA)		
13	**Long Duration Current**		
a	Peak Current		
b	Virtual duration of Peak T		
14	High Current impulse Operating Duty		
15	Creepage Distance of Arrester Housing		
16	Partial Discharge at 1.05 times M.C.O. V		
17	Energy Absorption capacity (KJ/KV)		
18	Repetitive charge transfer withstand (coloumbs),Qrs		
19	**Temporary over voltage (TOV)**		
a	1 sec		
b	10 sec		
20	**Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave**		

a	at 5kA		
b	at 10kA		
c	at 20kA		
21	Maximum switching current impulse residual voltage in kVP at 500 A		
22	Max. Cantilever Strength		
23	Total height of the arrester		
24	Total weight of the arrester		
25	No. of Metal oxide blocks in arrester		
26	Rating of individual ZnO blocks used for assembly		
27	Power Losses of the Arrester in watt		
28	Type of Mounting		
29	Material of Insulating base		
30	Insulating Terminal Cap	Polyolefin	
31	Material of Nuts and bolts	Stainless Steel	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1022

Specification Name : Technical Specification For Heat Shrinkable Straight through Joint & Termination for 33KV Power Cable

BARSHA BANDITA	MILAN MAITY	K GOVINDARAJ	Syed Mohammed Yousuf Raja	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
10-01-2023	10-01-2023	11-01-2023	12-01-2023	12-01-2023	12-01-2023

CONTENTS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of 33 kV Power Cable-Heat Shrinkable Straight Through Joint & termination with all accessories and necessary training for trouble free & efficient performance.

2. APPLICABLE STANDARDS:

The equipments covered in this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest revisions of relevant Indian Standards/ IEC and shall conform to the regulations of local statutory authorities.

Sl. No	IEC/IS	Description
1	IS-13573(part2): 2011	Test Requirements-Cable Accessories for Extruded Power Cables (for working voltages from 3.3 kV up to and including 33 KV)
2	IS 7098(part2):2011	Cross-linked polyethylene insulated thermoplastic sheathed cables (for working voltages from 3.3 kV up to and including 33 KV)
3	IS 692: 1994	Paper insulated lead sheathed cables for rated voltages up to and including 33 KV
4	IEC 60502: 2009	Power cables with extruded insulation and their accessories for rate voltages from 1 kV up to 30 kV
5	ASTM D-2303	Standard Test Methods for Liquid Contaminant, Inclined plane track and Erosion of insulating materials
6	ASTM D-2671	Standard Test Methods for Heat Shrinkable Tubing
7	ENA TS 09-13.1981	High Voltage Heat Shrinkable Components for use with HV solid typ cables up to and including 33 kV
8	IEC 61238(part1): 2003	Test methods and requirements - Compression and mechanical connectors for power cables for rated voltages up to 30 kV. For in house connectors, third party certification is mandatatory.
9	IS 2633:1986	Method for testing of uniformity of zinc coating
10	IS 4826: 1979	Hot dipped galvanized coatings on round steel wires
11	IS 12444:1988	Continuously Cast and Rolled Electrolytic Copper Wire Rods for electrical conductors

12	IS 191	Copper
13	IS 10810	Methods of test for cables
14	IEC 60216 part 2	Determination of thermal endurance properties of electrical insulat materials
15	IEC 60216 part 8	Instructions for calculating thermal endurance characteristics using simplified procedures

3. CLIMATIC CONDITIONS:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed tosun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for

outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4. GENERAL TECHNICAL REQUIREMENTS:

General design and sizes of 33 kV XLPE insulated cables operated in TPCODL/ TPWODL/ TPNODL/ TPSODL Network are as mentioned below:

A) XLPE Insulated Underground Cables as per IS 7098-2: 33 KV (E)

A2XCWY-(Aluminum stranded compacted conductor, XLPE insulation, copper tape screen, wire Gl armour, PVC sheath)

A2XCWAY (Aluminum stranded compacted conductor, XLPE insulation, copper tape screen, wire Aluminum armour, PVC sheath)

CAS 33 kV 1Core- 300, 400 sq.mm (Aluminum stranded compacted conductor, XLPE insulation, copper tape screen, Corrugated Aluminum armour, PVC sheath

i. 3CX35 sq.mm A2XCWY
ii. 3CX50 sq.mm A2XCWY
iii. 3CX70 sq.mm A2XCWY
iv. 3CX95 sq.mm A2XCWY
v. 3CX185 sq.mm A2XCWY
vi. 3CX240 sq.mm A2XCWY
vii. 3CX300 sq.mm. A2XCWY
viii. 3CX400 sq.mm. A2XCWY
ix. 1CX300 sq.mm. A2XCWaY
x. 1CX400 sq.mm. A2XCWaY and Corrugated Aluminum Armour
xi. 1CX630 sq.mm. A2XCWaY
xii. 1CX1000 sq.mm. A2XCWaY

Type & Size of cable	Type of Joint
33 kV 3C X 185, 3C X 240, 3CX300 and 400 sq.mm. XLPE insulated cable	Indoor termination with 185-400 sq.mm. tinned coated mechanical connector

Type & Size of cable	Type of Joint
	Straight through Joint with 185-400 sq.mm. tinned coated mechanical connector
	Outdoor termination with 185-400 sq.mm. tinned coated mechanical connector
33 kV 3CX35, 3CX50, 3CX70, 3CX95, 3C X150 XLPE insulated cable	Indoor termination with Aluminium crimping ferrule
	Straight through Joint with Aluminium crimping ferrule
	Outdoor termination with Aluminium crimping ferrule
33 kV 1CX300, 1CX400 Sq.mm XLPE Insulated Cable	Indoor termination with 185-400 sq.mm. tinned coated mechanical connector
	Straight through Joint with 185-400 sq.mm. tinned coated mechanical connector
	Outdoor termination with 185-400 sq.mm. tinned coated mechanical connector
33 kV 1CX630 Sq.mm XLPE Insulated Cable	Indoor termination with 630 sq.mm. tinned coated mechanical connector
	Straight through Joint with 630 sq.mm. tinned coated mechanical connector
	Outdoor termination with 630 sq.mm. tinned coated mechanical connector
33 kV 1CX1000 Sq.mm XLPE Insulated Cable	Indoor termination with 1000 sq.mm. tinned coated mechanical connector
	Straight through Joint with 1000 sq.mm. tinned coated mechanical connector
	Outdoor termination with 1000 sq.mm. tinned coated mechanical connector
PILCA to XLPE transition joints	Screened Transition joint 3CX300/400 sq.mm. XLPE insulated cable with 3CX300/400 sq.mm PILCA cable (with mechanical connector)

The jointing kit containing heat shrinkable tubing, mastics, lugs, mechanical connector and other accessories for making a complete joint and termination shall be designed to meet TPCODL/TPWODL/TPNODL/TPSODL specification, ENA TS 09-13, IEC 60502, IEC 61238 part1 and IS 13573, part 2 and other relevant standards. Cable Joint and termination material shall not be adversely affected in any manner even after contact with material used in cable construction and material used as accessories in the construction of cable joints and terminations and there will be no chance of corrosion developing on any metal surface.

Assembled jointing kit components shall perform without distress in system with parameters

(mentioned below):

S. No.	Parameter	Units	Requirement
1	Max Withstand System Voltage	KV	36
2	Partial Discharge at 1.73 Uo	pC (Pico-coulombs)	<10
3	Impulse Peak Withstand	KV	170
4	Continuous operation withstand Temperature	°C	90 °C
	Short Circuit withstand temperature	°C	250 °C
5	Short Circuit Withstand Current	KA/1Sec	As per Size of the Conductor
6	Storage Temperature Range	°C	-10°C to +45°C
7	Shelf life of kit components excluding mastic and solution	Years	Min.5
8	Shelf life of mastic and solution	Years	Min.2

A. General Technical Particular for Heat Shrinkable Insulation Tubing/Sleeves/Wrap around Sleeve:

S. No.	Parameter	Requirement
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Internal dia of tube after full recovery	Shall not be higher than as specified in approved BOM/GTP
4	Longitudinal change	10% Max.
5	Electric Strength	10KV/MM(Min.)
6	Tensile Strength	10N/mm2 (Min.) [8N/mm2 for anti-tracking]
7	Ultimate Elongation	200%(Min.)
8	Heat Shock	No Splitting, Cracking, Dripping or flowing after 30 mins. At 200 °C (Min.) (For stress control tube: 30 Mins. At 200 °C Minimum)
9	Low Temperature Flexibility	No cracking after 4 Hrs at -20Deg.C (Max.)
10	Tracking Resistance	No tracking, erosion to top surface or flame failure after 1 hr. @ 2.5KV 1 hr. @ 2.7KV 1 hr. @ 3KV 20 min @ 3.25KV

S. No.	Parameter	Requirement
11	Volume Resistivity	$1x10^{10}$ Ohm-meter (min.) For stress control tube VR: $1X10^{7}$ Ohm-meter Min.)
12	Flame Retardant (Applicable only for Anti tracking Tubes/ sleeves)	After 1 min. burn: Burnt or charred length 250mm Max.

B. General Technical Particular for Heat Shrinkable Moulded Components/Breakouts/Weather Sheds:

S. No.	Parameter	Requirement
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Internal dia of tube after full recovery	Shall not be higher than as specified in approved BOM/GTP
4	Longitudinal change	25% Max.
5	Electric Strength	10 KV/MM(Min.)
6	Tensile Strength	8N/mm2 (Min.)
7	Ultimate Elongation	200 %(Min.)
8	Heat Shock	No Splitting, Cracking, Dripping or flowing after 30 mins. At 250 ^{o}C Min.
9	Low Temperature Flexibility	No cracking after 4 Hrs at -20^{o}C(Max.)
11	Volume Resistivity	$1x10^{10}$ Ohm-meter(min.)
12	Flame Retardant (for anti-tracking moulded components)	After 1 min. burn: Burnt or charred length 250mm Max.

5. GENERAL CONSTRUCTION:

a) Termination kit shall be designed based on heat shrink technology and shall be suitable for installation for 33 kV, three core and single core aluminum conductor, XLPE insulated (in line with TPCODL/TPWODL/TPNODL/TPSODL Specification for underground IS 7098-part 2. IS 13573 Part 2 &3).

b) Length of 33 KV terminations (from bottom of breakout to center of lug hole) shall be minimum:

i) 1 core cable I/D 900 mm
ii) 1 core cable O/D 1100 mm
iii) 3 core cable (I/D) Indoor terminations: 1100 mm
iv) 3 core cable O/D (Outdoor terminations): 1500 mm

- **Components of Termination Kit:**

<table>
<tr><th>S. No.</th><th>Components</th><th>Requirement</th></tr>
<tr><td>1</td><td>Heat Shrinkable insulating tube/Sleeve</td><td>a) Surface of material: shall be smooth and free from protrusion, voids and nicks.
b) Wall thickness ratio (before recovery) of all sleeves/tubes shall not be less than 60% st any two points of measurement.
<table>
<tr><th>Sl no</th><th>Size</th><th>Tube type</th><th>Qty</th><th>Size (min in mm)</th><th>OD (Before/After shrinking) mm</th></tr>
<tr><td>1</td><td>3C 300/400 sqmm I/D & O/D</td><td>Stress control tube</td><td>3</td><td>300</td><td>65/30</td></tr>
<tr><td>2</td><td>3C 300/400 sqmm O/D</td><td>Anti tracking tube</td><td>3</td><td>2000</td><td>70/30</td></tr>
<tr><td>3</td><td>3C 300/400 sqmm O/D</td><td>Anti tracking tube</td><td>3</td><td>900</td><td>70/30</td></tr>
<tr><td>4</td><td>3C 300/400 sqmm I/D</td><td>Anti tracking tube</td><td>3</td><td>1200</td><td>70/30</td></tr>
<tr><td>4</td><td>1C 300/400 sqmm O/D & ID</td><td>Stress control tube</td><td>1</td><td>300</td><td>65/30</td></tr>
<tr><td>5</td><td>1C 300/400 sqmm O/D & ID</td><td>Anti tracking tube</td><td>1</td><td>1300</td><td>70/30</td></tr>
<tr><td>6</td><td>1C 300/400 sqmm O/D & ID</td><td>Insulating tube</td><td>3</td><td>300</td><td>35/12</td></tr>
</table>
• For lower sizes length & OD of tubes should be adjusted proportionally.
• O/D – Outdoor termination , I/D indoor termination</td></tr>
<tr><td>2</td><td>Tinned coated Mechanical connector/ Compression lugs</td><td><u>Mechanical connector:</u>
a) Tinned coated Aluminium Alloy 185-400 mm^2/ 630mm^2/1000mm^2
b) Type tested as per IEC 61238(part1):2003
c) Dimensions shall be as annexure-I of this specification.
d) Approved make NILLED, PFISTERER, NEXANS, TYCO</td></tr>
</table>

		(GERMANY) **<u>Compression Lugs:</u>** a) Material: Aluminium b) All Aluminum lugs with anti-corrosive paste shall be long barrel type as per IS 8309: 2003. c) Dimensions shall be as annexure-I of this specification. d) 1000mm² Aluminum lugs shall be without palm hole. e) Conductivity of ferrule shall be as per IS 8309:2003.
3	**Lug Seal, Anti-tracking tube, weather sheds, stress control tube**	a) Heat shrinkable b) Fire resistant and weather resistant as per ENA TS 09-13 c) For lug seals, weather sheds & anti tracking tube
4	**Mastic tape**	a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant. b) Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13. c) Stress control mastic tape for semicon area d) Moisture sealing mastic for lugs/connectors
5	**Heat Shrink Breakout**	a) Heat shrinkable b) Fire resistant and weather resistant as per ENA TS 09-13 – for lug seals, weather sheds and Anti- tracking tubes c) Adhesive coated Breakouts shall be provided on outer sheath of the cable to prevent water ingress.
6	**Tinned coated copper braid**	a) Shall be completely insulated with adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug at one end. b) Fire resistant and weather resistant as per ENA TS 09-13 c) Size and length as per below: For 3C cables: 70 mm² X 750 mm X 1 Run for 150/185/240/300/400/630 mm² cables. 50 mm² X 750 mm X 1 Run for below 150 sqmm. For 1C cables: 70mm² X 750 mm X 1 Run for 300/400/630 & 1000 mm² cables. Additionally 3 nos x 150 mm2 Al lugs with sealing sleeves/mastic for armor back fold earth bonding.
7	**Tinned coated copper braid as a leakage current collector**	a) Leakage current collector tinned copper braid b) 1R x 7 mm² x 150 mm per core shall be provided for terminations
8	**Tinned copper wire mesh**	Minimum 2" X 0.5m I/D & 0.7m O/D (2.5mm²) tinned copper mesh shall be provided on armor circumference beneath the copper braid.
9	**Sub-kit components**	a) GI Solid Collet dia of dia as per cable OD (1no only in 3C cables),

		b) Worm drive clip/ Jubilee clip of stainless steel (2nos) c) Compatible support rings (Aluminium for single core and GI for three core cables) d) Soldering on copper screen is not acceptable e) Constant pressure roll shall be provided for screen connections as per compatible size. For 3 core- 3nos, for 1C -1nos f) Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same g) Tinned copper binding wire 20 SWG, qty 50gms- 3C, 25gms- 1C h) Nylon string OD 1mm, 2mtr i) Silicone grease, 30 gms- 3C, 10gm -1C j) Cleaning liquid k) Vinyl tape l) Al oxide cloth m) Other necessary items
10	**Submission of BOM and instruction sheet**	a) Participating bidder shall submit BOM(during pre bid) with dimensions of each size and quantity of all components b) BOM shall be approved during tender evaluation and during GTP approval c) Instruction sheet should be submitted in each kit.

- **Components of Straight Through Jointing Kit:**

<table>
<tr><th>Sl. no</th><th>Components</th><th>Requirement</th></tr>
<tr><td>1</td><td>Heat Shrinkable insulating tube/Sleeve</td><td>a) Surface of material: shall be smooth and free from protrusion, voids and nicks.
b) Recovered thickness: Recovered thickness of insulation tubes over ferrule or connector circumference shall not be less than 10.56 mm at any point of measurement.
c) Wall thickness ratio (before recovery) of all sleeves/tubes shall not be less than 60% st any two points of measurement.

Following tubes shall be included in BOM
<table>
<tr><th>Sl no</th><th>Size</th><th>Tube type</th><th>Qty</th><th>Size (min in mm)</th><th>OD (Before/After shrinking) mm</th></tr>
<tr><td>1</td><td>3C 300/400 sqmm</td><td>Stress control tube</td><td>3</td><td>650</td><td>60/25</td></tr>
</table>
</td></tr>
</table>

		<table><tr><td>2</td><td>3C 300/400 sqmm</td><td>Red Insulating tube</td><td>6</td><td>640</td><td>65/27- 3nos, 85/37- 3nos</td></tr><tr><td>3</td><td>3C 300/400 sqmm</td><td>Dual wall tube</td><td>3</td><td>640</td><td>110/40</td></tr><tr><td>4</td><td>1C 300/400 sqmm</td><td>Stress control tube</td><td>1</td><td>60</td><td>60/25</td></tr><tr><td>5</td><td>1C 300/400 sqmm</td><td>Red Insulating tube</td><td>2</td><td>590</td><td>66/27, 85/37</td></tr><tr><td>6</td><td>1C 300/400 sqmm</td><td>Dual wall tube</td><td>1</td><td>580</td><td>110/40</td></tr></table> • For lower sizes length & OD of tubes should be adjusted proportionally.
2	**Tinned coated Mechanical connector/ Compression lugs**	**Mechanical connector:** a) Tinned coated Aluminium 185-400 mm^2/ 630mm^2/1000mm^2 b) Type Tested as per IEC 61238(part1):2003 c) Dimensions shall be as annexure-I of this specification. d) Approved make NILLED, PFISTERER, NEXANS, TYCO (GERMANY) **Compression Lugs:** a) Material: Aluminium b) All Aluminum lugs with anti-corrosive paste shall be long barrel type as per IS 8309: 2003. c) Dimensions shall be as annexure-I of this specification. d) 1000mm2 Aluminum lugs shall be without palm hole. e) Conductivity of ferrules/mechanical connectors shall be as per IS 8309: 2003.
3	**Mastic tape**	a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant. b) Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13. c) Stress grading mastic should be provided for both connector portion and semicon portion. d) Water resistant sealing mastic shall also be provided.for end sealing in straight through kit and lug sealing in termination kit.
4	**Tinned coated copper braid for GI armour continuity/**	Tinned coated copper braid for GI armor continuity: Uniformly tinned coated copper braid shall be provided for armor continuity.

	Ferrules for Aluminium armour continuity	a) Wrap tinned copper wire mesh with 50% overlap around the joint area and continue 25mm over the copper screen on both sides. Bind the copper wire mesh on copper screen with CFS a) Uniformly tinned coated wire mesh shall be provided for armor continuity. b) Tinned copper braid shall be provided for wrapping over armor circumference beneath the copper braid and size shall be as below: For 3C cables: 70 mm² X 2600 mm X 1 Run for 150/185/240/ 300/400 mm² cables. For 1C cables: 70mm² X 2500 mm X 1 Run for 630 mm² &1000 mm² cables. Additionally 2 nos x 150 mm² Al lugs for aluminium armor continuity.
5	**Tinned coated copper braid for screen continuity**	7 mm² x 150 mm- 6 nos. for 3 core only
6	**Tinned copper wire mesh**	Uniformly tinned coated copper braid shall be provided for screen continuity. Minimum 2.5mm2 tinned copper mesh shall be provided on both sides of armor circumference beneath the copper braid. For 3C 2'' X 10mtr (min 2.5 sqmm) For 1C 2'' X 12mtr (min 2.5 sqmm) 2nos & 2" X 10mtr (min 2.5 sqmm) 1 no
7	**GI wire mesh/ copper wire mesh**	a) Mechanical protection shall be provided in GI armored cables by means of heavily zinc coated GI mesh as per IS 4826 b) In 1C Aluminium armored cables, for mechanical protection, copper wire mesh shall be provided as mentioned in Sl no 5. c) For 3C W 3'' X 15mtr (heavily zinc coated) minimum
8	**Breakouts**	Adhesive coated breakout shall be provided on outer sheath at both sides on the cable to prevent water ingress. Qty. 2nos
9	**Nesting & end sealing tube**	a) Hot melted adhesive coated bested end sealing tube for protection of moisture ingress in cores. b) Length 200mm minimum c) 6 nos for 3C, 2 nos for 1C
10	**Wrap around insulating tube/Sleeve as outer most tube**	Material: Cross-linked polyolefin (Heat Shrinkable) as a waterproof seal. Shape: Wrap around form with hot-melt adhesive liner on the inner surface of the sleeve (Upon heating, the sleeve shrinks and the adhesive melts, creating a water-tight bond between the sleeve and the

		cable). Stainless steel channel shall be provided along the wrap around to close the sleeve during installation. Excellent mechanical and corrosion protection, and atmospheric sealing. High split resistance. *Note: Overlapping of wrap around sleeve is not acceptable. Length of one sleeve: Minimum 1000mm, Qty. 2nos Insulating sleeve of 500 mm should be provided to cover mid joints Portion
11	**Sub kit components**	a) GI Solid Collet dia of dia as per cable OD (2nos only in 3C cables), b) Worm drive clip/ Jubilee clip of stainless steel (3 core- 6nos, 1C 2nos), c) Compatible support rings (Aluminium for single core and GI for three core cables) d) Soldering on copper screen is not acceptable e) Constant pressure roll shall be provided for screen connection as per compatible size.. For 3 core- 6nos, for 1C -2nos f) Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same a) Tinned copper binding wire 20 SWG, qty 50gms b) Nylon string OD 1mm, 2mtr c) Silicone grease, 30 gms d) Cleaning liquid e) Vinyl tape f) Al oxide cloth g) Other necessary items
12	**Submission of BOM and instruction sheet**	a) Participating bidder shall submit BOM(during pre bid) with dimensions of each size and quantity of all components b) BOM shall be approved during tender evaluation and during GTP approval c) Instruction sheet should be submitted in each kit.

SL no	Cable size	Joint type	Connector type
1	3C 185/240/300/400	Straight through, I/D termination, O/D termination	Mechanical
2	1C 300/400/630/1000	Straight through, I/D termination, O/D termination	Mechanical
3	3C 35/70/95/150 sqmm	Straight through, I/D termination, O/D termination	Crimping

6. MARKING:

Following details shall be printed in the box:

a) Manufacture's name and address.
b) Month & Year of Manufacturing
c) Voltage Grade
d) PO No.
e) "TPCODL/ TPWODL/ TPNODL/ TPSODL" Name

HS Sleeves/tubes and breakout components shall be embossed with:

a) Manufacture's name and address.
b) Month & Year of Manufacturing
c) Batch No. / Lot No.
d) Shrink Ratio
e) Size
f) Type
g) "TPCODL/ TPWODL/ TPNODL/ TPSODL" Name

7. TESTS:

All Routine, Acceptance & Type tests shall be carried out in accordance with the Relevant IS/IEC/ ENA TS 09-13. All the components shall also be type tested as per the relevant standards mentioned below. Following tests shall be necessarily conducted on the Joint and Termination Kits In addition to others specified in IS/IEC/ENA-TS 09-13 standards:

7.1 ACCEPTANCE TESTS:

Test	Clause No.	Reference Standard
Visual inspection	3.15	ENA -TS 09-13
Physical verification of kit contents and dimensions	As per TPCODL/TPWODL/TPNODL/TPSODL approved BOM	
Electric Strength test	3.4	ENA -TS 09-13
Ultimate Elongation tests	3.12	ENA -TS 09-13
Tensile Strength	3.12	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Wall thickness ratio	3.3	ENA -TS 09-13
Expanded and recovered diameters	3.3	ENA -TS 09-13
Longitudinal change after recovery	3.3	ENA -TS 09-13
Heat shock test	3.7.1/3.7.2	ENA -TS 09-13
Low temperature flexibility	4.5	ENA -TS 09-13
Insulation build up thickness after shrink on Ferrule	8.1	IS 10810 -6
Flame retardant test on anti-tracking tubes and anti-tracking moulded components and earth braid protective tube after shrink on mandrill for terminations	3.5.1/ 3.5.2	ENA -TS 09-13
Area measurement of tinned copper braids (Area of one wire x no. of wires x no. of carriers)	As per TPCODL/TPWODL/TPNODL/TPSODL specification/ approved BOM	
Conductivity test on ferrules/ connectors/ lugs	8.3	IS 8309/ As per IEC 61238 part 1
Uniformity of zinc coating on GI mesh (Manufacturer's TC to be provided)	4.1	IS 2633

7.2 ROUTINE TESTS

Test	Clause No.	Reference Standard
Visual inspection of tubing and moulded components for free from pin holes, cracks, nicks, protrusion and other defects	3.15	ENA -TS 09-13
Dimension check	As per TPCODL/TPWODL/TPNODL/TPSODL	

Test	Clause No.	Reference Standard
	approved BOM	
Electric Strength	3.4	ENA -TS 09-13
Ultimate Elongation	3.12	ENA -TS 09-13
Tensile Strength	3.12	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Wall thickness ratio	3.3	ENA -TS 09-13
Expanded and recovered diameters of tubes	3.3	ENA -TS 09-13

7.3 TYPE TESTS:

(i) Terminations & Straight Through joints

Test	Clause No.	Reference Standard
Conductor resistance with Ferrule/Lugs/Mechanical connectors	4.1	IS 13573(Part-2)
AC Voltage withstand Test (Air)	4.2	IS 13573(Part-2)
AC Voltage withstand test (under wet conditions) (for outdoor termination only)	4.2	IS 13573(Part-2)
Partial Discharge	7.0	IS 13573(Part-2)
Impulse voltage test	6	IS 13573(Part-2)
Heat Cycle test in air and water	9.1 and 9.2	IS 13573(Part-2)
Thermal Short Circuit Test for Screen	10	IS 13573(Part-2)
Thermal Short Circuit Test for Conductor	11	IS 13573(Part-2)
DC Voltage Withstand	5	IS 13573(Part-2)
Dynamic short circuit test	12	IS 13573(Part-2)
Thermal Endurance test	IEC 60216 part 2 & 8	
Salt fog test (Only for Outdoor terminations only)	13	IS 13573(Part-2)

(II) Kit Components

a) For Tubing and Moulded Components

Test	Clause No.	Reference Standard
Corrosion Resistance	3.1	ENA -TS 09-13
Density	3.2	ENA -TS 09-13
Dimensions	3.3	ENA -TS 09-13
Electric Strength	3.4	ENA -TS 09-13
Flame Retardance	3.5	ENA -TS 09-13
Heat Shock	3.7	ENA -TS 09-13
Low temperature flexibility	3.8	ENA -TS 09-13
Relative Permittivity	3.9	ENA -TS 09-13
Tensile strength and Ultimate elongation	3.12	ENA -TS 09-13
Thermal Ageing	3.13	ENA -TS 09-13
Tracking Resistance	3.14	ENA -TS 09-13
Visual Examination	3.15	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Water Absorption	3.17	ENA -TS 09-13

b) For Compression Lugs, Compression Ferrules and Mechanical connectors

Test	Reference Standard
Mechanical Pull Test	IEC 61238, part - 1
Heat cycle Test (1000 Nos.)	IEC 61238, part - 1
Short circuit Test	IEC 61238, part - 1

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA** as per relevant IS. However, TPCODL/ TPWODL/ TPNODL/ TPSODL/ TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report / Lab having accreditation from ILAC Signatory under exceptional circumstances after due diligence/ scrutiny by DISCOM. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/ TPWODL/ TPNODL/ TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/ TPWODL/ TPNODL/ TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser

and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/ TPWODL/ TPNODL/ TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/ TPWODL/ TPNODL/ TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/ TPWODL/ TPNODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPWODL/TPNODL/TPSODL
c) TPCODL/TPWODL/TPNODL/TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/ TPWODL/ TPNODL/ TPSODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of at least 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract whichever is later.

Further Bidder shall also stand guarantee towards poor workmanship in installation of straight through joint and terminations installed by bidder's jointer up to 60 months from the date of installation.

Bidder shall be liable to undertake to replace/rectify such defects at own costs, within mutually agreed time frame, and to the entire satisfaction of TPCODL/TPWODL/TPNODL/TPSODL, failing which TPCODL/TPWODL/TPNODL/TPSODL shall be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further

be responsible for free replacement for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company.

12. PACKING AND TRANSPORT:

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE:

Bidder shall submit the sample of material during submission of Bids.

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
b) BOM
c) Work Experience details

d) Type test certificates.

e) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

S. No.	Parameter	Units	To be Furnished by Bidder
1	Max Withstand System Voltage	KV	
2	Partial Discharge at 1.73 Uo	pC (Pico-coulombs)	
3	Impulse Peak Withstand	KV	
4	Continuous operation withstand Temperature	°C	
	Short Circuit withstand temperature	°C	
5	Withstand short circuit current	KA/1Sec	
6	Storage Temperature Range	°C	
7	Shelf life of kit components excluding mastic and solution	Years	
8	Shelf life of mastic and solution	Years	

A. General Technical Particular for Heat Shrinkable Insulation Tubing/Sleeves/Wrap around Sleeve:

S. No.	Parameter	To be Furnished by Bidder
1	Visual Examination	
2	Wall thickness Ratio	
3	Internal dia of tube after full recovery	
4	Longitudinal change	
5	Electric Strength	
6	Tensile Strength	
7	Ultimate Elongation	
8	Heat Shock	
9	Low Temperature Flexibility	
10	Tracking Resistance	
11	Volume Resistivity	
12	Flame Retardant (Applicable only for Anti tracking Tubes/ sleeves)	

B. General Technical Particular for Heat Shrinkable Moulded Components/Breakouts/Weather Sheds:

S. No.	Parameter	To be Furnished by Bidder
1	Visual Examination	
2	Wall thickness Ratio	
3	Internal dia of tube after full recovery	
4	Longitudinal change	
5	Electric Strength	
6	Tensile Strength	
7	Ultimate Elongation	
8	Heat Shock	
9	Low Temperature Flexibility	
11	Volume Resistivity	
12	Flame Retardant (for anti-tracking moulded components)	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

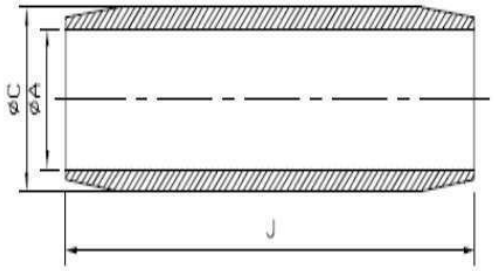
Signature

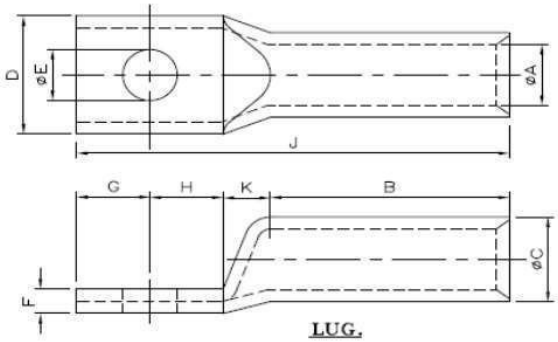
Designation

Annexure- Dimensions Ferrules & Lugs HT

Dimensional details of Aluminum ferrules for HT AL circular stranded compacted XLPE cables			
Cable Size in MM²	φA (mm) +0.3mm	φC (mm) +0.3 mm	J (mm) ±3mm
95	12	16.9	108
150	15.1	21.2	116
300	21.8	30.2	150
400	25	34.8	150
630	31.7	44.4	200
1000	41	56	250

Dimensional details of Aluminum Lugs for HT circular stranded compacted XLPE cables							
Cable Size in MM²	ϕE (mm) ±0.1mm in centre of palm	ϕA (mm) +0.5mm	ϕC (mm) +0.5 mm	D (mm) ±1.5mm	F (mm) ±0.5mm	B±3.0mm	J (mm) ±5mm
95	13	12	16.9	23.5	4.9	73	109
150	13	15.1	21.2	29.5	6	83	128
300	17	21.8	30.2	42	8.4	89	157
400	17	25	34.8	48	9.8	113	187
630	17	31.7	44.4	61	12.7	140	225
1000	-	41	56	77.5	15	160	280





LUG.

For remaining cable sizes, dimensions of Ferrules & Lugs shall be as per IS.

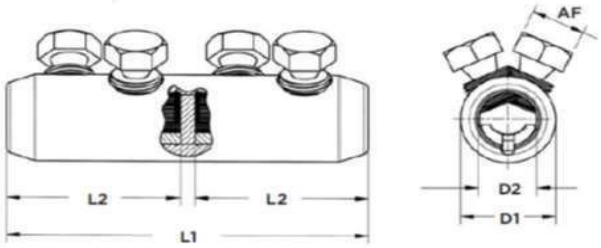
Annexure- Dimensions Mechanical connectors & Mechanical Lugs

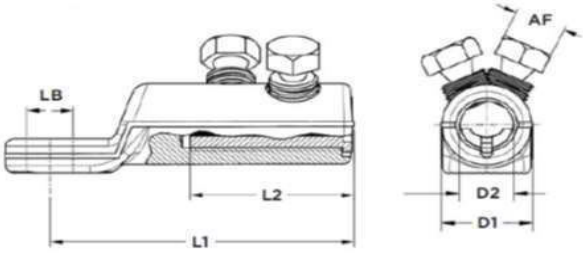
Aluminium Mechanical connectors

Cable Size in MM²	ϕD1 (mm)	ϕD2 (mm)	L (mm)
185-400	50	25.5-26	440- 450
185-400	42	25.5-26	170-200
500- 630	50	33- 33.5	180-230
1000	60	40	180-230

Tinned Aluminium Mechanical Lugs

Cable Size in MM²	ϕLB (mm)	ϕD1 (mm)	ϕD2 (mm)	L (mm)
185-400	17	42	25.5-26	137-150
500- 630	17	50	33- 33.5	150-180
1000	2x17	60	40- 40.5	180- 240





STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-EHV-1036

Specification Name : Technical Specification for 33KV Polymeric Disc Insulator (90KN & 120KN)

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
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TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
18-03-2023	21-03-2023	31-03-2023	06-04-2023	26-04-2023	26-04-2023

CONTENTS

1. SCOPE

This specification covers the technical requirements of design, manufacture, performance, testing at manufacturer's works, packing & forwarding, supply and unloading at store/ site, performance of 33 kV Ball and Socket Disc Polymer Insulator complete with all the accessories for trouble free and efficient performance.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

Ref. IS/IEC	Description
IEC:61109	Definition, test methods and acceptance criteria for composite insulators for A.C. overhead lines above 1000V.
IS:2071/ IEC:60060-1	Methods of High Voltage Testing.
IS:2486/ IEC:60120/ IEC:60372	Specification for Insulator fittings for Overhead Power Lines with a nominal voltage greater than 1000V. Ball and socket couplings of string insulator units –Dimensions Locking devices for ball and socket couplings of string insulator units - Dimensions and tests
IEC:60575	Thermal-mechanical performance test and mechanical performance test on string insulator units.
IS: 13134/ IEC: 60815	Guide for the selection of insulators in respect of polluted condition.
IEC: 60433	Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic insulators for AC systems - Characteristics of insulator units of the long rod type.
STRI guide 1.92/1	Hydrophobicity Classification Guide.
IS:8263/ IEC:60437	Methods of RI Test of HV Insulators.
IS:4759	Hot dip zinc coatings on structural steel & other allied products.
IS:2629	Recommended practice for Hot Dip galvanization for iron and steel
IS:6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles.
IS:3203	Methods of testing of local thickness of electroplated coatings.

Ref. IS/IEC	Description
IS:2633	Testing of Uniformity of coating of zinc coated articles.
ASTM D 578-05	Standard specification for glass fiber standards.
IS:4699	Refined secondary zinc

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

TPCODL/TPNODL/TPSODL/ TPWODL service area **has heavy saline conditions along the coast and High cyclonic Intensity winds with speed up to 300 Km ph**. The atmosphere is generally laden with mild acid, dust in suspension during the dry months, and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

i) The Composite insulators will be used on 33kV lines on which the conductor will be ACSR/AAAC of sizes 148 & 232 Sq.mm. The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind. Insulator shall be suitable for moderately to heavily polluted, Humid & High saline atmosphere.

ii) Bidder must be indigenous manufacturer and supplier of Composite insulator of rating 33kV or above or must have developed proven in house technology and manufacturing process for composite insulators of above rating or possess technical collaboration/association with the manufacturer of composite insulators of rating 33kV or above. The Bidder shall furnish necessary evidence in support of the above along with the bid which can be in the form of certification from Utilities concerned, or any other documents to the satisfaction of the Owner.

iii) Insulators shall be suitable for Strain type of load and shall be of B&S type. The diameter of Composite Insulator shall be as per technical specification.

iv) Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the commendation of IEC- 60815/ IS: 13134.

v) The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with-IEC 61109:

± (0.04d + 1.5) mm when d ≤ 300 mm
± (0.025d+6) mm when d > 300 mm

Where, d being the dimensions in millimetres for diameter, length or creepage distance as the case may be. **However, no negative tolerance shall be applicable to creepage distance.**

vi) The composite insulators including the end fitting connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.

vii) All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

viii) The composite insulators offered shall be suitable for use of hotline maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
		33 kV 90 KN	**33 kV 120 KN**
1	Type of Insulator	Polymeric B&S	Polymeric B&S
2	Standard according to which the insulators manufactured and tested.	IEC 61109	IEC 61109
3	Name of material used in manufacture of the insulator with class/grade)	High voltage grade Silicone rubber Wacker-Germany, Dow Corning-USA	High voltage grade Silicone rubber Wacker-Germany, Dow Corning-USA
(a)	Material of core (FRP rod) (I) E-glass of ECR-glass.	ECR or BORRON FREE	ECR or BORRON FREE
(b)	Material of housing weather sheds (silicon content)	Silicon content of minimum 40% by weight	Silicon content of minimum 40% by weight
(c)	Material of end fittings	MCI/SGI/Forged Steel	MCI/SGI/Forged Steel
(d)	Sealing compound for end fittings	RTV SILICON	RTV SILICON
4	Colour	GREY	GREY
5	Electrical characteristics		
(a)	Nominal system voltage	33 kV	33 kV
(b)	Highest system voltage	36 kV	36 kV
(c)	Dry Power frequency withstand voltage	105 kV	105 kV
(d)	Wet Power frequency withstand voltage	75 kV	75 kV
(e)	Dry flashover voltage	>105 kV	>105 kV
(f)	Wet flash over voltage	>75kV	>75kV
(g)	Dry lighting impulse withstand voltage		
	(a) Positive	170 kVp	170 kVp
	(b) Negative	180 kVp	180 kVp
(h)	Dry lighting impulse flashover voltage		
	a) Positive	180kVp	180kVp
	b) Negative.	190kVp	190kVp
(i)	FRP rod leakage current at 175 V/mm	< 0.05 mA	< 0.05 mA
(j)	RIV at 1 MHz when energized at 10 kV/30kV (rms) under dry condition.	< 70 microvolt	< 70 microvolt
(k)	Creepage distance (Min.)	900 MM	900 MM
6	Minimum failing load.	90 KN	120 KN
7	**Dimensions of insulator**		
(i)	Weight	1.6 kg	1.8 kg
(ii)	Dia of FRP rod	16 mm	20 mm
(iii)	Length of FRP rod	440 mm	440 mm
(iv)	Dia of weather sheds	≥100 mm	≥100 mm
(v)	Thickness of housing	3 mm	3 mm
(vi)	Dry arc distance Dimensioned drawings of insulator (including weight with tolerances in weight)	380 mm	380 mm

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
		33 kV 90 KN	33 kV 120 KN
8	Method of fixing of sheds to housing (specify). Single mould or Modular construction (injection moulding/compression	Injection Moulding	Injection Moulding
9	Type of sheds	Aerodynamic	Aerodynamic

5. GENERAL CONSTRUCTIONS:

Composite Insulators shall be designed to meet the light quality, safety and reliability and are capable of withstanding a wide range of environmental conditions. Polymeric Insulators shall consist of THREE parts, at least two of which are insulating parts:

(a) Core- the internal insulating part

(b) Housing- the external insulating part

(c) Metal end fittings.

5.1 CORE

It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free. Electrically Corrosion Resistant (ECR) grade fiber glass reinforced plastic (FRP) rod having at least 80% fibres by weight.

5.2 POLYMER HOUSING:

The FRP rod shall be covered by a seamless sheath of high voltage grade Silicone rubber housing of thickness 3mm minimum. It shall be one- piece housing using only Injection Moulding process to cover the core. The housing shall be designed to provide the necessary creepage distance and protection against environmental influences, external pollution and humidity. Housing shall conform to the requirements of IEC 60815 with latest amendments. All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating condition. It shall be extruded or directly moulded on core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing / bonding area shall be free from voids.

5.3 WEATHERSHEDS

The composite polymer weathersheds made of high voltage grade Silicone rubber polymer shall be moulded as part of the sheath and shall be free from imperfections. It should protect the FRP rod against environmental influences, external pollution and humidity. The weathersheds should have **silicon content of minimum 40% by weight**. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids. Housing and weathersheds material shall have tensile strength of 3 Mpa with 400% elongation minimum and tear strength of 16 N/mm.

5.4 HARDWARE FITTINGS:

a) End fitting transmit the mechanical load to the core. They shall be made of spheroidal graphite cast iron, malleable cast iron or forged steel or aluminium alloy. Metal end fitting shall be suitable for Ball and socket type hardware of respective specified mechanical load and shall be hot dip galvanized in accordance with IS 2629.

b) They shall be connected to the rod by means of a controlled compression technique. The material used in fittings shall be corrosion resistant. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process & should not damage the individual fibers or crack the core.

c) The gap between fittings and sheath shall be sealed by flexible silicone elastomeric compound or silicone alloy compound sealant, system of attached of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof.

d) The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/IS: 2486 - Part-II.

e) Outer portion of ball or socket should be Zinc sleeved with minimum 99.95% purity of Electrolytic high grade zinc.

f) **Ball pin and socket couplings**: Ball pin and socket shall be of forged steel and dimensions are as specified in IS 2486 (Part-2). Insulator metal caps shall be made of malleable cast iron conforming to IS 14329.

g) **Locking device of the coupling:** The security clips to be used as a locking device for ball and socket coupling shall be ‘R’ shaped hump type or ‘W’ type as per IS 2486. The locking device shall be resilient, corrosion resistant, and of suitable mechanical strength. Material to be used for ‘W’ locking clip is phosphor bronze and for ‘R’ type locking clip is stainless steel. The hardness and temper of material are important for their satisfactory operation. The locking devices shall retain their ability after being operated from the locking to the

coupling position at least twenty times at normal temperature. They should be effective at the lowest temperature likely to be encountered in service. Socket for use with W-clips have the lower edge of the rectangular slot at the level of bottom of the socket. The slot is so shaped that it will accept the W-clip and retain it in two distinct positions when operated for coupling and locking. The shape of the W-clip is such that complete withdrawal when moving from the locking to the coupling position prevented.

h) All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 705 gm/Sq.m, or 100mm min. thickness and shall be in accordance with the requirement of IS: 4759, The zinc used for galvanizing shall be of purity 99.5% as per IS: 4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. Before ball fittings and galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the design dimensional requirements.

6. MARKING:

Each insulator shall be legibly and indelibly marked (embossing/engraved) to show the following:

a) Name & Trade mark of the manufacturer
b) Voltage Grade
c) Year of manufacturing
d) Minimum failing load in KN
e) "TPCODL/TPNODL/TPWODL/TPSODL" Name should be mentioned on each insulator

7. TESTS

The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

i) Verification of dimensions
ii) End Sealing test (FRP rod and Silicone rubber housing)
iii) Visual examination (Free from voids, cavity, foreign particle and scratch/nick spot)
iv) Mechanical performance Test
v) Galvanizing Test
vi) Mechanical Failing Load Test
vii) Dry Power Frequency Withstand Voltage Test
viii) Wet Power Frequency Withstand Voltage Test
ix) Verification of the locking system or the tightness of the interface between end fitting and insulator housing

7.2 ROUTINE TESTS

i) Visual examination (Free from voids, cavity, foreign particle and scratch/nick spot)
ii) Mechanical Load test
iii) Electrical Routine Test

7.3 TYPE TESTS

A) For Insulators

i) Dry Power Frequency Withstand Voltage Test
ii) Dry Power Frequency Voltage Flashover Test
iii) Dry lightning impulse withstand voltage test.
iv) Wet Power Frequency Withstand Voltage Test
v) Wet Power Frequency Voltage Flashover Test
vi) Mechanical failing load test.
vii) Salt fog test: On insulators for 1000 hr as per IEC
viii) Galvanization test
ix) Damaged Limit Proof Test
x) Radio interference test.

B) For Silicon rubber

i) Tensile Strength
ii) Elongation
iii) Tear Strength
iv) Inclined plane Tracking & Erosion resistance test
v) Volume Resistivity
vi) Dielectric constant
vii) Dielectric Strength
viii) Density
ix) Hardness
x) Arc Resistance
xi) Silicone Content
xii) Flammability
xiii) Limiting oxygen index test
xiv) Resistance to weathering & UV.
xv) Specific gravity

C) For FRP rods

i) Verification of dimensions
ii) Specific Gravity
iii) Glass Content
iv) Water Diffusion Test
v) Hardness
vi) Dye Penetration Test
vii) Flexural Strength
viii) Brittle fracture resistance test.
ix) Water Diffusion Test

D) For End Fittings

i) Thickness of Zinc coating
ii) Uniformity of Zinc Coating
iii) Micro-structural of metal fitting

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA/Other Govt. Lab** as per the relevant IS/IEC. For **High voltage Silicone rubber material used for Polymer housing** the test are conducted at **CIPET/CPRI** as per the relevant standards. TPCODL/ TPWODL/ TPNODL/ TPSODL. TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report under exceptional circumstances after due diligence/ scrutiny by DISCOM. Type tests should have been conducted in certified Test laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPWODL/TPSODL.

9. PRE DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPWODL/TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPWODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPWODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific

MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/ TPNODL/ TPWODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPWODL/TPSODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORES:

The material received at TPCODL/TPNODL/TPWODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of guarantee period for any 'latent defects' if noticed by the company.

12. PACKING:

Supplier shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport and be packed in such a manner so as to protect the equipment from damage in transit. The material used for packing shall be environmentally friendly. All insulators shall be packed in strong corrugated box of min. 7 ply duly palette or wooden crates. The gross weight of the crates along with the material shall not normally exceed 100

Kg to avoid handling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season. Each wooden case / crate / corrugated box shall have all the markings stencilled on it in indelible ink. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE:

Bidder shall submit the sample of material during submission of Bids.

14. QUALITY CONTROL:

The bidder shall submit with the offer Quality Assurance Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections. The bidder shall ensure that the material supplied is as per the Guaranteed Technical Particulars as specified in the specifications.

15. TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES:

The bidder shall get the approved drawing and GTP before start of manufacturing activity. The successful bidder will have to submit details of the offered design & components for approval as per specification. CAT-A/CAT-B is mandatory to start manufacturing.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled–in clause wise compliance of the specification
b) Schedule "B" Deviations
c) Work Experience details
d) Type test certificates.
e) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

Bidder to submit completely clause wise compliance of this specification

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

CONTENTS

1. SCOPE

This specification covers the technical requirements of design, manufacturing, supply, Inspection & testing of 33KV Post polymer insulator used in 33KV Overhead Transmission lines. The specific requirements are covered in the enclosed technical data sheet. This specification also covers the requirement of manufacture, testing at manufacturer's works, packing, Supply, transportation, forwarding and unloading at TPWODL/TPNODL/TPCODL/TPSODL stores/site.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International standards / IEC and shall conform to the regulations of the local authorities. In case of any conflict in the below mentioned standards, TPWODL/TPNODL/TPCODL/TPSODL specification shall prevail:

IEC: 61109:	Definition, test methods and acceptance criteria for composite insulators for A.C. overhead lines above 1000V.
IEC: 61952:	Insulators for overhead lines – Composite line post insulators for alternative current.
IEC: 62231:	Testing procedure for Station Post Polymer Insulator.
IS: 2071/ IEC: 60060-1:	Methods of High Voltage Testing.
IS: 2486/ IEC: 60120:	Specification for Insulator fittings for Overhead power Lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices.
IEC: 60575:	Thermal Mechanical Performance test and mechanical performance test on string insulator units.
IS: 13134/ IEC: 60815:	Guide for the selection of insulators in respect of polluted condition.
STRI guide 1.92/1:	Hydrophobicity Classification Guide.
IEC: 60437:	Methods of RI Test of HV insulators.
IS: 4759:	Hot dip zinc coatings on structural steel & other allied products.
IS: 2629:	Recommended Practice for Hot, Dip Galvanization for iron and steel.
IS: 6745:	Determination of Weight of Zinc Coating on Zinc coated iron and steel articles.
IS: 2633:	Testing of Uniformity of Coating of zinc coated articles.
ASTM D 578-05:	Standard specification for glass fiber strands.

**In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.*

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4. GENERAL TECHNICAL REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Type of insulator	33KV Polymeric Post Insulator
2	Reference Standard	IEC 61952/IEC 61109/IEC 62231
3	Material of Core (FRP Rod)	ECR Glass Borron Free
4	Material of Housing and Weather sheds	High voltage grade Silicone rubber Wacker-Germany, Dow Corning-USA
5	Material of end fittings	SGCI/ MCI, HDG
6	Material of sealing compound	RTV Silicon Sealant
7	Colour of sheds	Grey
8	**Electrical Characteristics**	
8.1	Rated system voltage	33 KV
8.2	Highest system voltage	36 KV
8.3	Rated Frequency	50 HZ
8.4	Visible Discharge Test	27 KV
8.5	Dry Power Frequency Withstand voltage	95 KV
8.6	Wet Power Frequency Withstand voltage	75 KV
8.7	Dry Power Frequency Flashover Voltage	130 KV
8.8	Wet Power Frequency Flashover Voltage	90 KV
8.9	Dry Lightning Impulse withstand voltage	Positive: 170 KV Negative: 180 KV
8.10	Dry Lightning Impulse Flashover voltage	Positive: 210 KV Negative: 230 KV
8.11	RIV at 1 MHz when energized at 10 Kv (rms)	< 100 Micro Volts
8.12	Creepage distance (min)	900 mm
8.13	Dry Arc Distance (min)	390 mm
9	Minimum Failing load	10 KN
10	FRP rod dia. Min	32 mm
11	Length of FRP Rod (min)	300 mm
12	Dia of weather sheds	≥100 mm
13	Thickness of housing	3 mm
14	Type of sheds	Aerodynamic
15	Method of fixing sheds to housing	Injection moulding
16	Number of Holes & Holes dia. (Top & Bottom)	4 Nos & Ø M 12
17	Pitch Circle Diameter (PCD)	76 mm
18	Type of packing	Wooden / Corrugated box
19	No of insulator in each pack	Twenty
20	Tolerance	IEC - 61952 with up to date amendments
21	Marking / Embossing	TPWODL/TPNODL/TPCODL/TPSODL, Manufacture's name or trademark, Year of Manufacture

5. GENERAL CONSTRUCTIONS:

General construction should comply to industrial standard. Polymeric Insulators shall be designed to meet the high quality, safety and reliability and are capable of withstanding a

wide range of environmental conditions. Polymeric Insulators shall consist of THREE parts, at least two of which are insulating parts: -

a. Core- the internal insulating part.

b. Housing- the external insulating part.

c. Weather Sheds

d. Metal end fittings.

5.1 CORE

Core shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free and should have high resistance to acid corrosion. Electrically Corrosion Resistant (ECR) grade fiber glass reinforced plastic (FRP) rod having at least 80% fibres by weight.

5.2 POLYMER HOUSING:

The FRP rod shall be covered by a seamless sheath of high voltage grade Silicone rubber housing of thickness 3mm minimum. It shall be one- piece housing using only Injection Moulding process to cover the core. The housing shall be designed to provide the necessary creepage distance and protection against environmental influences, external pollution and humidity. Housing shall conform to the requirements of IEC 60815 with latest amendments. All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating condition. It shall be extruded or directly moulded on core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing / bonding area shall be free from voids.

5.3 WEATHERSHEDS

The composite polymer weather sheds made of high voltage grade Silicone rubber polymer shall be moulded as part of the sheath and shall be free from imperfections. It should

protect the FRP rod against environmental influences, external pollution and humidity. The weather sheds should have **silicon content of minimum 40% by weight**. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids. Housing and weather sheds material shall have tensile strength of 3 Mpa with 400% elongation minimum and tear strength of 16 N/mm.

5.4 METAL END FITTINGS:

End fitting transmit the mechanical load to the core. They shall be made of spheroidal graphite cast iron, malleable cast iron or forged steel or aluminum alloy. Metal end fitting shall be suitable for Post type hardware support of respective specified mechanical load and shall be hot dip galvanized in accordance with IS 2629. They shall be connected to the rod by means of a controlled compression technique. The OD of end fittings should be machined to make the surface uniform round to ensure effective sealing when housing is molded over it. The material used in fittings shall be corrosion resistant. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process & should not damage the individual fibers or crack the core. The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/ IS: 2486 - Part-II /1989. Outer portion of Post should be Zinc sleeved with minimum 99.95% purity of Electrolytic high-grade zinc. Bottom end metal fitting (Shank) of Post insulator should be forged steel as per IS 2002/92. Bottom end fitting should be single unit without any joints. Nuts as per IS 1363 (P-III) and spring washer shall be as per IS 3063 with Latest amendments if any, Nuts and spring washer shall be hot dip galvanized. The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulators shall not lead to deterioration. The Post insulator shall not engage directly with hard metal.

6. MARKING:

Each Insulator shall be legibly and indelibly marked/ embossed with “PO Number with date”, “Code Number”, “PROPERTY OF TPWODL/TPNODL/TPCODL/TPSODL- ODISHA” in such that it is permanent and does not harm the body & along with the following parameters:

a) “PROPERTY OF TPWODL/TPNODL/TPCODL/TPSODL”.
b) “PO no. with date”.
c) “Manufacturer Name”.
d) Type of Designation & Serial No.

e) Month & Year of Manufacturing.

f) Minimum failing load in KN.

g) ISI Mark.

h) No. of Relevant Standard.

i) Country of Manufacture.

7. TESTS

All routine, acceptance and type tests shall be carried out in accordance with the relevant IS/IEC standards and that are mentioned in clause 2. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components should have been type tested as per the relevant standards from CPRI/ERDA. All the Type Tests as per latest IS should have been carried out on the equipment in addition to others specified in IS/IEC/IEEE/UL standards.

7.1 TYPE TEST

All the type tests have to be performed as per IS. The following Type tests for 33kV Post Polymer insulator should be done as per relevant standards:

Tests on Silicone Rubber:

1) Tensile Strength & Elongation
2) Tear Strength
3) Inclined Plane Tracking & Erosion
4) Volume resistivity
5) Dielectric Strength
6) Dielectric Constant
7) Density
8) Hardness
9) Arc Resistance
10) Silicone content
11) Flammability
12) Resistance to weathering & UV.
13) Limiting oxygen index test.
14) Specific gravity.

Tests on FRP Rods:

1) Verification of dimensions.
2) Specific Gravity
3) Glass Content

4) Water Diffusion Test
5) Hardness
6) Dye Penetration Test.
7) Flexural strength.
8) Water absorption.
9) Brittle fracture resistance test.
10) Visible discharge test.
11) Dry lightning impulse withstand voltage test.
12) Wet power frequency with-stand voltage test.
13) Power Arc test.
14) Accelerated weathering test.
15) Tracking & erosion test.

Tests on End Fittings:

1) Thickness of Zinc Coating
2) Uniformity of Zinc Coating
3) Micro-structural of metal fitting.

Test of Complete polymer insulators:

1) Dry lightning impulse withstand voltage test.
2) Wet power frequency test.
3) Mechanical failing load test.
4) Radio interference test.
5) Mechanical performance test
6) U.V Resistance as per ASTM G 53: 1000 Hrs - UV Light for 8 Hours and condensation for 4 hours in a continuous cycle. Elongation to be limited to 20% (% Elongation to break before and after the test).
7) Salt Fog test: On insulators for 1000 hours as per IEC.
8) Galvanization test.
9) Visual examination.
10) Verification of dimensions.
11) Bending test.
12) Verification of the locking system or the tightness of the interface between end fitting and Insulator housing.
13) Assembled core load time test.
14) Determination of the average failing load of the core of the assembled insulator.

Design Tests:

For composite insulators it is essential to carry out design test as per clause 4.1 of IEC 61109 / 92-93 with latest amendments. The design tests are intended to verify the suitability of the design, materials and method of manufacture (technology). When a composite insulator is submitted to the design tests, the result shall be considered valid for the whole class of insulators, which are represented by the one tested and having the following characteristics:

- The materials for the core, and sheds and same manufacturing method;
- The material of the fittings, the same design, the same method of attachment;
- Polymer insulator should have greater layer thickness of the shed material over the core (including a sheath where used);
- Polymer insulator should have smaller ratio of the highest system voltage to insulation length;
- Polymer insulator should have smaller ratio of all mechanical loads to the smallest core diameter between fittings
- Polymer insulator should have greater diameter of the core.

The tested composite insulators shall be identified by a drawing giving all the dimensions with the manufacturing tolerances.

Manufacturer should submit test reports for Design Tests as per IEC – 61109 (clause – 5) along with the bid. Additionally following tests shall be carried out or reports for the tests shall be submitted after award of contract: UV test: the test shall be carried out in line with clause 7.2 of ANSI C29.13.

In addition, chemical composition test for silicon content would also be added in the testing list.

7.2 ROUTINE TESTS

All the Routine tests & acceptance tests have to be performed as per IS. The following tests shall be conducted as per IS. Routine test to be done on the random samples (As per IS) taken from the offered lot material for the purpose of acceptance of that lot of material.

i) Visual Examination
ii) Mechanical load test as per IEC 61109 & IEC 62231

7.3 ACCEPTANCE TEST:

All the Acceptance tests have to be performed as per IS. Routine and acceptance tests shall be conducted at the place of manufacturer.

For Composite Insulators:

1) Verification of dimensions
2) Visual examination
3) Verification of the locking system or the tightness of the interface between end fitting and insulator housing
4) Galvanizing test
5) Verification of the specified mechanical load
6) Bending load test
7) Dry power frequency with-stand voltage test
8) Analysis of material properties of housing material
9) Analysis of material properties of core material

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA** as per the relevant IS/IEC. For **High voltage Silicone rubber material used for Polymer housing** the test are conducted at **CIPET/CPRI** as per the relevant standards. TPCODL/ TPWODL/ TPNODL/ TPSODL. TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report under exceptional circumstances after due diligence/ scrutiny by DISCOM. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e., any test report not acceptable, same shall be carried out without any cost implication to TPCODL/ TPNODL/ TPWODL/ TPSODL.

9. PRE DISPATCH INSPECTION:

1. Material shall be subject to inspection by a duly authorized representative of TPWODL/TPNODL/TPCODL/TPSODL.
2. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.
3. Bidder shall grant free access to the places of manufacture to TPWODL/TPNODL/TPCODL/TPSODL's representatives at all times when the work is in progress.
4. Inspection by TPWODL/TPNODL/TPCODL/TPSODL or authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
5. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate)

is issued by TPWODL/TPNODL/TPCODL/TPSODL.

Following documents shall be sent along with material:

1) Test report
2) MDCC issued by TPWODL/TPNODL/TPCODL/TPSODL
3) Invoice in duplicate
4) Packing list
5) Drawings & catalogue
6) Guarantee / Warrantee card
7) Brought out (raw) material test certificates
8) Delivery Challan
9) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORES:

The material received at TPWODL/TPNODL/TPCODL/TPSODL, Odisha store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to "Engineering" department.

11. GUARANTEE:

1. Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract.

2. In the event any defect is found by the TPWODL/TPNODL/TPCODL/TPSODL, up to a period of 12 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 12/24 months could be enhanced subject to mutual agreements). Bidder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12. PACKING:

Bidder shall ensure that all the Equipment covered under this specification shall be prepared for rail/road transport and be packed in a manner so as to protect the equipment from damage in transit. The material used for packing shall be environmentally friendly.

13. TENDER SAMPLE:

Bidder shall submit the sample of material with the offer (in case of first supply to TPWODL/TPNODL/TPCODL/TPSODL).

14. QUALITY CONTROL:

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPWODL/TPNODL/TPCODL/TPSODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES:

The successful Bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order. Manufacturing mass quantity to start only after getting approved drawings or as per intimation from TPWODL/TPNODL/TPCODL/TPSODL.

17. SPARES, ACCESSORIES AND TOOLS:

Not Applicable And the bidder can submit a recommended list of commissioning spares along with item wise price.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
b) Work Experience details
c) Type test certificates.
d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Type of insulator	**To be provided by Bidder**
2	Reference Standard	
3	Material of Core (FRP Rod)	
4	Material of Housing and Weather sheds	
5	Material of end fittings (B&S)	
6	Material of sealing compound	
7	Colour of sheds	
8	**Electrical Characteristics**	
8.1	Rated system voltage	
8.2	Highest system voltage	
8.3	Rated Frequency	
8.4	Visible Discharge Test	
8.5	Dry Power Frequency Withstand voltage	
8.6	Wet Power Frequency Withstand voltage	
8.7	Dry Power Frequency Flashover Voltage	
8.8	Wet Power Frequency Flashover Voltage	
8.9	Dry Lightning Impulse withstand voltage	
8.10	Dry Lightning Impulse Flashover voltage	
8.11	RIV at 1 MHz when energized at 10 Kv (rms)	
8.12	Creepage distance (min)	
8.13	Dry Arc Distance (min)	
9	Minimum Failing load	
10	FRP rod dia. Min	
11	Length of FRP Rod (min)	
12	Dia of weather sheds	
13	Thickness of housing	
14	Type of sheds	
15	Method of fixing sheds to housing	
16	Type of packing	
17	No of insulator in each pack	
18	Tolerance	
19	Marking / Embossing	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-GEN-4003

Specification Name : AAAC CONDUCTOR- 34,55,80 Sq.mm

JYOTIPRAKASH MOHANTY	SATYA PRASAD NAYAK	Vijender Goyal	SHANTAPRIYA JENA	ANUP JAWASE	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPCODL	TPSODL	TPNODL	TPWODL	TPWODL
02-01-2023	03-01-2023	03-01-2023	03-01-2023	03-01-2023	04-01-2023

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-GEN-4003 **Specification Name:** TECHNICAL SPECIFICATION FOR AAAC CONDUCTOR- 34,55,80 SQ.MM

CONTENTS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer'sworks, packing, forwarding, supply and unloading at site/store and performance of AAAC Conductors (34Sq.mm, 55Sq.mm, 80Sq.mm) with all accessories and necessary training for trouble free & efficient operation.

2. APPLICABLE STANDARDS:

AAAC Conductors covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest revisions of relevant Indian Standards/ IEC and shall conform to the regulations of local statutory authorities.

Sl. No.	Ref. IS	Description
1	IEC :1089	Round wire concentric lay overhead electrical standard Conductor
2	IS 398:4	Aluminum Alloy Stranded Conductors
3	IS 9997	Aluminum Alloy redraw rods for electrical purposes
4	IEC 502: 1994	Extruded solid dielectric insulated power cables for rated voltages 1.0 kVto 30 kV
5	IEC 104	Aluminum Magnesium Silicon alloy wire for overhead line conductor
6	IS 1778	Reels and drums of bare conductor.

3. CLIMATIC CONDITIONS:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70

9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place includes hilly areas, subject to high relative humidity, which can give rise to condensation. Atmosphere is generally laden with mild acid and dust due to industrial activities. Some places are in heavily industrial polluted areas. On occasions, the combination of humid, acidic and dust condensation may create pollution conditions for outdoor equipment's. Therefore, outdoor materials and equipment's shall be designed and protected for use exposed, heavily polluted, acidic, corrosive, tropical and humid atmosphere.

4. GENERAL TECHNICAL REQUIREMENTS:

The wires shall be of heat-treated aluminum, magnesium silicon alloy containing approximately silcon-0.5 to 0.9 %, magnesium-0.6 % to 0.9%, Fe-0.5% (maximum), Copper- 0.1% (max), Mn-0.03%, Cr-0.03%, Zn-0.1%, B-0.06%, and having the mechanical and electrical properties specified in the table and be smooth and free from all imperfections, such as, spills, splits and scratches.

Neutral grease shall be applied between the layers of wires. The drop point temperature of the grease shall not be less than 120C.

SL.NO.	TECHNICAL PARTICULARS	UNIT	WEASEL (34 Sq.mm)	RABBIT (55 Sq.mm)	RACCOON (80 Sq.mm)
1	**Make**				
a)	Aluminum Alloy rod		HINDALCO/BALCO/ VEDANTA/ NALCO		
b)	Conductor		Name of Company to be mentioned		
2	**Type**	No/mm	7/2.50	7 / 3.15	7 / 3.81
3	**Particulars of Raw material**				
a)	Si	%	0.50 - 0.90	0.50 - 0.90	0.50 - 0.90
b)	Mg	%	0.60 - 0.90	0.60 - 0.90	0.60 - 0.90

SL.NO.	TECHNICAL PARTICULARS	UNIT	WEASEL (34 Sq.mm)	RABBIT (55 Sq.mm)	RACCOON (80 Sq.mm)
c)	FE	%	0.50 max	0.50 max	0.50 max
d)	Cu	%	0.10 max	0.10 max	0.10 max
e)	Mn	%	0.03 max	0.03 max	0.03 max
f)	Cr.	%	0.03 max	0.03 max	0.03 max
g)	Zn	%	0.10 max	0.10 max	0.10 max
h)	B	%	0.06 max	0.06 max	0.06 max
i)	Other Elements (Each)	%	0.03 max	0.03 max	0.03 max
j)	Other Elements (Total)	%	0.10 max	0.10 max	0.10 max
k)	Aluminium	%	Remainder	Remainder	Remainder
4	**Aluminium Alloy wire**				
i	Diameter (mm)				
a)	Normal	Mm	2.5	3.15	3.81
b)	Maximum	Mm	2.53	3.18	3.85
c)	Minimum	Mm	2.47	3.12	3.77
ii	Cross Section Area of Nominal dia. wire	Sq. mm	4.909	7.793	11.40
iii	Minimum Breaking Load ofeach strand after stranding	KN	1.44	2.29	3.34
iv	Minimum elongation % on gauge length of 200 mm (After Strand)	%	4	4	4
v	Max. Resistance at 20°C	Ohm/ KM	6.845	4.290	2.938
5	**AAAC Stranded conductor**				
5.1	Nominal Sectional Area	sq. m	34	55	80
5.2	Overall Diameter	Mm	7.5	9.45	11.43
5.3	Approx. Mass	Kg. /Km	94	149.2	218.26
5.4	Minimum Ultimate Breaking Load of Conductor	KN	10.11	16.03	23.41
5.5	Lay ratio of conductor	Min. /Max	10/14	10 / 14	10 / 14
5.6	Calculated Max. resistance ofconductor at 20º C	Ohm/ Km.	0.990	0.621	0.425
6	Standard length of conductor	Mtr.	2000	2000	2000

SL.NO.	TECHNICAL PARTICULARS	UNIT	WEASEL (34 Sq.mm)	RABBIT (55 Sq.mm)	RACCOON (80 Sq.mm)
	(meter)				
6.1	Continuous max. current carryingcapacity in still air at 40ºC ambient temperature	Amp	155(min)	230(min)	295(min)
6.2	Temperature rises for above current		35ºC Over the ambient	35ºC Over the ambient	35ºC Over the ambient
6.3	Tolerance on standard length ofConductor (%)	%	±5	±5	±5
6.4	Direction of lay for outside layer		Right Hand		
7	Modulus of Elasticity	Kg/cm^2	0.6324 x106 Kg/cm2		
8	Joints		There shall be no joints in any wire of a stranded conductor		
9	Co-efficient of liner expansion perdeg. C	Per ˚C	23x10-6		
10	Density of Material	Kg/ cm3	2.7		

Maximum resistance values given have been calculated from the maximum values of the resistively as specified and the cross-sectional area based on the minimum diameter.

5. GENERAL CONSTRUCTION:

The conductors shall be constructed as per IS 398 (Part IV). The steel strands shall be uniformly grease coated as anti-corrosive agent in Weasel, Rabbit & Raccoon conductors. Neutral Lithium based Grease shall complied to IS 7623.

Lay Ratios for Aluminium Alloy Stranded Conductors

Number of Wires in Conductor	LAY RATIOS							
	3/6 Wire Layer		12 Wire Layer		18 Wire Layer		24 Wire Layer	
	Min	Max	Min	Max	Min	Max	Min	Max
7	10	14	---	---	---	---	---	---
19	10	16	10	14	---	---	---	---

5.1 MATERIALS

5.1.1 The materials shall be as per clause 4.0 & 6.0 of IS 398 (Part IV). The Aluminum conductor strands shall be drawn from 99.5% pure electrolytic EC grade Aluminum rods.

5.1.2 Aluminum raw material shall be procured from NALCO/ BALCO/ HINDALCO/ VEDANTA only.

5.1.3 The galvanized steel wire shall be drawn from high carbon steel rods produced by either acid or base open-hearth process, electric furnace or basic oxygen process.

5.1.4 Steel raw material shall be from Tata Steel, Jindal steel, SAIL, JSW only.

5.1.5 Grease shall be from BPCL, HPCL, Balmer Lawrie only.

5.2 SURFACE CONDITION

5.2.1 Surface conditions of the conductor shall be generally as per clause 7.0 of IS 398 (Part IV). The wires used for standard conductor shall be smooth and free from imperfections, such as spills and split the conductor shall be free from points, sharp edges, abrasions and other departures from smoothness on uniformity of surface contour that would increase radio interference and corona losses. When subjected to tension up to 50% of the ultimate strength of the conductor, the surface shall not depart from the cylindrical form on any part of the compartment, parts or strands, more relative to each other in such a way as to get out of place and disturb the longitudinal smoothness of the conductor.

5.2.2 The zinc coating on steel wire shall be uniform, adherent, smooth and free from such imperfections as flurry, ash and dross inclusions, bare patches, black spots, pimples, lumpiness, runs, rust stains, bulky white deposits, and blisters.

6. MARKING:

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

a) Contract/Award letter number

b) Name and address of consignee.

c) Manufacture's name and address.

d) Drum and lot number

e) Size and type of conductor

f) Length of conductor in meters

g) Arrow marking for unwinding

h) Position of the conductor ends

i) Number of turns in the outer most layer.

j) Gross weight of the drum after putting lagging.

k) Average weight of the drum without lagging. ISI mark Manufacturer Name/ Trade Mark "TPCODL/ TPNODL/ TPSODL/ TPWODL" P.O No and Date.

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer:

7.1 ACCEPTANCE TESTS:

Acceptance Test on Finished Conductor

i) Lay Ratio/Direction of the lay Mechanical Properties
ii) Diameter
iii) Breaking Load / Tensile Test
iv) Resistance
v) Wrapping Test
vi) Elongation
vii) Density Test (using Hygrometer)

7.2 ROUTINE TESTS

i) Check for Joints
ii) Surface Condition of the strand and stranded conductor
iii) All acceptance tests
iv) Check the drum

7.3 TYPE TESTS:

Type Test of Finished Conductor

i) UTS test on stranded conductor Mechanical Properties
ii) DC resistance test on stranded conductor

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ ERDA/ Approved Govt. Labs by TATA ODISHA DISCOM** as per relevant IS. Type tests should have been conducted during the period not exceeding 10 years from the date of opening the bid. In theevent of any discrepancy in the test reports, i.e., any test report not acceptable, same shall be carried out without any cost implication to TPCODL/ TPNODL/ TPSODL/ TPWODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/ TPNODL/ TPSODL/ TPWODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/ TPNODL/ TPSODL/ TPWODL's representatives at all times when the work is in progress. Inspectionby the TPCODL/ TPNODL/ TPSODL/ TPWODL or its authorized representatives shall not relieve the bidder of his obligation of

furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/ TPNODL/ TPSODL/ TPWODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/ TPNODL/ TPSODL/ TPWODL
c) TPCODL/ TPNODL/ TPSODL/ TPWODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/ TPNODL/ TPSODL/ TPWODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of at least 12 months from the date of commissioning or 24 months from the date of last supplies made under the contract whichever is later, (the time scale of 12/24 months could be enhanced subject to mutual agreements). Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed period, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" asthe case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12. PACKING AND TRANSPORT:

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. Standard Length of both the conductors is 2000 Mtrs (2 Lengths per drum). The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13.TENDER SAMPLE:

Bidder shall submit the sample of 1 mtr. material during the tender evaluation process with the offer.

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carriedout on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15.TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptancetests as per relevant Indian standards.

16.MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage,with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17.SPARES, ACCESSORIES AND TOOLS

Not applicable.

18.DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations

b) Work Experience details

c) Type test certificates.

d) Drawing 1 Set of Hard Copy & Soft Copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS: To Be Furnished by Bidder

SL. NO.	TECHNICAL PARTICULARS	UNIT	WEASEL (34 Sq.mm) (7/2.50 mm)	RABBIT (55 Sq.mm) (7 / 3.15 mm)	RACCOON (80 Sq.mm) (7 / 3.81 mm)
1	**Make**				
a)	Aluminum Alloy rod				
b)	Conductor				
2	**Type**	No/mm			
3	**Particulars of Raw material**				
a)	Si	%			
b)	Mg	%			
c)	FE	%			
d)	Cu	%			
e)	Mn	%			
f)	Cr.	%			
g)	Zn	%			
h)	B	%			
i)	Other Elements (Each)	%			
j)	Other Elements (Total)	%			
k)	Aluminium	%			
4	**Aluminium Alloy wire Strands**				
i	Diameter (mm)				
a)	Normal	mm			
b)	Maximum	mm			
c)	Minimum	mm			
ii	Cross Section Area of Nominal dia. wire	Sq. mm			
iii	Minimum Breaking Load ofeach strand after stranding	KN			

SL. NO.	TECHNICAL PARTICULARS	UNIT	WEASEL (34 Sq.mm) (7/2.50 mm)	RABBIT (55 Sq.mm) (7 / 3.15 mm)	RACCOON (80 Sq.mm) (7 / 3.81 mm)
iv	Minimum elongation % on gauge length of 200 mm (After Strand)	%			
v	Max. Resistance at 20 °C	Ohm/KM			
5	**AAAC Stranded conductor**				
5.1	Nominal Sectional Area	sq. m			
5.2	Overall Diameter	Mm			
5.3	Approx. Mass	Kg. / Km			
5.4	Minimum Ultimate BreakingLoad of Conductor	KN			
5.5	Lay ratio of conductor ((Min. / Max.)				
5.6	Calculated Max. resistance of conductor at 20º C	Ohm/ Km.			
6	Standard length of conductor (meter)	Mtr.			
6.1	Continuous max. current carrying capacity in still air at 40ºC ambient temperature.	Amp			
6.2	Temperature rise for above current				
6.3	Tolerance on standard length of Conductor(%)	%			
6.4	Direction of lay for outside layer				
7	**Modulus of Elasticity**	Kg/cm^2			
8	Joints				
9	Co-efficient of liner expansion per deg. C	Per ^0C			
10	Density of Material	Kg/ cm3			

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature
Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-GEN-4004

Specification Name : AAAC CONDUCTOR- 100,148, 232 Sq.mm

JYOTIPRAKASH MOHANTY	SATYA PRASAD NAYAK	Vijender Goyal	SHANTAPRIYA JENA	ANUP JAWASE	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPCODL	TPSODL	TPNODL	TPWODL	TPWODL
02-01-2023	03-01-2023	03-01-2023	03-01-2023	03-01-2023	04-01-2023

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-GEN-4004 **Specification Name:** SPECIFICATION FOR AAAC CONDUCTOR- 100,148, 232 Sq.mm

CONTENTS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of AAAC Conductors(100 Sq.mm,148 Sq.mm,232 Sq.mm) with all accessories and necessary training for trouble free & efficient performance.

2. APPLICABLE STANDARDS:

AAAC Conductors covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest revisions of relevant Indian Standards/ IEC and shall conform to the regulations of local statutory authorities.

Sl. No	IEC/IS	Description
1	IEC :1089	Round wire concentric lay overhead electrical standard Conductor
2	IS 398:4	Aluminum Alloy Stranded Conductors
3	IS 9997	Aluminum Alloy redraw rods for electrical purposes
4	IEC 502: 1994	Extruded solid dielectric insulated power cables for rated voltages 1.0 kV up to 30 kV
5	IEC 104	Aluminum Magnesium Silicon alloy wire for overhead line conductors
6	IS 1778	Reels and drums of bare conductor.

3. CLIMATIC CONDITIONS:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%

5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1200m
8	Wind Pressure	300 Km/hr.
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed up to 300 Kmph. The atmosphere is generally laden with mild acid, dust in suspension during the dry months, and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

The wires shall be of heat-treated aluminum, magnesium silicon alloy containing approximately silcon-0.5 to 0.9 %, magnesium-0.6 % to 0.9%, Fe-0.5% (maximum), Copper- 0.1% (max), Mn-0.03%, Cr-0.03%, Zn-0.1%, B-0.06%, and having the mechanical and electrical properties specified in the table and be smooth and free from all imperfections, such as, spills, splits and scratches. Neutral grease shall be applied between the layers of wires. The drop point temperature of the grease shall not be less than 120^0C.

SL. NO.	TECHNICAL PARTICULARS	UNIT	DOG (100Sq.mm) (7 / 4.26mm)	COYOTE (148 Sq.mm) (19 / 3.15mm)	PANTHER (232 Sq.mm) (19 / 3.94mm)
1	Make				
a)	Aluminium Alloy rod		HINDALCO/BALCO/ VEDANTA/ NALCO		
b)	Conductor		Name of Company		
2	Type	No/mm	7 / 4.26	19 / 3.15	19 / 3.94
3	Particulars of Raw material				
a)	Si	%	0.50 - 0.90	0.50 - 0.90	0.50 - 0.90
b)	Mg	%	0.60-0.90	0.60-0.90	0.60-0.90
c)	FE	%	0.50 max	0.50 max	0.50 max
d)	Cu	%	0.10 max	0.10 max	0.10 max
e)	Mn	%	0.03 max	0.03 max	0.03 max

f)	Cr.	%	0.03 max	0.03 max	0.03 max
g)	Zn	%	0.10 max	0.10 max	0.10 max
h)	B	%	0.06 max	0.06 max	0.06 max
i)	Other Elements (Each)	%	0.03 max	0.03 max	0.03 max
j)	Other Elements (Total)	%	0.10 max	0.10 max	0.10 max
k)	Aluminium	%	Remainder	Remainder	Remainder
4	Aluminium Alloy wire Strands				
i	Diameter (mm)				
a)	Normal	mm	4.26	3.15	3.94
b)	Maximum	mm	4.3	3.18	3.98
c)	Minimum	mm	4.22	3.12	3.90
ii	Cross Section Area of Nominal dia. wire	Sq. mm	14.25	7.79	12.19
iii	Minimum Breaking Load of each strand after stranding	KN	4.18	2.29	3.58
iv	Minimum elongation % on gauge length of 200 mm (After Strand)	%	4	4	4
v	Max. Resistance at 20 Deg.C	Ohm/ KM	2.345	4.290	2.746
5	AAAC Stranded conductor		DOG	COYOTE	PANTHER
5.1	Nominal Sectional Area	sq. m	100	148	232
5.2	Overall Diameter	mm	12.78	15.75	19.70
5.3	Approx. Mass	Kg. /Km	272.86	406.91	636.67
5.4	Minimum Ultimate Breaking Load of Conductor	KN	29.26	43.5	68.05
5.5	Lay ratio of conductor (Min. / Max.)		10 / 14	10/16	10/16
5.6	Calculated Max. resistance of conductor at 20º C	Ohm/ Km.	0.3390	0.2290	0.1471
6	Standard length of conductor (meter)	Mtr.	2000	2000	2000
6.1	Continuous max. current carrying capacity in still air at 40ºC ambient temperature	Amp	345(min)	447(min)	593(min)

6.2	Temperature rises for above current		35º C Over the ambient	35º C Over the ambient	35º C Over the ambient
6.3	Tolerance on standard length of Conductor (%)	%	±5		
6.4	Direction of lay for outside layer		Right Hand		
7	Modulus of Elasticity	Kg/cm^2	0.6324 x10^6 Kg/cm^2	0.612 x106 Kg/cm2	
8	Joints- There shall be no joints in any wire of a stranded conductor containing continuation				
9	Co-efficient of liner expansion per deg. C	Per ^{0}C	23x10^{-6}		
10	Density of Material	Kg/ cm3	2.7		

Maximum resistance values given have been calculated from the maximum values of the resistively as specified and the cross-sectional area based on the minimum diameter. The minimum breaking load is calculated on nominal diameter at ultimate tensile strength of 0.3 09 KN / mm^2 for wire before stranding and 95% of the ultimate tensile strength after stranding.

5. GENERAL CONSTRUCTION:

The conductors shall be constructed as per IS 398 (Part IV). The steel strands shall be uniformly grease coated as anti-corrosive agent in Dog, Coyote, Panther conductors. Neutral Lithium based Grease shall complied to IS 7623.

Lay Ratios for Aluminum Alloy Stranded Conductors

Number of Wires in Conductor	**LAY RATIOS**							
	3/6 Wire Layer		12 Wire Layer		18 Wire Layer		24 Wire Layer	
	Min	Max	Min	Max	Min	Max	Min	Max
7	10	14	---	---	---	---	---	---
19	10	16	10	14	---	---	---	---

5.1 MATERIALS.

5.1.1 The materials shall be as per clause 4.0 & 6.0 of IS 398 (Part IV). The Aluminum conductor strands shall be drawn from 99.5% pure electrolytic EC grade Aluminum rods.

5.1.2 Aluminum raw material shall be procured from NALCO, BALCO, HINDALCO and VEDANTA only.

5.1.3 The galvanized steel wire shall be drawn from high carbon steel rods produced by either acid or base open-hearth process, electric furnace or basic oxygen process.

5.1.4 Steel raw material shall be from Tata Steel, Jindal steel, SAIL, JSW only

5.1.5 Grease shall be from BPCL, HPCL, Balmer Lawrie only

5.2 SURFACE CONDITION.

Surface conditions of the conductor shall be generally as per clause 7.0 of IS 398 (Part IV). The wires used for standard conductor shall be smooth and free from imperfections, such as spills and split the conductor shall be free from points, sharp edges, abrasions and other departures from smoothness on uniformity of surface contour that would increase radio interference and corona losses. When subjected to tension up to 50% of the ultimate strength of the conductor, the surface shall not depart from the cylindrical form on any part of the compartment, parts or strands, more relative to each other in such a way as to get out of place and disturb the longitudinal smoothness of the conductor.

6. MARKING:

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

a) Contract/Award letter number

b) Name and address of consignee.

c) Manufacture's name and address.

d) Drum and lot number

e) Size and type of conductor

f) Length of conductor in meters

g) Arrow marking for unwinding

h) Position of the conductor ends

i) Number of turns in the outer most layer.

j) Gross weight of the drum after putting lagging.

k) Average weight of the drum without lagging.

ISI mark Manufacturer Name/ Trade Mark

"TPCODL/TPNODL/TPSODL/TPWODL" P.O No and Date

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer:

7.1 ACCEPTANCE TESTS: Acceptance Test on Finished Conductor

i. Lay Ratio/Direction of the lay Mechanical Properties
ii. Diameter
iii. Breaking Load / Tensile Test
iv. Resistance
v. Wrapping Test
vi. Elongation
vii. Density Test (using Hygrometer)

7.2 ROUTINE TESTS

i. Check for Joints
ii. Surface Condition of the strand and stranded conductor
iii. All acceptance tests
iv. Check the drum

7.3 TYPE TESTS

Type Test of Finished Conductor

i) UTS test on stranded conductor Mechanical Properties
ii) DC resistance test on stranded conductor

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ ERDA/ Approved Govt. Labs by TATA ODISHA DISCOM** as per relevant IS. Type tests should have been conducted during the period not exceeding 10 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e., any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPSODL/TPWODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not

relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPSODL/TPWODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
c) TPCODL/TPNODL/TPSODL/TPWODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPNODL/TPSODL/TPWODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of at least 12 months from the date of commissioning or 24 months from the date of last supplies made under the contract whichever is later, (the time scale of 12/24 months could be enhanced subject to mutual agreements). Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed period, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12. PACKING AND TRANSPORT:

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. Standard Length of the conductors is 2000 Mtrs. / as per PO terms and conditions. The bidder shall provide

instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE:

Bidder shall submit the sample of 1 mtr. material during the tender evaluation process with the offer.

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
b) Work Experience details
c) Type test certificates.
d) Drawing 1 Set of Hard Copy & Soft Copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS: To Be Furnished by Bidder

SL. NO.	TECHNICAL PARTICULARS	UNIT	DOG (100 Sq.mm) (7 / 4.26mm)	COYOTE (148 Sq.mm) (19 / 3.15mm)	PANTHER (232 Sq.mm) (19 / 3.94mm)
1	**Make**				
a)	Aluminium Alloy rod				
b)	Conductor				
2	**Type**	No/mm			
3	**Particulars of Raw material**				
a)	Si	%			
b)	Mg	%			
c)	FE	%			
d)	Cu	%			
e)	Mn	%			
f)	Cr.	%			
g)	Zn	%			
h)	B	%			
i)	Other Elements (Each)	%			
j)	Other Elements (Total)	%			
k)	Aluminium	%			
4	**Aluminium Alloy wire Strands**				
i	Diameter (mm)				
a)	Normal	mm			
b)	Maximum	mm			
c)	Minimum	mm			
ii	Cross Section Area of Nominal dia wire	Sq. mm			
iii	Minimum Breaking Load of each strand after stranding	KN			
iv	Minimum elongation % on gauge length of 200 mm (After Strand)	%			

v	Max. Resistance at 20 Deg.C	Ohm/ KM			
5	**AAAC Stranded conductor**				
5.1	Nominal Sectional Area	sq. m			
5.2	Overall Diameter	mm			
5.3	Approx. Mass	Kg. /Km			
5.4	Minimum Ultimate Breaking Load of Conductor	KN			
5.5	Lay ratio of conductor ((Min. / Max.)				
5.6	Calculated Max. resistance of conductor at 20º C	Ohm/ Km.			
6	Standard length of conductor (meter)	Mtr.			
6.1	Continuous max. current carrying capacity in still air at 40ºC ambient temperature	Amp			
6.2	Temperature rises for above current				
6.3	Tolerance on standard length of Conductor (%)	%			
6.4	Direction of lay for outside layer				
7	**Modulus of Elasticity**	GN/Mtr^2			
8	Joints-- There shall be no joints in any wire of a stranded conductor containing continuation .				
9	Co-efficient of liner expansion per deg. C	^0C			

10	Density of Material	Kg/ cm3	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-GEN-4005

Specification Name : GALVANISED IRON (GI) FLATS OF DIFFERENT SIZES

Ranjan Kumar Sahoo	SATYA PRASAD NAYAK	SHANTAPRIYA JENA	JYOTIPRAKASH MOHANTY	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPCODL	TPNODL	TPWODL	TPSODL	TPSODL
22-12-2022	22-12-2022	22-12-2022	22-12-2022	22-12-2022	22-12-2022

TPCODL TPNODL TPWODL TPSODL	**Document No:** ENG-GEN-4005 **Document Title:** GALVANISED IRON (GI) FLATS OF DIFFERENT SIZES

CONTENTS

1.0	**SCOPE**	This specification covers technical requirements of design, manufacturing, testing, Inspection, Supply & transportation of Hot dip Galvanised Iron (GI) Flat 25X3 MM, 25X4 MM, 25X6 MM, 50X6 MM, 75X10 MM, 90X6 MM at TPCODL/TPNODL/TPSODL/TPWODL stores/site.
2.0	**APPLICABLE STANDARDS**	The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall confirm to the regulations of the local Statutory authorities: • IS 1239 (Part1): Specification for Steel Tubes, Tubulars & other wrought steel fittings. • IS 1239 (Part2): Specification for Steel Tubes, Tubulars & other steel fittings. • IS 228: Method for chemical analysis of steels. • IS 4736 : Specification for Hot dip zinc coating on mild steel tubes • IS 4759: Specification for Hot dip zinc coating on structural steel and other allied products. • IS 1387: General requirements for the supply of metallurgical materials. • IS 1608: Mechanical testing of metals-Tensile Strength. • IS 4711: Methods for sampling of steel pipes, tubes and fittings. • IS 4740: Code of practice for packaging of steel tubes. • IS 10748: Hot rolled steel strip for welded tubes & pipes. • IS 12278: Method for ring tensile test on metallic tubes. • IS 3043-1987: Code of practice for earthing. • IS 1367: Technical supply conditions for threaded steel fastners. • IS 14394: Industrial fastners-Nuts of product GradeC- Hot Dip Galvanised. • IS 2016:-1997: Specification for plain washers. • IS 1730-1989: Steel plates, sheets, strips and flats for structural • And general engineering purpose-Dimensions • IS 814-2004: covered electrodes for manual metal Arc welding • of carbon and carbon Manganese steel- specification. • IS: 2629(1966)- Recommended practice for hot dip galvanized of Iron Earthing Strips • IS: 2633(1972)- Methods of testing weight, thickness & uniformity of coating on hot dip galvanized articles. • IS: 5358(1969)- Specification for hot dip galvanized coating on fastness I • IS:3203-Specification for Electroplating • IS: 4759(1968)- IS: 4759(1968) • IS 2062 **In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.*

3.0 CLIMATIC CONDITIONS OF INSTALLATION

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4.0 GENERAL TECHNICAL REQUIREMENTS

MATERIAL

Supplier has to purchase raw materials (MS Flat) as per relevant IS at his own cost.

The zinc required for galvanizing shall be quality Zn-99.95% or better Zinc grade & shall confirm to IS and its latest amendments.

The Supplier shall make his own arrangement for procurement before the commissioning of work, sufficient quantity of electrolytic zinc of proper quality for galvanizing. The Supplier shall however not link the delivery period with the supply of zinc. TPCODL/TPNODL/TPSODL/TPWODL is at liberty to have sample of zinc used and to test in any laboratory at his own cost and reject the particular supply, is found below standard.

All raw materials required for galvanizing etc. and for complete execution of work shall be stocked in adequate quantities by the Supplier to ensure that the progress of work is not hampered.

SL. NO.	TECHNICAL PARTICULARS	Requirement
1	Material	Hot-Dip Galvanized Flat
2	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, IS: 4759
3	Make	SAIL, TATA Steel, ESSAR, JSW Steel and TATA steel BSL
4	Grade of Steel	E 250 A
5	Minimum Tensile Strength in Mpa	410
6	Yield Stress in Mpa	250
7	Percentage Elongation (Min.) at Gauge Length	23%
8	Bend Test (Internal Dia)	Min-2t
9	Mass of Zinc Coating	705 gm/m^2
10	Zinc Coating Thickness & No of Dips	100 Micron (6 Dip)
11	Chemical composition	Grade: E 250 A (As per IS: 2062)
12	Standard length of supply	6 Metre Long
13	Tolerances	As per IS 1852 latest Amendment

5.0 GENERAL CONSTRUCTION

GI Flat intended for different use in electricity distribution utility. The zinc coating shall be uniform. The materials shall be strictly from approved vendors' i.e. SAIL, TATA Steel, ESSAR, JSW Steel and TATA steel BSL & Billets(grade E250) with re rolling shall be allowed for mentioned MAKE. Documentary evidence certifying the raw material lifted from the approved vendor, which should not be less than the ordered quantity. Similarly the zinc for galvanization shall be procured from Hindustan zinc LTD. or Vedanta LTD. And the firm shall submit the documentary evidence certifying not less than the ordered quantity of zinc lifted from the approved vendor. The hot dip galvanization shall be done only after the all fabrication and welding done. The nut bolt, & washers provided shall be as per relevant IS.

5.1 Mass of the Flats are as follows:-

a) 25X3 mm: - 0.589kg/m

b) 25X4 mm: - 0.785kg/m

c) 25X6 mm: - 1.18kg/m

d) 50x6 mm: - 2.36kg/m

e) 75x10 mm: -5.89kg/m

f) 90x6 mm: -4.24kg/m

5.2 Chemical Composition

Chemical composition for Fe 410 WA Grade

a)C - 0.23% Max

b)Mn - 1.5% Max

c)S - 0.045% Max

d)P - 0.045%Max

e)SI - 0.40% Max

f) CE (Carbon Equivalent)- 0.42%

5.3 Galvanization:

All flats shall be hot dip galvanized, are as following:

a) All galvanizing shall be carried out by the hot dip process, in accordance with Specification IS 2629.

b) The zinc coating (705 gms per sq.mt / 100Micron,6 dips) shall be smooth, continuous and uniform. It shall be free from acid spot and shall not scale, blister or be removable by handling or packing.

c) There shall be no impurities in the zinc or additives to the galvanic bath which could have a detrimental effect on the durability of the zinc coating. Purity of zinc shall be Zn 99.95% or better.

d) In the event of damage to the galvanizing the method used for repair shall be subject to the approval of the Engineer in Charge or that of his representative. Repair of galvanization at site will not be permitted in any situation.

e) Partial immersion of the work shall not be permitted and the galvanizing tank must therefore be sufficiently large to permit galvanizing to be carried out by one immersion.

After galvanizing no drilling or welding shall be performed on the galvanized parts. To avoid the formation of white rust galvanized materials shall be stacked during

		transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization. The galvanized steel shall be subjected to test as per IS-2633.
6.0	**NAME PLATE AND MARKING**	The body of the device shall be appropriately marked with "TPCODL/TPNODL/TPSODL/TPWODL" , Manufacture's name or trademark and Year of Manufacturing. at suitable location such that it is permanent and does not harm the body of the device.
7.0	**TESTS**	All routine, acceptance & type tests shall be carried out in accordance with the relevant IS.
7.i)	**TYPE TEST**	The following tests shall constitute the type tests and shall be carried out as per IS: 1239 Part-1: 2004(Latest Amendment) 1)Test for Mechanical Properties (As per 1239 Part-1: 2004 or Latest Amendment clause no.14.1 & 14.1.1) • Percentage of Elongation. • Tensile strength. 2) Mass of zinc coating. (As per 4736:1986 or Latest Amendment clause no.5.1) 3) Chemical composition. (As per 1239 Part-1: 2004 or Latest Amendment clause no.6.1.1)
7.ii)	**ROUTINE/ ACCEPTANCE TEST**	The following tests shall be got conducted in presence of TPCODL/TPNODL/TPSODL/TPWODL representative as per IS: 1239 Part-1: 2004 (Latest Amendment) on the samples taken from the offered lot material for the purpose of acceptance of that lot of material. 1) Dimension of GI Flat. (As per IS 1239 Part-1: 2004 clause No.9.1 a&b)-Test shall be performed. 2) Chemical composition (Manufacturer's Test Certificate for raw material-Document Review only.) 3) Mass of zinc coating. (As per 4736:1986 or Latest Amendment clause no.5.1)-Test shall be performed. 4) Test for mechanical properties (Manufacturer's Test Certificate for raw material-Document Review only.) 5) Galvanizing/Electroplating test 6) Visual Inspection test to confirm products free from any defects
8.0	**TYPE TEST CERTIFICATES**	The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA / Other Government Labs/ NABL accredited Lab as per relevant IS. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL .

9.0	**PRE DISPATCH INSPECTION**	The Material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL . Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPSODL/TPWODL 's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPSODL/TPWODL . The pre-dispatch inspection shall be carried out as per annexure-IV Following documents shall be sent along with material a) Test reports b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL c) Invoice in duplicate d) Packing list e) Drawings & catalogue f) Guarantee / Warrantee card g) Delivery Challan h) Other Documents (as applicable)
10.0	**INSPECTION AFTER RECEIPT AT STORES**	The material received at TPCODL/TPNODL/TPSODL/TPWODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to each QA and Plant Engineering group.
11.0	**GUARANTEE**	Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of 12 months from the date of commissioning or 18 months from the date of last supplies made under the contract whichever is earlier, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.
12.0	**PACKING**	Bidder shall ensure that the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.
13.0	**TENDER SAMPLE**	Samples to be provided as required to TPCODL/TPNODL/TPSODL/TPWODL

		Engineering Dept.
14.0	**TRAINING**	Not Applicable
15.0	**QUALITY CONTROL**	The bidder shall have a prove track of not less than 10 years in GI Flat in manufacturing and servicing in national or international market. The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.
16.0	**MINIMUM TESTING FACILITIES**	Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.
17.0	**MANUFACTURING ACTIVITIES**	The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.
18.0	**SPARES ACCESSORIES AND TOOLS**	To be provided by BA
19.0	**DRAWINGS AND DOCUMENTS**	Constructional drawings are attached as annexure-I, annexure-II, annexure-III should be followed for fabrication. Following documents shall be prepared based on TPCODL/TPNODL/TPSODL/TPWODL specifications and statutory requirements with complete BOM and shall be submitted with the bid: 1. Completely filled in Technical Particulars along with Size and weight/sq.m of G.I. Flat, Standard Length, Galvanization Process, Galvanization thickness 2. General description of the equipment and all components including brochures. 3. Bill of Material 4. Type test Certificates 5. Experience List. After award of order Soft of all the drawing, GTP, test certificates shall be submitted for the final approval of the same to the purchaser. Following Drawings/Documents shall be submitted after the award of the contract:

		Sl. No / **Description** / **For Approval** / **For Review Information** / **Final Submission** 1 / General Technical Parameters / √ / / √ 2 / Manual/Catalogues/drawings for all components. / / √ / 3 / Technical details and test certificates of the component. / / √ / √ 4 / Instructions for use / / √ / √ 5 / Transport/shipping dimension drawing / / √ / √ 6 / QA & QC Plan / √ / √ / √ 7 / Routine, Acceptance and Type test Certificates / √ / √ / √ All the Documents and Drawings shall be in English Language.
20.0	**GUARANTEED TECHNICAL PARTICULARS**	Clause wise compliance shall be provided by bidders

21.0	**SCHEDULE OF DEVIATIONS**	**(TO BE ENCLOSED WITH THE BID)** All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the TPCODL/TPNODL/TPSODL/TPWODL 's specifications: **S.No.** / **Clause No.** / **Details of deviation with justifications** We confirm that there are no deviations apart from those detailed above. Seal of the Company: Signature Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-GEN-4006

Specification Name : GI EARTHING PIPE

Ranjan Kumar Sahoo	SATYA PRASAD NAYAK	SHANTAPRIYA JENA	JYOTIPRAKASH MOHANTY	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPCODL	TPNODL	TPWODL	TPSODL	TPSODL
21-12-2022	21-12-2022	22-12-2022	22-12-2022	22-12-2022	22-12-2022

CONTENTS

1. SCOPE:

The specification covers technical requirements of design, Manufacturing, testing, Inspection, supply and transportation of Heavy type GI Earth Pipe Electrode. Scope also includes transportation & unloading at store / site.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IS 1239 (Part-1)	Specification of steel tubes, Tubular and other wrought steel fittings
IS 1239 (Part-2)	Specification of steel tubes, Tubular and other steel fittings
IS 10748	Hot- rolled steel strip for Welded Tubes and Pipes
IS: 228	Methods of Chemical analysis for steels
IS: 4759	Specification for Hot Dip Zinc Coating on structural steel and other allied products
IS: 4711	Methods for sampling of steel pipes, tubes, fittings
IS 3043	Code for practice of Earthing

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

SL. No	TECHNICAL PARTICULAR	DESIRED VALUE		
1	Diameter of earthing Pipe	40 mm dia	50 mm dia	100 mm dia
2	Standard	IS 1239	IS 1239	IS 1239
3	Material	GI Pipe	GI Pipe	GI Pipe
4	Make	JINDAL /TATA	JINDAL /TATA	JINDAL /TATA
5	Class	Heavy	Heavy	Heavy
6	Outdoor diameter	47.9 mm min. to 48.8 mm max.	59.7 mm min. to 60.8 mm max.	113.1 mm min. to 115 mm max.
7	Wall thickness	4 mm	4.5 mm	5.4 mm
8	% of Elongation	20	20	20
9	Tensile strength	320 N/mm²	320 N/mm²	320 N/mm²
10	Length of pipe earthing	3000 mm	3000 mm	3000 mm
11	Dimensions of holes	12 mm	12 mm	12 mm
12	Tolerance on dimensions/weight	+/-5 %	+/-5 %	+/-5 %
13	Galvanizing shall confirm	IS:4736, IS: 2633, IS: 2629	IS:4736, IS: 2633, IS: 2629	IS:4736, IS:2633, IS: 2629
14	Dimension of clamp	50 x 6 GI flat	50 x 6 GI flat	50 x 6 GI flat
15	Weight of Pipe (As per IS 1239 Part-1(2004)	4.37Kg/Mtr.	6.19Kg/Mtr.	14.5Kg/Mtr.
16	Center of Hole	150mm	150mm	150mm

Note: - For design and other parameter refer to the drawing on page No:-7.

5. GENERAL CONSTRUCTION:

For welded and seamless plain end steel tubes intended for different use in electricity distribution utility shall comply IS 1239 (Part-1). Plain ends of the tubes are cleanly finished by normal deburring process. For tubes with thickness up to 6 mm, the minimum mass of zinc coating in accordance with IS: 6745, shall be 400g/mm2. The Zinc coating on the tube shall be uniform and tested in accordance with IS 4736. The welded tubes shall be manufactured from hot rolled steel strip for welded tubes and pipes confirming to IS 10748. Pipe shall be strictly from approved vendors i.e. TATA/JINDAL. The hot dip galvanization shall be done only after the all fabrication and welding done. Zinc

electroplated/painted material will not be accepted. The nut bolt and washer s provided shall be as per the relevant IS. Chemical composition for GI earth pipe are in below:

Carbon: 0.20% (max.)

Manganese: 1.30% (max.)

Phosphorus: 0.04% (max.)

Sulphur: 0.04% (max.)

6. MARKING:

The unit shall be appropriately marked as

a) TPCODL/TPNODL/TPSODL/TPWODL
b) Manufacture's name or trademark
c) Year of Manufacturing

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer:-

7.1 ACCEPTANCE TESTS

i) Visual Inspection
ii) Verification of Dimensions
iii) Tensile Strength
iv) Bend Test
v) Hot Dip galvanizing
vi) Determination of mass of Zinc coating on Zinc coated iron and steel

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS

i) Visual Inspection
ii) Verification of Dimensions
iii) Tensile Strength
iv) Bend Test
v) Flattening test (dia.>50mm)
vi) Hot Dip galvanizing
vii) Determination of mass of Zinc coating on Zinc coated iron and steel

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI / ERDA / Other Government/NABL Accredited Labs** as per relevant IS. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPSODL/TPWODL 's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPSODL/TPWODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
c) TPCODL/TPNODL/TPSODL/TPWODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPNODL/TPSODL/TPWODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

12. PACKING:

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE:

Not Applicable

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

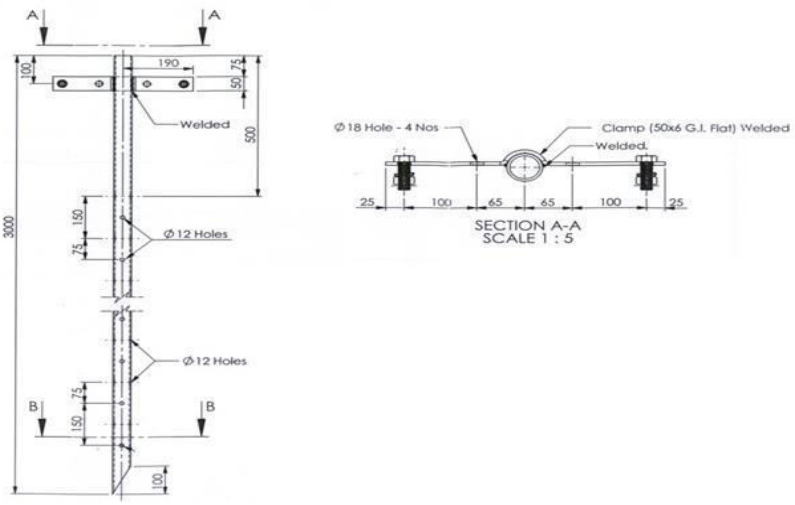
Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations

b) Work Experience details

c) Type test certificates

d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing



NOTE: - The drawing is for tender purpose only.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:-

SL. No	TECHNICAL PARTICULAR	TO BE FURNISHED BY THE BIDDER		
1	Diameter of earthing Pipe	40 mm dia	50 mm dia	100 mm dia
2	Standard			
3	Material			
4	Make			
5	Class			
6	Outdoor diameter			
7	Wall thickness			
8	% of Elongation			
9	Tensile strength			
10	Length of pipe earthing			
11	Dimensions of holes			

12	Tolerance on dimensions/weight			
13	Galvanizing shall confirm			
14	Dimension of clamp			

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2007

Specification Name : ENG-ELC-006- TECHNICAL SPECIFICATION FOR 11KV XLPE ARMOURED CABLE- R1

JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	Ranjan Kumar Sahoo	VARUN BHATNAGAR	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPNODL	TPCODL	TPSODL	TPWODL	TPWODL
10-12-2022	10-12-2022	12-12-2022	12-12-2022	13-12-2022	13-12-2022

CONTENTS

1. SCOPE:

This specification covers technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store, performance of 11 kV XLPE ARMOURED cable, for trouble free and efficient operations.

Inclusive sizes: -

3 CORE CABLE	1 CORE CABLE
3C X 95 sq.mm.	1C X 300 sq.mm.
3C X 120 sq.mm.	1C X 400 sq.mm.
3C X 185 sq.mm.	
3C X 150 sq.mm.	1C X 630 sq.mm.
3C X 300 sq.mm.	
3C X 400 sq.mm.	1C X 1000 sq.mm.
3C X 400 sq.mm. (co-extruded cable)	

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IS 7098 (Part 2)	Cross-linked Polyethylene (XLPE) insulation for Cables
IS 8130	Conductors for insulated electrical cables and flexible cords
IS 10418	Specification for Drums for Electric cables
IEC 60228	Conductor for insulated cables
IS 3975	Low carbon galvanized steel wires, formed wires and tapes for armoring of cables
IS 5831	Specification for PVC insulation sheath for electric cables
IEC-60811	Test methods for insulations and sheaths of electric cables and cords.
ASTM D 6097	Standard test method for relative resistance to vented water tree growth in Solid Dielectric insulating materials
ICEA T 31-610	Test method for conducting longitudinal water penetration resistance tests on blocked conductors
IS 10810	Methods of tests for cables
IS 4905	Methods for random sampling
IS 4984	High density polyethylene pipes for water supply
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds

IS 4826	Specification for hot dipped galvanized coatings on round steel wires
IS 5:2007	Colors for ready mixed paints and enamels
ASTM 2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
IEC 60754	Apparatus and procedure for the measurement of the amount of halogens evolved during the combustion of materials taken from electric or optical fiber cable constructions
IEC-60502 (Part-2)	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1.2 kV) up to 30 kV (Um = 36 kV) - Part 2: 22 kV Cables for rated voltages from 6 kV (Um = 7.2 kV) up to 30 kV (Um= 36 kV).
IEC 332	Test on electric cables on the fire conditions
ASTM 2843	Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.

14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted,salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during thedry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Description	Requirement	
		3 CORE CABLE	1 CORE CABLE
1	Voltage grade	11 kV (Earthed system)	
2	Max System voltage	12 kV	
3	Frequency	50 Hz	
4	Variation in frequency	+/- 3%	
5	Conductor	Watertight Stranded Aluminum (compacted circular)	
6	Conductor screen	Semi conducting tape and screen	
7	Insulation	XLPE	
8	Insulation screen	Shall have three layers:	Shall have three layers:
9		a) Bonded Semiconducting, b) Semiconducting water swellable tape, c) Metallic copper tape	a) Bonded Semiconducting, b) Semiconducting water swellable tape, c) Metallic copper tape d) Polyester transparent tape over copper screen
10	Core identification strip	Beneath copper screen	NA
11	Inner sheath	Pressure Extruded PVC ST- 2 with PP fillers	Extruded PVC ST-2
S. No.	Description	Requirement	
		3 CORE CABLE	1 CORE CABLE

12	Armour	GI wire round binded with rubberized cotton binding tape	Aluminum wire binded by rubberized cotton tape
13	Outer sheath	PVC ST-2 FRLSH type of color 'Crimson Red shade' code:355 as per IS 5:2007	
14	Outer sheath (for co-extruded cable)	a) Inner layer: HDPE ST-7, Crimson Red shade b) Outer sheath: HDPE ST-7, Black color	NA
15	Guarantee	up to a period of 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract whichever is earlier.	

5. GENERAL CONSTRUCTION:

The cross-linked polyethylene insulated (XLPE) 11 kV Cable (Dry cured & water cooled) shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – 2)/ Relevant IEC/International standards and its latest amendments.

All material used in the manufacturing of cables shall be new and shall be selected as the best available for the intended use.

The rating factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and different laying configuration of cables shall be provided by the Bidder.

5.1 Conductor

S. No.	Parameter	Requirement							
1	Conductor	As per IS 8130							
2	Class	Class II							
3	Material	Plain Aluminium, grade H2/H4							
4	Shape	Stranded Compacted Circular							
5	Nominal size ofconductor mm2	95	120	150	185	300	400	630	1000
6	Min. number ofstrands	15	15	15	30	30	53	53	53
7	Max. DC resistance@ 20 deg C (Ohm/km)	0.32	0.25	0.206	0.164	0.1	0.08	0.047	0.03
8	Conductor Short circuit current ratingfor 1 second	9 kA	11.3 kA	14.2 kA	17.5 kA	28.3 kA	37.7 kA	59.4 kA	94.3 kA
9	Min. weight ofconductor (kg/km/core)	244	308	390	480	780	1080	1650	2600

10	Longitudinal water sealing of conductor	a) Non-conductive water swellable yarn/ tape/ combination of both shall be provided in between interstices of the conductor. b) Also, this water swellable tape and yarn shall be compatible to withstand conductor continuous temperature of 90 deg C and short circuit temperature of 250 deg C without any decay. c) It shall not affect the electrical conductivity of the conductor.
11	Cleanliness anduniformity	a) Before stranding, the cross-section of the Aluminium conductor shall be circular, and shall have uniform smooth surface, free from sharp edges and free from any defects. b) Stranded Conductor shall be free from oil traces & aluminum dust. Conductor (after stranding) shall be super cleaned c) Traces of aluminum dust on conductor or conductor screen shall not be acceptable.
12	Conductor jointing	Not acceptable in any strand or in any conductor after it is stranded.
13	Raw material supplier ,	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta / Equivalent (in-line with TS)
14	Diameter of conductor	To be specified by bidder

5.2 Conductor Screen:

S. No.	Parameter	Requirement
1	Material	**1st layer:** Semi-conducting tape **2nd layer:** Semi-conducting compound
2	Configuration	**1st layer:** Semi-conducting tape shall be applied over conductor with nominal thickness of 0.2 mm. **2nd layer:** Semi-conducting compound screen shall be applied through triple extrusion process.
3	Min. thickness	Minimum thickness of semi-conducting compound screen shall be 0.5 mm at any point of measurement.
4	Resistivity	Resistivity of semiconducting conductor screen shall not exceed 1000 Ω-m
5	Uniformity on interfacial region	Interfacial region between conductor screen and insulation shall be uniform. Protrusion/ convolution/ other defects are not acceptable in the region.
6	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz. Dow/ Borealis/ Hanwa/ Equivalent (in-line with TS)

5.3 Insulation:

S. No.	Parameter	Requirement
1	Material and extrusion process	XLPE insulation shall be applied through CCV/VCV line by triple extrusion process with 'Dry Curing' and 'Water Cooling'.
2	Raw material supplier	**a) XLPE compound shall be super cleaned and procured from reputed raw material suppliers viz. Dow/Borealis/Hanwa/** Equivalent (in-line with TS) b) Both XLPE and semi conductive compounds shall be used from same raw material supplier.
3	Thickness and Eccentricity	a) Nominal thickness shall be 3.6 mm. b) Minimum thickness shall be 3.14 mm at any point of measurement. c) Eccentricity of insulation shall not exceed 10%.
4	Thermal stability	The insulation properties shall be stable under thermal conditions arising out of continuous operation at conductor temperature of 90 deg. C rising momentarily to 250 deg. C under short circuit conditions.
5	Cleanliness and uniformity	Interfacial region between insulation and insulation screen shall be uniform. Protrusion/convolution/ other defects are not acceptable. Core shall be free from void and contamination.

5.4 Insulation Screen & Core identification strip:

S. No.	Parameter	Requirement
1	Material	a) **1st layer:** Semi-conducting compound b) **2nd layer**: Semi-conducting water swellable tape c) **3rd layer:** Annealed copper tape
2	Configuration	**a) 1st layer: Non-Metallic Part:** Extruded Insulation semiconducting screen shall be bonded type. Resistivity shall not exceed 500 Ω-meter. Surface of insulation screen shall be smooth, free from cavity/ nicks/scratches/ other visible defects. Min. thickness shall be 0.3 mm at any point of measurement. **b) 2nd layer: Water Swellable tape:** Semi-conducting water swellable tapes shall be applied over non-metallic screen. Minimum thickness of water swellable shall be 0.3 mm and minimum overlapping shall be 15%. **Core identification strip:** **3 CORE CABLE: -** Each of the three core identification strips shall

S. No.	Parameter	Requirement
		be applied longitudinally beneath copper screen. Width of the colored strip shall be 7-10 mm. R, Y, B. **1 CORE CABLE: - NA** c) **3rd layer: Metallic Part**: Annealed copper tape, helically wound over the water swellable tape with minimum 15% overlap. Minimum thickness shall be 0.045 mm at any point of measurement.
3	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz.,Dow/Borealis/Hanwa / Equivalent (in-line with TS)
4	Diameter of cores	To be specified by bidder
5	Weight of cores/km (approx.)	To be specified by bidder
6	Weight of copper tape/km (approx.)	To be specified by bidder

5.5 Fillers:

S. No.	Parameter	Requirement	
		3 CORE CABLE	**1 CORE CABLE**
1	Material	Virgin Polypropylene fibers of natural color	NA
2	Configuration	Virgin Polypropylene fibers shall be tightly filled in empty space as fillers.	

5.6 Inner Sheath:

S. No.	Parameter	Requirement	
		3 CORE CABLE	**1 CORE CABLE**
1	Material	Black colored Polyvinyl chloride (PVC) type ST-2 compound	
2	Configuration	The laid-up cores shall be provided with *pressure extruded* Polyvinyl chloride (PVC) type ST-2 compound conforming to IS: 5831 with latest amendments. Pressurized extrusion is required to remove any gaps remaining in between the fillers and to make the cable as circular as possible. It shall be applied to fit closely on to the laid-up cores and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.	Extruded PVC ST-2 type conforming to IS: 5831. It shall be applied to fit closely and shall be possible to remove easily without causing any damage to the underlying insulated cores and screens.

3	Raw material supplier	PVC compound shall be procured from reputed suppliers viz, Shakun, Kalpana, KLJ, DCM ShriRam/ Equivalent (in line with TS). PVC compound from cable manufacturer shall be considered only after factory evaluation for the same.

4	Min. thickness at anypoint of measurement	**3 CORE CABLE**						
		95 sq.mm.		120 sq.mm.	150 sq.mm.	185 sq.mm.	300 sq.mm.	400 sq.mm.
		0.6 mm		0.6 mm	0.6 mm	0.7mm	0.7 mm	0.7 mm
		1 CORE CABLE						
		300 sq. mm.	400 sq.mm.	630 sq.mm.		1000 sq.mm.		
		0.4 mm(min)	0.4 mm	0.5 mm		0.6 mm		

5.7 Armour:

S. No.	Parameter	Requirement					
		3 CORE CABLE				**1 CORE CABLE**	
1	Material	Low carbon annealed hot dippedgalvanized round steel wires				H4 Grade Aluminum wires	
2	Compliance to Standard	It shall comply with the requirements of IS 3975 along withlatest amendments. Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires. Zinc coating shall be 290g/m2 as per IS 4826:1979.				It shall comply with the requirements of IS8130 along with latest amendments.	
3	Nominal Dimensions	**3 Core cable**					
		95 sq.mm	120 sq.mm	150 sq.mm	185 sq. mm.	300 sq.mm	400 sq.mm.
		2.5 (GI Wire)	2.5 (GI Wire)	2.5 (GI Wire)	3.15(GI WIRE)	3.15 (GI Wire)	4.00 (GI Wire)
		1 CORE CABLE					
		300 sq. mm.	400 sq.mm	630 sq.mm			1000 sq.mm
		2 mm (Aluminum wire)	2 mm (Aluminum wire)	2 mm (Aluminum wire)			3.15 mm (Aluminum wire)
4	Approx. Armor Short circuitrating in kAfor 1 sec	**3 Core cable**					
		95 sq.mm	120 sq.mm	150 sq.mm		300 sq.mm	400 sq.mm.
		9	12	15		15	15
		1 CORE CABLE					
		300 sq. mm	400 sq.mm	630 sq.mm			1000 sq.mm
		15	15	15			15
		Fault current for the armour with minimum 90 % coverage.					

5	Jointing in the armour wires	Not acceptable in any armour wire
6	Laying of armour	The armor wires shall be applied as closely as practicable. Shall not be less than 90% of total circumference.
7	Binding	The rubberized cotton binding tape shall be applied to bind the armor wires suchthat it shall not affect the electrical properties of the armor wires and the overall cable.
8	Weight of armor	To be furnished by Bidder
9	Raw material supplier	Steel armour shall be procured from reputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL/ Equivalent (in-line with TS) / Aluminium armour shall be procuredfrom reputed raw material suppliers viz TATA/ BALCO/HINDALCO/NALCO/Vedanta Only/ Equivalent (in-line with TS)

5.8 Outer Sheath (for Normal cable)

S. No.	Parameter	Requirement					
1	Material	Polyvinyl chloride (PVC) ST-2 **FRLSH** type compound with **'lead naphthenate'** additive					
2	Configuration	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with **'lead naphthenate'** additive as 'termite & rodent repellent' applied by extrusion process.					
3	Min. Thickness at any point of measurement	**3 CORE CABLE**					
		95 sq.mm	120 sq.mm	150 sq. mm	185 sq. mm.	300 sq.mm	400 sq.mm.
		2.2 mm	2.2 mm	2.36 mm	2.52 mm	2.84 mm	3.0 mm
		1 CORE CABLE					
		300 sq. mm.	400 sq.mm	630 sq.mm			1000 sq.mm
		1.56 mm	1.72 mm	1.88 mm			2.2 mm
4	Color	Crimson Red color, color code: 540 as per IS 5:2007.					
5	Surface uniformity	Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.					
6	Raw material supplier	**PVC compound shall be procured from reputed raw material suppliers viz.,** Shakun, Kalpana, KLJ, DCM ShriRam. Equivalent (in-line with TS) PVC compound from cable manufacturer shall be considered only after factory evaluation for the same.					
7	Weight of outer sheath/km	To be provided by bidder					

5.9 Outer Sheath (for Co extruded 3C Cable)

S. No.	Parameter	Requirement
1	Inner layer	HDPE ST-7, Crimson red of color code 540, Minimum thickness at any point of measurement – 3 mm

2	Outermost layer	HDPE ST-7, Black color, Nominal Thickness at any point of measurement – 2 mm. Carbon content shall be as per IS 7098
3	Surface uniformity	Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.
4	Raw material supplier	**HDPE shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, SCJ Plastics, and Borealis**, Equivalent (in-line with TS)
5	Weight of outer sheath/km	To be provided by bidder
6	Weight of HDPE/km	To be provided by bidder

5.10 Sealing End Cap:

S. No.	Parameter	Requirement
1	Material	Adhesive coated polyolefin heat shrinkable
2	Configuration	Adhesive coated polyolefin heat shrinkable end cap shall be provided at both ends of the cable.
3	Additional requirements	2 nos. additional cable end caps shall be provided with each drum and placed in the drum.

5.11 Other Requirements:

S. No.	Parameter	Requirement
1	Overall diameter of cable in mm	To be provided by bidder
2	Weight of Overall cable in kg/km	To be provided by bidder

6 MARKING:

Steel drums shall be provided. Drum shall be free from sharp edges and visual defect. Stencil plate on one flange side of the drum and laminated paper sheet on other side flange of drum.

Cable length on one drum shall be 250 meters max. +/- 5%. (As per PO Terms.)

I. Following details shall be provided on flanges of drum:

a) Manufacturer's name
b) Type of Cable
c) Size of Cable
d) Voltage Grade
e) Length of the cable on the drum
f) Direction of the rotation of the drum
g) Gross mass
h) Country of manufacture
i) Year and month of manufacture

j) Purchase Order no.

k) Drum No.

II. Following details shall be embossed on the outer PVC Jacket (For normal Cable) & HDPE layer (for co-extruded cable):

Embossing may be clearly visible. At interval of every 1 meter, following details to be embossed:

i) TPWODL/ TPCODL/ TPNODL/ TPSODL

ii) Manufacturer's name

iii) Month & Year of Manufacturing

iv) Voltage grade

v) Size of the cable

vi) Purchase Order no.

vii) Cable code

Note: - Sequential meter marking shall be printed.

7 TESTS:

The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

Test on Conductor

7.1.1 Conductor resistance test

7.1.2 Test for non-conductivity of water swellable tape/yarn of conductor

7.1.3 Visual inspection for conductor cleanliness

7.1.4 Conductor water penetration test

Test on Conductor Screen

7.1.5 Thickness of semi-conducting tape over conductor

7.1.6 Test for conductivity of semi-conducting tape over conductor

7.1.7 Resistivity of extruded semi-conducting conductor screen

7.1.8 Thickness of extruded semi-conducting conductor screen

Test on Insulation

7.1.9 Tensile strength & Elongation at break (before ageing)

7.1.10 Insulation thickness

7.1.11 Eccentricity and Ovality of insulation

7.1.12 Hot set test

7.1.13 Volume resistivity

7.1.14 Void & contamination test on core (by silicon oil dip method)

7.1.15 Surface smoothness of insulation

Test on Insulation Screen

7.1.16 Resistivity of insulation screen

7.1.17 Thickness of insulation screen

7.1.18 Visual inspection for any convolution/ protrusion between conductor screen and XLPEinsulation, XLPE insulation and insulation screen

7.1.19 Thickness & % Overlapping of semi-conducting water swellable tape

7.1.20 Thickness & % Overlapping of copper tape

Test on Inner Sheath

7.1.21 PVC thickness

7.1.22 Color of inner sheath

Test on Armour (For 3 Core)

7.1.23 Tensile test

7.1.24 Mass of zinc coating

7.1.25 Uniformity of zinc coating

7.1.26 Adhesion test

7.1.27 Diameter and no. of wires

7.1.28 Coverage %

Test on Armour (For 1 Core)

7.1.29 Tensile test

7.1.30 Wrapping test

7.1.31 Resistance test

7.1.32 Diameter and no. of wires

7.1.33 Coverage %

Test on Outer sheath (for Normal cable)

7.1.34 Thickness

7.1.35 Tensile strength and Elongation at break (before ageing)

7.1.36 Color of outer sheath

7.1.37 Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void,nick, cavity

7.1.38 Presence of lead naphthenate in PVC outer sheath

7.1.39 Flammability test

7.1.40 Oxygen index

7.1.41 Temperature index

7.1.42 Acid gas generation

7.1.43 Smoke density

Test on Outer sheath (for 3 Core extruded cable)

INNER LAYER

7.1.44 Thickness

7.1.45 Tensile strength and Elongation at Break (before ageing)

7.1.46 Color

OUTER LAYER

7.1.47 Thickness

7.1.48 Tensile strength and Elongation at Break (before ageing)

7.1.49 Carbon Content

7.1.50 Color

7.1.51 Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void,nick, cavity

Test on Complete Cable

7.1.52 Partial discharge test

7.1.53 High voltage test

7.2 ROUTINE TESTS

i) Conductor resistance test

ii) Partial discharge

iii) High voltage test with power frequency

iv) Resistance test for Aluminium armour

7.3 TYPE TESTS

Tests on Conductor

7.3.1 Conductor resistance test

7.3.2 Conductor water penetration test

Tests on Insulation

7.3.3 Tensile strength & Elongation at break (before ageing)

7.3.4 Ageing in air oven

7.3.5 Tensile strength & Elongation at break

7.3.6 Tests for thickness of insulation

7.3.7 Eccentricity and Ovality of insulation

7.3.8 Hot set test

7.3.9 Shrinkage test

7.3.10 Gravimetric test (Water absorption)

7.3.11 Volume resistivity/ Insulation Resistance

Tests on Inner Sheath

7.3.12 PVC thickness

Tests on Extruded semi-conducting screen

7.3.13 Volume resistivity test of conductor screen

7.3.14 Volume resistivity test of core screen

Tests on Outer Sheath (PVC)

7.3.15 Flammability test for outer sheath

7.3.16 Thickness

7.3.17 Tensile strength and Elongation at break (before ageing)

7.3.18 Tensile strength and Elongation at break (after ageing)

7.3.19 Variation due to ageing

7.3.20 Loss of mass test

7.3.21 Shrinkage test

7.3.22 Hot deformation test

7.3.23 Heat shock test

7.3.24 Thermal stability test

7.3.25 Flammability test

7.3.26 Oxygen index

7.3.27 Temperature index

7.3.28 Acid gas generation

7.3.29 Smoke density

Tests on Outer Sheath - HDPE ST 7 (for Co-extruded cable)

7.3.30 Thickness

7.3.31 Tensile strength and Elongation at break (before ageing)

7.3.32 Tensile strength and Elongation at break (after ageing)

7.3.33 Shrinkage test

7.3.34 Carbon Black Content

Tests on Armour for 3 Core Cable

7.3.35 Tensile test

7.3.36 Torsion test

7.3.37 Wrapping test

7.3.38 Resistance test

7.3.39 Mass of zinc coating

7.3.40 Uniformity of zinc coating

7.3.41 Adhesion test

Tests on Armour for 1 Core Cable

7.3.42 Tensile test

7.3.43 Torsion test

7.3.44 Wrapping test

7.3.45 Resistance test

Tests on complete cable

7.3.46 Partial discharge test

7.3.47 Thermal ageing test

7.3.48 Bending test

7.3.49 Dielectric power factor test

7.3.50 High voltage test

7.3.51 Heat cycle test

7.3.52 Impulse withstand test

Additional Test (To be checked by Inspector)

7.3.53 Raw material consumption

7.3.54 Color coding identification over copper screen (for 3C cable)

7.3.55 Sequential marking check

7.3.56 Cable drum length verification

7.3.57 Packaging of cable on cable drum

7.3.58 Diameter over outermost sheath of co-extruded cable

7.3.59 Weight of outer sheath of co-extruded cable/ km

7.3.60 Weight of total HDPE of co-extruded cable/ km.

8 TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA as per relevant IS. However, TPWODL/ TPCODL/ TPNODL/ TPSODL/ TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report under exceptional circumstances after due diligence/ scrutiny by DISCOM. Tests should have been conducted during the period not exceeding 10 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPWODL/ TPCODL/ TPNODL/ TPSODL.

9 PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPWODL/ TPCODL/ TPNODL/ TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPWODL/ TPCODL/ TPNODL/ TPSODL's representatives at all times when the work is in progress. Inspection by the TPWODL/ TPCODL/ TPNODL/ TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL/ TPCODL/ TPNODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports

b) MDCC issued by TPWODL/ TPCODL/ TPNODL/ TPSODL

c) TPWODL/ TPCODL/ TPNODL/ TPSODL Invoice in duplicate

d) Packing list

e) Drawings & catalogue.

f) Guarantee / Warrantee card

g) Delivery Challan

h) Other Documents (as applicable).

10 INSPECTION AFTER RECEIPT AT STORE:

The material received at TPWODL/ TPCODL/ TPNODL/ TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copyof the report shall be sent to Engineering department.

11 GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

12 PACKING:

a) **Standard length of Cable:** The cable shall be supplied in continuous standard length of 250 (3 cores) & 500 (Single core) running meters with +/- 5% tolerance.

b) **Filling condition:** Drum shall not be overfilled.

c) **Cable drum:** The cable shall be wound on non-returnable steel drums without any extra cost to TPWODL/ TPCODL/ TPNODL/ TPSODL as per IS 10418 and its latest amendments.

d) **Sealing of cable ends:** The ends of the cable shall be sealed by means of heat shrinkable polyolefin end caps. Additional 2 nos. end caps shall be provided with each drum.

e) **Requirements for Cable drums:** Cable drums shall be so constructed as to have required mechanical strength so that the drum flanges and other components do not break during transport, in actual use or in storage. The flanges and the outside surface of the barrel shall be free from protruding materials/projections/ unevenness/ sharp edges that can damage the cable or hands of the operator during rotation of drums.

A metal preservation shall be applied to the entire drum.

f) Bottom end of cable should be clamped on drum by jute or nylon rope.

g) All ferrous metal parts used shall be treated with a suitable rust-free finish or coating to avoid rusting during transit or storage. The drums shall withstand normal handling and transport.

h) **Rail/ Road transportation:** The bidder shall ensure that the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.

i) **Packaging shall be as per climate change perspective. Cable wound on cable drum shall be covered by recyclable PVC sheet for dust proof.**

13 TENDER SAMPLE:

Not Applicable

14 QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15 TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16 MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17 SPARES, ACCESSORIES AND TOOLS

Not applicable.

18 DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B"

Deviations

b) Work Experience details

c) Type test certificates.

d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19 SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder to submit clause wise compliance.

20 SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2014

Specification Name : Specification For 11 KV Vacuum circuit Breaker 1250 A- Outdoor

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
SWARUP NAYAK	SURYAKANTA MOHANTY	SANTOSH KUMAR PATRA	Susavan Biswas	KHAJAN BHARDWAJ	POURUSH GARG
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
05-06-2023	05-06-2023	05-06-2023	05-06-2023	23-06-2023	24-06-2023

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-HV-2014 **Specification Name:** Technical Specification for 11KV Outdoor Vacuum Circuit Breaker (1250 A)

CONTENTS

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-HV-2014 **Specification Name:** Technical Specification for 11KV Outdoor Vacuum Circuit Breaker (1250 A)

1. SCOPE:

This specification This specification covers technical requirements of design, manufacture, construction, performance, testing at manufacturer's works, packing, forwarding, supply and unloading at stores/site of 11KV Outdoor VCB of 1250 Amps. completed with all accessories for trouble free and efficient performance.

2. APPLICABLE STANDARDS:

a) IS 13118: Specification for High Voltage Alternating Current Circuit Breakers
b) IS 12063: Classification of degrees of protection provided by enclosures of electrical equipment
c) IS 2099: Bushings for alternating voltages above 1000 Volts
d) IS 2629:Recommended Practice for Hot-Dip Galvanizing of Iron and Steel : Methods for testing uniformity of coating of zinc coated articles
e) IS 2633: Hot Dip Zinc coatings on structural steel and other allied products
f) IS 4759: High-voltage switchgear and control gear
g) IEC 62271-100 Alternating current circuit breakers
h) IEC 62271-1-: High-voltage switchgear and control gear - Part 1: Common specifications
i) ISO 1460: Metallic coatings - Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area
j) BS 729 : Specification for Hot dip galvanized coatings on iron and steel articles

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	100%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	180 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPWODL/TPSODL service area has **heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 180 Kmph**. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS

Sr. No.	Particulars for 11kV OD CB	Requirements
4.1	Application	Outdoor
4.2	Type	VCB
4.3	Rated voltage	12 kV
4.4	Service voltage	11 kV
4.5	Rated Frequency	50 Hz
4.6	Number of phases	3
4.7.1	Rated Lightning impulse withstand voltage	75KVp
4.7.2	Rated short duration power frequency withstand voltage	28kV rms
4.8	Rated normal current	1250A
4.9	Rated load breaking current (sym)	1250A
4.1	Percentage DC component	40%
4.11	Rated short circuit withstand current for 3 seconds	25 kA (rms)
4.12	Rated short circuit making current	62.5 kA
4.13	First Pole to Clear factor	1.5 for Terminal fault
		1 for Short line fault
		2.5 for Out of phase fault
4.14	Rated capacitive switching currents	
4.14.1	Rated line charging breaking current	As per IEC 62271-100
4.14.2	Rated cable charging breaking current	25A
4.14.3	Rated single capacitor bank breaking current	400A
4.14.4	Capacitor Banks with series reactors switching capacity	As per IEC 62271-100
4.15	Maximum switching over voltages for cable charging & capacitor bank breaking current	2.5 p.u.
4.16	Rated operating sequence	0-0.3sec-CO-3min-CO
4.17	Total Break time(max)	65 ms
4.18	Closing time (max)	85 ms
4.19	Rated supply voltage of control circuits	48V DC / 24V DC
4.19.1	Range for satisfactory operation of Trip circuit	70% to 110%
4.19.2	Range for satisfactory operation of closing & other circuits	85% to 110%
4.2	Transient recovery voltages	As per IEC 62271-100

4.21	No. of auxiliary cotacts	10 NO & 10 NC
4.22	Minimum Clearance in air	As per IEC 62271-100
4.22.1	Between phases (Center to Center)	300 mm
4.22.2	Phase to Earth	370 mm
4.23	Min. Creepage distance of insulator	31mm/kV
4.24	Degree of Protection	IP 55
4.25	Operating mechanism	Spring charged by universal motor.
4.26	Operation	Gang operated
4.27	Temp. rise at rated normal current	As per IEC 62271-100
4.28	Minimum Vertical clearance of live conductor from ground level	As per Manufacturer's type tested design
4.29	Mechanical Endurance	M2
4.3	Electrical Endurance	E2 without Auto-reclosing
4.31	Restriking Class	C2
4.32	Class	S2
4.33	Material of main contact	Manufacturer's Type Tested Design
4.34	Make of Interrupter	Make to Vacuum Interrupter should be of same make as that of Breaker manufacturer. Representative shall visit Interrupter manufacturing Facility during Factory Inspection

5. GENERAL CONSTRUCTIONS

5.1 GENERAL:

5.1.1 Circuit breaker shall be housed in a weather proof & dust proof cabinet made of CRCA or Equivalent thickness of which shall not be less than 2.5 mm. The circuit breaker unit shall be suitable for outdoor application with IP-55 degree of protection. Doors giving access to the mechanism at the front and sides shall be provided. The housing latch shall accommodate padlock requiring a 12 mm diameter hole. The bidder shall provide padlock and duplicate keys.

The circuit breaker unit shall be complete with internal wiring. The Circuit provided with GI support structure.

5.1.2 Suitable heaters shall be mounted in the housing to prevent condensation. On-off switch and fuse shall be provided. Heater shall be suitable for 240V single- phase 50 Hz AC supply. Electrical and Mechanical indications for ON-OFF to be provided which is visible from the front.

5.1.3 Terminal boards shall be furnished in the mechanism housing. All the terminal blocks shall be of disconnecting type links. Terminals for DC and AC shall be isolated from each other. A minimum of 20% spare terminals for control wiring shall be provided. All wiring in the housing shall be stranded and the insulation shall be vermin proof. Insulation shall be such that it shall not support combustion. Suitably rated switches shall be provided to enable the control supply to the breaker to be cut off from the mechanism housing. Requisite number of cable entries shall be provided at the bottom of the operating cabinet to receive purchaser's control cables. Number and size of

cable glands will be intimated to the bidder. A light point with a control switch shall be provided inside the housing of the breaker.

5.1.4 Height of operating box of the CB shall be specified. The height of manual operating handle shall not be more than 1500 mm from ground level. The operating box shall be provided with T-N-C switch "Pistol Grip" type for local operation. Separate terminal box below the main operating box to accommodate the terminal blocks shall be provided. The terminal box shall be provided with DC supply.

5.1.5 No external damping circuit shall be acceptable with the CB. Breaker tripping curve to be provided by the bidder. Bidders providing breakers with contact resistance <30 micro ohms and range for satisfactory operation of Trip circuit as 50 % to 110 % shall be given preference. The closing time and opening time shall not change during operating life. And the Contact resistance shall not change by ±10% during operating life.

5.2 OPERATING MECHANISM:

5.2.1 Circuit breaker shall be power operated through a motor compressed spring charging mechanism. Spring operated mechanism shall be complete with motor, opening spring, closing spring and all necessary accessories to make the mechanism a complete operating unit. Spring_ charging motor shall be universal type with overload protection and overload relay with contacts for annunciation. Each mechanism shall be so designed as to enable a continuous sequence of circuit breaker opening and closing operations to be obtained by the control switch as long as power is available to the motor, and at least one circuit breaker opening and closing after failure of power supply to the motor. Also, the Circuit breaker shall have suitable provision for manual spring charging. Anti-pumping feature shall be provided.

5.2.2 Operating mechanism shall normally be operated by remote electrical control. Provision shall be made for local electrical control and a "local/remote" selector switch shall be provided in the operating mechanism cubicle. A conveniently located manual tripping lever or button shall also be provided for tripping the breaker and simultaneously opening the reclosing circuit. A manual closing device that can easily be operated by one person standing on the ground shall also be provided for maintenance purposes. Each circuit breaker unit shall be provided with operation counter.

5.2.3 A closing release shall operate correctly at all values of voltage between 70% and 110% of the rated voltage. A shunt trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70% and 110% of rated voltage.

5.2.4 Working parts of the mechanism shall be of corrosion resisting material. Bearing which require greasing shall be equipped with pressure type grease fittings. Bearing pins, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the breaker.

5.2.5 Main poles of each breaker shall be connected together and operated by a common mechanism and shall be so adjusted and arranged that interrupting contacts of all phases can be readily adjusted to touch and part simultaneously.

5.2.6 Provision shall be made to enable electrical interlocking with the opening or closing of the isolator when breaker is closed. All electrical and mechanical interlocks, which are necessary for safe and satisfactory operation, shall be furnished.

5.2.7 Floor clamps, Foundation bolts, Lifting hooks and one manually operated tank lifting & lowering device for frame-mounted tanks shall be provided. All similar parts, particularly removable ones shall be interchangeable with one another. Exposed live parts shall be placed high enough above ground to meet the statutory requirements and local safety codes. All Terminal blocks shall be stud type. Bidder shall give suitable provision in CB such as space, auxiliary contact with wiring etc. for providing castle lock by purchaser.

5.3 CONTACTS:

Main contacts shall have sufficient area and contact pressure for carrying the rated current and the short time rated current of the breaker without excessive temperature rise that may cause pitting or welding. Contacts shall be adjustable to allow for wear, easily replaceable and shall have a minimum of movable parts and adjustments to accomplish these results. Main contacts shall be the first to open and the last to close.

5.4 BUSHINGS:

Porcelain used in bushing manufacture shall be a single piece and homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Glazing of the porcelain shall be of uniform brown colour free from blisters, burns and similar other defects. Bushings shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used. All bushings of identical ratings shall be interchangeable. Insulation of bushings shall be coordinated with breaker insulation so that impulse flashovers will occur outside the tank. Puncture strength of bushings shall be greater than the dry flashover value. When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulation or supports by the formation of substances produced by chemical action. No radio disturbance shall be caused by the bushings when operating at the normal rated voltage. Iron parts shall be preferably hot-dip galvanized, all joints shall be airtight. Surfaces of the joints shall be trued up; porcelain parts by grinding and metal parts by machining. Bushing design shall be such as to ensure a uniform compressive pressure on the joints.

5.5 PRIMARY TERMINALS:

Primary terminals shall be suitable for wedge type connectors with Panther conductors. Successful bidder shall supply connectors. It should have Primary terminals (connected at Fixed contact) on Single Side at top in case of bypassing CB.

5.6 GALVANIZING:

All galvanizing shall be carried out by the hot dip process, in accordance with IS 2629/ ISO 1460 amended to date. However, high tensile steel nuts, bolts and spring washers shall be electro -galvanized to service condition four. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.

The minimum mass of Zinc coatings shall be as per IS 4759. After galvanizing no drilling or welding shall be performed_ on the galvanized parts of the equipment except that nuts may be threaded after galvanizing.
To avoid the formation of white rust, galvanized material shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization. The galvanized steel shall be subjected to tests as per IS-2633/ BS 729 amended to date.

5.7 EARTHING:

Suitable grounding terminals shall be provided on the circuit breaker on opposite sides, for connecting to earth pit. The earthing terminals shall be readily accessible and so placed that the earth connection of the circuit breaker is maintained even when the cover or any other movable part is removed. GI strip for earthing shall be of size 50 mm X 6mm, approx. The earthing terminals shall be of adequate size, be protected against corrosion and shall be metallically clean. The earthing terminal shall be identified by means of the symbol "⏚" marked in a legible and indelible manner on case or frame to be earthed adjacent to the terminals.

5.8 CT Mounting Arrangement:

CT Mounting Arrangement shall be in scope of supplier. Supplier has to provide the detailed calculation for selection of all Load Bearing Components . Components shall be GI.

CT Base shall be 310 X 310 mm (Hole Centre to Centre)
Minimum weight to be considered: 80 kg (min) per CT.

5.9 24V DC LED Type Indicating Lamps shall be mounted inside control cubicle which shall be visible from outside through glass of cubicle door.

a. Breaker ON - Red
b. Breaker OFF – Green
c. Spring Charged - Blue

6. MARKING

Circuit breaker and its operating devices shall be provided with durable and legible nameplates containing all technical parameters. Name plate for Circuit breaker shall be embossed with "PO No. with date", "PROPERTY OF TPCODL/TPNODL/TPWODL/TPSODL", along with the following information:
Manufacture's nameType designation and serial number

1. Year of manufacture
2. Relevant standard
3. Rated voltage
4. Rated lightning impulse withstand voltage
5. Rated switching impulse withstand voltage
6. Rated normal current
7. Rated duration of short circuit
8. Rated short circuit breaking current

9. DC time constant of the rated short circuit breaking current if different from 45 ms
10. DC component of the rated short circuit breaking current at contact separation corresponding to the dc time constant of the rated short circuit breaking current
11. Rated operating sequence
12. Classification

Name plate for the operating device shall be provided with following information:

1. Manufacturer's name
2. Type designation and serial number
3. Relevant standard

7. TESTS

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the Purchaser/his authorized representative. Following tests shall be necessarily conducted in addition to others specified in relevant standards.

7.1 Routine tests:

1. Dielectric tests on the main circuit
2. Tests on auxiliary and control circuits
3. Measurement of the resistance of the main circuit
4. Tightness tests
5. Design and Visual checks
6. Mechanical operating tests

7.2 Type tests:

1. Dielectric Tests
2. Measurement of the resistance of the main circuits
3. Temperature rise tests
4. Short time withstand current and peak withstand current tests
5. Additional tests on auxiliary and control circuits
6. Mechanical operation test at ambient temperature
7. Short circuit making and breaking tests
8. Verification of the degree of protection
9. Tightness tests
10. Mechanical tests
11. Out of phase making and breaking tests
12. Electrical endurance tests
13. Double earth fault tests
14. Capacitive Current switching tests

The above type test certificates must accompany drawing of type tested equipment, duly signed by type testing authority.
The above tests must not have been conducted on the equipment within time frame as per latest CEA Guidelines
In case of any change in design/type of Breaker already type tested and the one offered against this specification, the owner reserves the right to demand repetition of type tests, without any extra cost.

8. TYPE TEST CERTIFICATES

The Bidder shall furnish the type test certificates of the Item for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA/CESI/KEMA/KERI/PEHLA as per the relevant standards. Type tests should have been conducted in certified Test laboratories during the period not exceeding years as per CEA Guidelines from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPWODL/TPSODL .

9. PRE DISPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPDCOL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPWODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPWODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPWODL/TPSODL .

Following documents shall be sent along with material

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPWODL/TPSODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORES

The material received at TPCODL/TPNODL/TPWODL/TPSODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 36 months from the date of commissioning or 48 months from the date of last supplies made under the contract, whichever is earlier, bidder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges(@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for "Free Replacement" for another period of THREE years from the end of the guarantee period for any "Latent Defects" if noticed and reported by the company.

12. PACKING:
Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit.

13. TENDER SAMPLE : Not required

14. QUALITY CONTROL:
The bidder shall submit with the offer, assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and after finishing, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's/ Consultant's engineer shall have free access to the manufacturer/sub bidder's works to carry out inspections.

15. MINIMUM TESTING FACILITIES:
Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES:
The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

17. SPARES, ACCESSORIES & TOOLS SPARES:

Following spares shall be supplied along-with CB. 10% spare to be considered. Bidder should quote unit rates for spares. Exact quantity to be finalized during tendering.

1. Trip Coil
2. Closing coil
3. Spring charging motor
4. Vacuum interrupter (For VCB type)
5. T-N-C Switch
6 .Local / remote selector switch
7. LED Indicator (Red and Green)
8. Contactor/Relay for Control Circuit
9. Breaker aux contact

In addition to above bidder shall submit recommended list of spares for 3 years, if any with unit prices and recommended quantity.

ACCESSORIES: The circuit breakers shall be provided with the following accessories, in addition to those needed for normal operation and control

1. Breaker position indicator
2. Breaker Operation counter
3. T-N-C switch

4. A local mechanical emergency trip device with necessary shrouds
5. Castle key & lock (Series will be finalized during detail engineering)
6. Electrical & mechanical interlocks with isolators
7. A heater rated 230 volts AC, 50 Hz for the operating mechanism housing heater current monitors

SPECIAL TOOLS & GAUGES: A list of complete set of special tools and gauges required for erection & maintenance and installation procedure shall be submitted

18. DRAWINGS AND DOCUMENTS

Following documents shall be prepared based on TPCODL/TPNODL/TPWODL/TPSODL specifications and statutory requirements with complete BOM and shall be submitted with the bid:

a) Completely filled in Technical Particulars.
b) General description of the equipment and all components including brochures.
c) Type test Certificates
d) Experience List/Performance Certificates from end users.
e) Foundation Plan
f) Operation & Maintenance Manual

After the approval of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, test certificates shall be submitted after the final approval of the same to the purchaser

Following Drawings/Documents shall be submitted after the award of the contract

S. No	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	GA Drawings	√		√
3	Internal Wiring Diagram		√	√
4	Foundation Plan		√	√
5	Installation Instruction		√	√
6	Transport/Shipping dimension Drawing		√	√
7	QA & QC Plan	√	√	√
8	Test Certificate	√	√	√

All the Documents and Drawings shall be in English Language.

Instruction Manuals: Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

19. GUARANTEED TECHNICAL PARTICULARS

S. No.	Description	Units	To Be Furnished by Bidder
			11 kV (VCB)
1	Application		
2	Type		
3	Rated voltage	kV	
4	Service voltage	kV	
5	Rated Frequency		
6	Number of phases		
7	Rated insulation level		
7.1	Rated Lightning impulse withstand voltage		
a	To earth and b/w Poles	kVp	
b	Across the isolating distance	kVp	
7.2	Rated short duration power frequency withstand voltage		
a	To earth and b/w Poles (dry test for 1 min)	kV	
b	Across the isolating distance(dry test for 1 min)	kV	
c	To earth and b/w Poles and across the isolating distance(wet test for 10 sec)	kV	
8	Rated normal current	A	
9	Rated load breaking current (sym)	kA (rms)	
10	Percentage DC component		
11	Rated short circuit withstand current for 3 seconds	kA	
12	Rated short circuit making current	kA	
13	First Pole to Clear factor		
14	Rated capacitive switching currents		
14.1	Rated line charging breaking current		

14.2	Rated cable charging breaking current	A	
14.3	Rated single capacitor bank breaking current	A	
14.4	Capacitor Banks with series reactors switching capacity	MVAR	
15	Maximum switching over voltages for cable charging & capacitor bank breaking current	p.u.	
16	Rated operating sequence		
17	Total Break time(max)	ms	
18	Total closing time	ms	
19	CO time	ms	
20	Pole discrepancy	ms	
21	Rated supply voltage of control circuits	V	
21.1	Range for satisfactory operation of Trip circuit		
21 2	Range for satisfactory operation of closing & other circuits		
20	Transient recovery voltages		
21	No. of auxiliary contacts		
22	Clearance in air		
22.1	Between phases	mm	
22.2	phase to earth	mm	
23	Min. Creepage distance of insulator	mm	
24	Degree of Protection		
25	Operating mechanism		
26	Anti pumping feature		
27	Spring charging time		
28	Temp. rise at rated normal current	Deg C	
29	Vertical clearance of live conductor	mm	
30	Mechanical Endurance		
31	Electrical Endurance		
32	Restriking Class		
33	Class		
34	Main Contacts		
34.1	Type		
34.2	Material		

35	Arcing Contacts		
35.1	Type		
35.2	Material		
36	No. of operations		
36.1	At rated normal current		
36.2	At rated capacitor bank breaking current		
36.3	At rated short circuit breaking current		
37	No. of breaks per phase		
38	Minimum contact resistance		
39	**FOR VCB Type**		
39.1	Type of indication for contact erosion		
39.2	Rating of interrupter		
39.3	Make of interrupter		
40	Connectors		
41	Type test certificates		
42	Test for Re-strike free for VCB		
43	Total weight of breaker (Kg)		
44	Dimensions (mm)		

20. SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S. No	Clause No.	Details of deviation with justifications

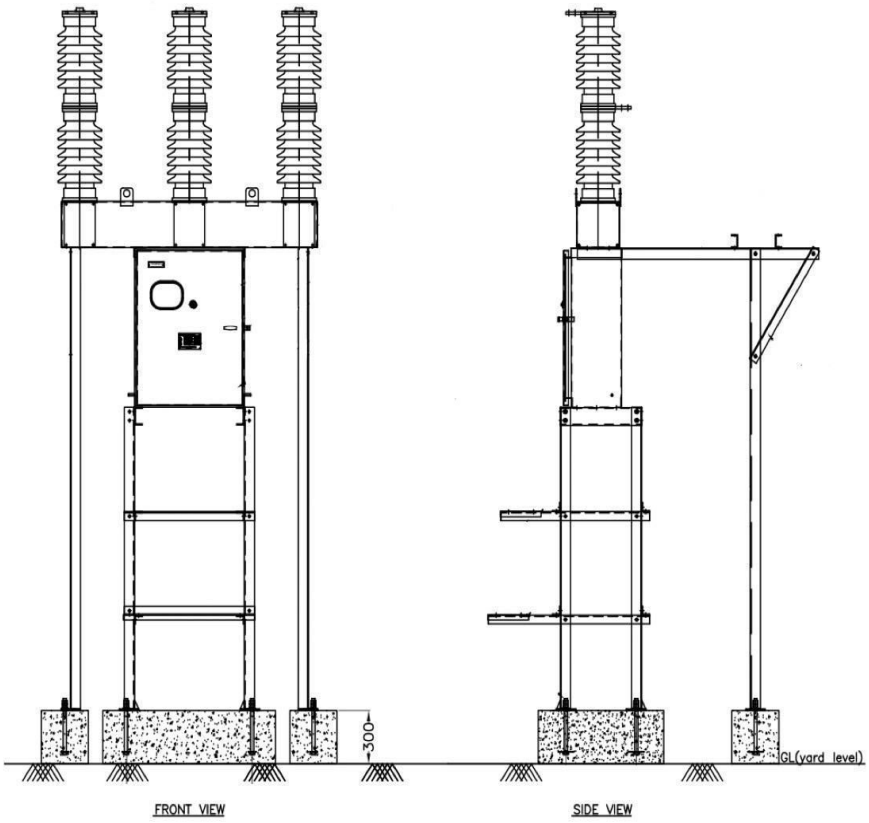
We confirm that there are no deviations apart from those detailed above

Seal of the Company:

Signature

Designation

21. SAMPLE DRAWING (For Tender purpose only)



STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2015

Specification Name : Technical Specification for 11KV Lightening Arrester (10 KA)

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
SRASTANTH MOHANTY	DEEPAK BADATYA	SMARANIKA ACHARYA	Vijender Goyal	KHAJAN BHARDWAJ	POURUSH GARG
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
21-01-2023	23-02-2023	01-03-2023	04-03-2023	18-03-2023	18-03-2023

CONTENTS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of 12kV,10kA, Station class-SL, (class-II) Metal Oxide Gap less Polymeric Lightning Arrester. The specific requirements are covered in the enclosed technical data sheet. Some of the parts that may have not been specifically included, but otherwise form part of the Lightening arrester as per standard practice or necessary for proper operation, will be deemed to be also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. Scope also includes transportation & unloading at store / site.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

IEC 60099-4	Specification for surge arrestor without gap for AC System
IS 15086	Specification for Metal Oxide Gap less Lightning arresters for alternating current System
IS 6209	Method of Partial Discharge Measurement
IS 8704 & IS 731	Guide for selection of creepage distance of polymeric housing insulator.
ISO 48	Rubber, vulcanized or thermoplastic -- Determination of hardness (hardness between 10 IRHD and 100 IRHD).
IEC 60721-3-2	Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Transportation
IEC 60071	Insulation co-ordination -- Part 1 definitions, principles and rules; -- Part 2: Application Guide
IEC 60815-1	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions –Part 1: Definitions, information and general principles
IS 2629	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
IS 2633	Methods for testing uniformity of coating of zinc coated articles
IS 4759	Hot-dip zinc coatings on structural steel and other allied products

3. CLIMATIC CONDITIONS:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	150mm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPWODL/TPNODL/TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
1	Installation	Outdoor
2	Reference standards (Latest Amend.)	IS 15086,Part-4, IEC 60099
3	Arrester Type and Housing	Metal Oxide Gapless Cage type with Polymeric housing
4	Normal System Voltage	11 kV
5	Highest System Voltage	12 kv
6	Rated Frequency	50 Hz
7	Maximum Continuous Operating Voltage (M.C.O.V)	9.6 kV (rms)
8	Arrester Rating	12 kV (rms)
9	**Discharge Current**	
a	Nominal Discharge Current	10 kA
b	Switching impulse discharge current	0.5kA

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
10	Short Circuit rating	25 kA
11	**Voltage Withstand on Arrester Housing**	
a	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	28kV (rms)
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	75kV (Peak)
12	Lightning Impulse Protection Level (at 10kA)	49 kV
13	**Long Duration Current**	
a	Peak Current	75 A
b	Virtual duration of Peak T	1000 T (Micro Sec)
14	High Current impulse Operating Duty	65 kA (Peak)
15	Creepage Distance of Arrester Housing	31mm/KV (min) or 380 mm (min)
16	Partial Discharge at 1.05 times M.C.O. V	<10 pc
17	Energy Absorption capacity (KJ/KV)	>=4KJ/KV
18	Repetitive charge transfer withstand (coloumbs),Qrs	>=1.0
19	**Temporary over voltage (TOV)**	
a	1 sec	15kVp
b	10 sec	14kVp
20	**Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave**	
a	at 5kA	35kVp
b	at 10kA	38kVp
c	at 20kA	--
21	**Maximum switching current impulse residual voltage in kVP at 500 A**	21 kVp
22	Max. Cantilever Strength	12 Kg-M(minimum)
23	Total height of the arrester	To be specified by bidder
24	Total weight of the arrester	To be specified by bidder
25	No. of Metal oxide blocks in arrester	To be specified by bidder
26	Rating of individual ZnO blocks used for assembly	To be specified by bidder
27	Power Losses of the Arrester in watt	To be specified by bidder
28	Type of Mounting	Bracket type
29	Material of Insulating base	UV resistant Fire retardant DMC
30	**Disconnector (optional)**	
a	Disconnector connecting lead	Insulated flexible tinned plated copper braid with lugs
b	Size of Insulated Tinned copper	25 sq.mm

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
	braid	
c	Length of Insulated Tinned copper braid	300 mm
31	Insulating Terminal Cap	Polyolefin
32	Material of Nuts and bolts	Stainless Steel

5. GENERAL CONSTRUCTION:

Lighting arrestors shall be station class, zinc oxide and gapless type suitable for operation under the system conditions specified. This shall be self-supporting, structure mounting type. Each unit of arrestor assembly shall be hermitically sealed, leak tested and protected against ingress of moisture and shall be individual demountable. The seal shall be properly designed and tested for operation under extreme weather conditions.

5.1 Assembly:

Lighting arrestor shall be supplied along with the insulating base/Mounting bracket, terminal connector, insulating terminal cap (Polyolefin) and necessary hardwares. The assembly consists of a stack of metal oxide elements arranged in cage type designs. All metal parts shall be of non-rusting and non –corroding metal. Bolts, screws and pins shall be provided with lock washers. Lightning arrestor construction shall be suitable to withstand seismic loading, short circuit forces, wind load, the force exerted on the arrestor base and to terminal imposed by the line conductor. All similar parts, particularly removable ones, shall be interchangeable.

a) The 12kV 10kA station class Lightning Arrester shall have L-shaped terminal clamp suitable for conductor size of 148 sqmm.

b) Housing shall be polymeric to provide thermal dissipation of heat generated in the metal oxide elements during over voltage and line discharge. Polymeric housing shall be free from flaws affecting the mechanical and electrical strength of the arrestor. Housing shall be capable to withstand the temperature rise due to the non-uniform field distribution, caused by the pollution on the surface of the housing.

c) The arrestor shall have thermal stability to withstand the heat generated from ZnO element due to continuous operating voltages and surges. It shall remain in undamaged condition, capable protective function.

d) Arrestors shall incorporate anticontamination feature to prevent arrestor failure, consequent to uneven voltage gradient across the stack in the event of contamination of the arrestor insulating material. These features shall be described in detail when submitting the Bid.

Arrestors shall be capable of discharging over voltages occurring during switching of unloaded transformers, capacitors banks and long lines. No radio interferences shall be caused by the arrestors operating at the normal rated voltage.

e) Bidder shall mention energy handling capacity.

5.2 EARTHING TERMINALS:

Earth Terminals shall be provided with Lightning arrestor.

5.3 MECHANICAL STRENGTH:

a) The Lightning Arrester and it base shall withstand rated mechanical terminal load and electromagnetic forces without impairing their operational reliability.

b) The Lightning Arrester shall not come out of their positions by gravity, wind pressure, vibrations or reasonable shocks.

5.4 DISCONNECTORS (OPTIONAL):

a) Each Individual unit of Lighting Arrester with disconnector shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire life time of the Lightning Arrester with disconnector under the specified service conditions. Disconnectors shall give the visible indication of the failed arrestor. The Lightning Arrester with disconnector shall be suitable for bracket type mounting. Disconnector shall be suitable for screwing directly to LA with terminal of M10.

b) The corresponding units of Lightning Arrester with disconnector of the same rating shall be interchangeable without adversely affecting the performance. All the necessary flanges, bolts, nuts, clamps etc. required for assembly of complete Lightning Arrester with disconnector and accessories and mounting on purchaser's support structure shall be included in bidder's scope of supply. The mounting details for mounting the Lightning Arrester with disconnector on purchaser's support shall be given along with bid.

5.5 MOUNTING BRACKET:

a) The 12kV 10kA Distribution class Lightning Arrester shall be fixed over a mounting bracket made of UV resistance, Fire retardant DMC material.

b) The 12kV 10kA Station class Lightning Arrester shall be fixed over a mounting arrangement made of Hot dip galvanized MS material.

6. MARKING:

A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each Lightning Arrester in a visible position and shall carry all the information as specified in the standards. The letters on the rating plate shall be engraved black on the white/silver background. Fixing screws for outdoor use shall be of stainless steel or any other corrosion resistant metals. The Name plate shall be embossed with "PO no. with date" & "TPCODL/TPWODL/TPNODL/TPSODL",

The following information shall be mentioned on the Name Plate

a) Continuous operating Voltage
b) Rated Voltage
c) Rated Frequency
d) Nominal Discharge Current
e) Pressure relief rated current in kA r.m.s.
f) Manufacturer's Name
g) Type and Identification of the complete
h) Year/Month of Manufacture
i) Serial Number.
j) Warrantee/guarantee clause

7. TESTS:

All routine, acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components and fittings shall also be type tested as per the relevant standards. Following tests shall necessarily be conducted on lightning arrestor in addition to others specified in IS/IEC standards: -

7.1 ACCEPTANCE TESTS

a) Measurement of Power frequency reference voltage
b) Lightning impulse residual voltage test on complete arrestor or arrestor unit.
c) Internal Partial Discharge test
d) Visual Examination

All acceptance tests shall be witnessed by TPCODL/TPWODL/TPNODL/TPSODL / the purchaser's or his authorized representative. The above mentioned tests shall be made on 100 % of arrestors to be supplied.

7.2 ROUTINE TESTS

a) Measurement of reference voltage test
b) Residual Voltage Test on complete arrester
c) Internal partial discharge test. This test shall be performed on each arrester unit. The test sample may be shielded against external partial discharges. Internal partial discharge shall not exceed 10 pC

7.3 TYPE TESTS

a) Insulation withstand tests, including lightning impulse voltage withstand test
b) Residual voltage tests, including steep current impulse residual voltage test, lightning impulse residual voltage test and switching impulse residual voltage test.
c) Operating duty tests
d) Long duration current impulse withstand test/Repetitive charge transfer rating, Qrs.
e) Weather ageing test
f) Short circuit test (low/high current)
g) Power frequency (voltage vs Time curve)
h) Bending moment test
i) Hot dip Galvanizing test on exposed steel parts.
j) Internal partial discharge test
k) Wet power frequency voltage withstand test.
l) Seal leak rate test
m) Tests on arrestor disconnectors- Time current characteristics (optional)

7.4 SPECIAL THERMAL STABILITY TEST:

The test requires additional agreement between manufacturer and purchaser prior to the commencement of arrestor assembly.

8. TYPE TEST CERTIFICATES:

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

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPWODL/TPNODL/TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPWODL/TPNODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPWODL/TPNODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance

with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPWODL/TPNODL/TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPWODL/TPNODL/TPSODL
c) TPCODL/TPWODL/TPNODL/TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPWODL/TPNODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for ' free replacement' for another period of THREE years from the end of gurantee period for any 'latent defects' if noticed by the company.

12. PACKING AND TRANSPORT:

Bidder shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site. The material should be packed in vertical position in individual box in such a way that the

shape of rain shed does not get deformed during transportation and storage.

13. TENDER SAMPLE:

One sample to be submitted during technical bid submission. This shall be Non-returnable basis.

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

The successful bidder will have to submit technical compliance document and drawing as per RC line items for getting approval before mass manufacturing.

Manufacturing shall start only after getting CAT-A approved drawings or as per intimation from TPCODL/TPWODL/TPNODL/TPSODL. .

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on TPCODL/TPWODL/TPNODL/TPSODL specifications and statutory requirements and shall be submitted with the bid:

a) Completely filled in Technical Particulars and compliance to each clause of the specification General Technical Requirements to Additional Details.
b) Description of the equipment and all components including brochures.
c) General Drawing arrangement of lightening arrester.
d) Sectional drawing showing internal blocks etc.

e) Bill of material.
f) Experience Certificate and list.
g) Type test certificates.
h) List of makes of major components.
i) Foundation plan

Drawings / documents to be submitted after the award of the contract are as under:

List of Drawings/Parameters to be submitted:

a) Technical Parameters as asked in Specification (General Technical Particulars, General Technical Requirements, Additional Details, Fittings, Type test Reports and Routine test certificates of bought out accessories).
b) General Arrangement Drawing of the Lightening arrester (Front view and Top view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
c) Sectional drawing showing the blocks arrangement.
d) Terminal and connection drawings
e) Type Test Certificates.
f) Installation/ Mounting Instructions/Drawing.

Additional Documents to be submitted:

a) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer.
b) Type test certificates of the raw materials and bought out accessories.
c) The successful Bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.

All the documents & drawings shall be in English language.
After the receipt of the order, the successful bidder will be required to furnish all relevant drawings/parameters/calculation to TPCODL/TPWODL/TPNODL/TPSODL for approval.

Instruction Manuals:

Bidder shall furnish softcopies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
1	Installation	
2	Reference standards (Latest Amend.)	
3	Arrester Type and Housing	
4	Normal System Voltage	
5	Highest System Voltage	
6	Rated Frequency	
7	Maximum Continuous Operating Voltage (M.C.O.V)	
8	Arrester Rating	
9	**Discharge Current**	
a	Nominal Discharge Current	
b	Switching impulse discharge current	
10	Short Circuit rating	
11	**Voltage Withstand on Arrester Housing**	
a	Standard rated short duration Power Frequency withstand Voltage (Dry/Wet) as per IS:2165	
b	Standard rated Lightning Impulse withstand Voltage (Peak in kV)	
	Lightning Impulse Protection Level (at 10kA)	
13	**Long Duration Current**	
a	Peak Current	
b	Virtual duration of Peak T	
14	High Current impulse Operating Duty	
15	Creepage Distance of Arrester Housing	
16	Partial Discharge at 1.05 times M.C.O. V	
17	Energy Absorption capacity (KJ/KV)	
18	Repetitive charge transfer withstand (coloumbs),Qrs	
19	**Temporary over voltage (TOV)**	
a	1 sec	
b	10 sec	
20	**Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave**	
a	at 5kA	
b	at 10kA	
c	at 20kA	
21	**Maximum switching current impulse residual voltage in kVP at 500 A**	
22	Max. Cantilever Strength	
23	Total height of the arrester	

SL. NO.	TECHNICAL PARTICULARS (Class-SL,Class-II)	DESIRED VALUE
24	Total weight of the arrester	
25	No. of Metal oxide blocks in arrester	
26	Rating of individual ZnO blocks used for assembly	
27	Power Losses of the Arrester in watt	
28	Type of Mounting	
29	Material of Insulating base	
30	**Disconnector (optional)**	
a	Disconnector connecting lead	
b	Size of Insulated Tinned copper braid	
c	Length of Insulated Tinned copper braid	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2016

Specification Name : Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11KV Power Cable

BARSHA BANDITA	MILAN MAITY	K GOVINDARAJ	Syed Mohammed Yousuf Raja	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
10-01-2023	10-01-2023	11-01-2023	12-01-2023	12-01-2023	12-01-2023

TPCODL TPNODL TPWODL TPSODL	**Specification No:** ENG-HV-2016 **Specification Name:** Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11kV Power Cable

CONTENTS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of 11 kV Heat Shrink Cable Straight through Joints and Terminations with all accessories and necessary training for trouble free & efficient performance.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest revisions of relevant Indian Standards/ IEC and shall conform to the regulations of local statutory authorities.

SL. No.	IEC/IS	Description
1	IS-13573(part2): 2011	Test requirements - Cable accessories for extruded power cables (for working voltages 3.3 kV and up to including 33 kV)
2	IS 7098(part2):2011	Cross-linked polyethylene insulated thermoplastic sheathed cables (for working voltages from 3.3 kV up to and including 33 kV)
3	IS 692 : 1994	Paper insulated lead sheathed cables for rated voltages up to and including 33 kV
4	IEC 60502 : 2009	Power cables with extruded insulation and their accessories for rated voltages from 1 kV up to 30 kV
5	ASTM D-2303	Standard Test Methods for Liquid Contaminant, Inclined-plane tracking and Erosion of insulating materials
6	ASTM D-2671	Standard Test Methods for Heat Shrinkable Tubing
7	ENA TS 09-13:1981	High Voltage Heat Shrinkable Components for use with HV solid type cables up to and including 33 kV
8	IEC 61238(part1) : 2003	Test methods and requirements - Compression and mechanical connectors for power cables for rated voltages up to 30 kV
9	IS 8308 : 2003	Compression type tubular in-line connectors for Aluminium conductors of insulated cables
10	IS 8309 : 2003	Compression type tubular terminal ends for Aluminium conductors of insulated cables
11	IS 2633:1986	Method for testing of uniformity of zinc coating
12	IS 4826 : 1979	Hot dipped galvanized coatings on round steel wires
13	IS 12444:1988	Continuously Cast and Rolled Electrolytic Copper Wire Rods for electrical conductors

SL. No.	IEC/IS	Description
14	IS 191	Copper
15	IS 10810	Methods of test for cables
16	IEC 60216 part 2	Determination of thermal endurance properties of electrical insulating materials
17	IEC 60216 part 8	Instructions for calculating thermal endurance characteristics using simplified procedures

3. CLIMATIC CONDITIONS:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed tosun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material

and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4. GENERAL TECHNICAL REQUIREMENTS:

4.1 TYPES OF CABLES

A. 11 kV XLPE Insulated Underground Cables as per IS 7098 – 2: 11 kV ('E)

a) A2XCWY- (Aluminium stranded compacted conductor, XLPE insulation, copper tape screen, wire GI armour, PVC sheath)

b) A2XCWaY -(Aluminium conductor, XLPE insulation, copper tape screen, Aluminium wire armour, PVC sheath)

i) 3CX70 sq.mm. A2XCWY/A2XFY
ii) 3CX95 sq.mm. A2XCWY/A2XFY
iii) 3CX120 sq.mm. A2XCWY/A2XFY
iv) 3CX150 sq.mm. A2XCWY/A2XFY
v) 3CX185 sq.mm. A2XCWY/A2XFY
vi) 3CX240 sq.mm. A2XCWY/A2XFY
vii) 3CX300 sq.mm. A2XCWY/A2XFY
viii) 3CX400 sq.mm. A2XCWY/A2XFY
ix) 1CX400 sq.mm A2XCWaY
x) 1CX300 sq.mm A2XCWaY
xi) 1CX630 sq.mm. A2XCWaY
xii) 1CX1000 sq.mm. A2XCWaY
xiii) HT AB- 55/95/120/150 sq.mm. – Straight Through Jointing/ Outdoor Jointing

B. HT Aerial Bunched Cables with Aluminium alloy catenary : 11 kV (E)

a) A2XCY- (Aluminium stranded compacted conductor, XLPE insulation, copper tape screen, PVC sheath)

b) A2XC2Y- (Aluminium stranded compacted conductor, XLPE insulation, copper tape screen, HDPE sheath)

c) A2XWaY- (Aluminium stranded compacted conductor, XLPE insulation, Aluminium wire screen, PVC sheath)

i) 3CX95 sq.mm. A2XCY/ A2XC2Y/ A2XWaY

ii) 3CX150 sq.mm. A2XCY/ A2XC2Y/ A2XWaY

iii) 1CX55 sq.mm. A2XCY/ A2XC2Y/ A2XWaY

iv) 1CX95 sq.mm. A2XCY/ A2XC2Y/ A2XWaY

v) 1CX150 sq.mm. A2XCY/ A2XC2Y/ A2XWaY

C. PILCA Insulated Cables as per IS 692: 11 kV, (E) Belted APLST

(Al stranded sector shaped, paper insulated, lead sheath, steel tape sheath).

i) 3CX150 sq.mm. Belted APLST

ii) 3CX240 sq.mm. Belted APLST

iii) 3CX300 sq.mm. Belted APLST

4.2 According to standard sizes of cables, following types of cable joints and terminations shall be required:

Type & size of cable	Type of Joint	Type of connector
3CX70, 3CX95, 3CX120, 3CX150, 3CX185, 3CX240, sq.mm. XLPE insulated cable	Indoor termination	Compression lug
	Outdoor termination	Compression lug
	Straight through joint	Compression lug
3CX95, 3CX120, 3CX185 sq.mm. XLPE insulated cable	Indoor termination RMU	Mechanical connector
3CX300, 3CX400 sq.mm. XLPE insulated cable	Indoor termination	Mechanical connector
	Outdoor termination	Compression lug
	Straight through joint	Mechanical connector
1CX300, 1CX400, 1CX630, 1CX1000 sq.mm. XLPE insulated cable	Indoor termination	Mechanical connector
	Outdoor termination	Mechanical connector
	Straight through joint	Mechanical connector
1CX55, 1CX95, 1CX150 sq.mm. HT AB insulated cable	Outdoor termination joint	Compression lug
	Straight through joint	Compression lug
3CX185 – 400 sq.mm. XLPE	Straight through joints between XLPE insulated cables	Mechanical connector

4.3 General requirement for Heat Shrinkable Jointing and Termination kit:

a) The jointing kit containing heat shrinkable tubing, mastics and other accessories for making a complete joint and termination shall be designed to meet TPCODL/TPWODL/TPNODL/TPSODL specification, ENA TS 09-13, IEC 60502 and IS 13573, part-2 and other relevant standards.

b) Cable joint and termination material shall not be adversely affected in any manner even after contact with material used in cable construction and material used as accessories in the construction of cable joints and terminations and there will be no chance of corrosion developing on any metal surface.

c) Assembled jointing kit components shall perform without distress in system with parameters (mentioned below):

S. No.	Parameter	Units	Requirement
1	Max. Withstand System Voltage	kV	12
2	Partial Discharge at 1.73 Uo	pC	<10
3	Impulse Peak Withstand	kV	75 kV
4	Continuous operation withstand Temperature	ºC	90
	Short Circuit withstand temperature	ºC	250
5	Withstand short circuit current	kA/1Sec	As per Size of Conductors
6	Storage Temperature Range	ºC	-10ºC to + 45ºC
7	Shelf life of kit components excluding mastic and solution	Years	Min. 5
8	Shelf life of mastic and solution	Years	Min. 2

4.4 General Technical Particulars for Heat Shrinkable Insulation Tubing/ Sleeves/ Wrap around Sleeve:

SL. No.	Parameter	Requirement
1	Visual Examination	Free from protrusions, pinholes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Internal diameter of tube after full recovery	Shall not be higher than as specified in approved BOM / GTP
4	Longitudinal change	10% Max.

SL. No.	Parameter	Requirement
5	Electric Strength	10 KV /mm (Minimum)
6	Tensile Strength	10 N/mm2 (Minimum) and (8 N/mm2 for anti-tracking)
7	Ultimate Elongation	200% (Minimum)
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 200ºC Min. (For stress control tube: 30 Minutes at 250ºC Min.)
9	Low Temperature Flexibility	No cracking after 4 hrs. at minus -20ºC Max.
10	Volume Resistivity	1x 1010 Ohm- meter (Minimum) (For stress control, tube VR: 1x 10 7 Ohm-meter min.)
11	Tracking resistance	No tracking, erosion to top surface or flame failure after 1hr @ 2.5KV 1hr @2.7KV 1Hr@ 3.0 KV 20 min@ 3.25KV
12	Flame Retardant (Applicable only for Anti tracking Tubes/ sleeves)	After 1-minute burn: Burnt or charred length 250 mm max.

4.5 General Technical Particulars for Heat Shrinkable moulded components/ Breakouts/Weather sheds

Sl. No.	Parameter	Specified limit
1	Visual Examination	Free from protrusions, pinholes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Internal diameter of tube after full recovery	Shall not be higher than as specified in approved BOM / GTP.
4	Longitudinal change	25% Max.
5	Dielectric Strength	10 KV /mm (Minimum)
6	Tensile Strength	8 N/mm^2 (Minimum)
7	Ultimate Elongation	200% (Minimum)
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 250ºC Min.

Sl. No.	Parameter	Specified limit
9	Low Temperature Flexibility	No cracking after 4 hrs. @ minus -20ºC Max.
10	Volume Resistivity	1x 10^{10} Ohm- meter (Minimum)
11	Flame Retardant (For anti-tracking moulded components)	After 1-minute burn: Burnt or charred length 250mm max.

4.6 Service Support:

Bidder shall have own setup in Odisha for jointing and termination services along with supervision and other necessary allied services for ensuring quality of installed jointing and terminations.

5. GENERAL CONSTRUCTION:

5.1 Components of Indoor/ Outdoor Termination Kit:

Termination kit shall be designed based on heat shrink technology and shall be suitable for installation for 11 kV, three core and single core aluminum conductor, XLPE insulated (in line with TPCODL/TPWODL/TPNODL/TPSODL Specification for underground and AB cable, IS 7098-part 2, and IS 13573 Part 2 &3).

Length of 11KV terminations (from bottom of breakout to center of lughole) shall be:

i) HT ABC - 450mm

ii) 1core cable I/D & O/D - 550 mm

iii) 3 core cable I/D & O/D - 800 mm

iv) 3 core cable I/D RMU - 950 mm

S. No.	Components	Requirement
1	Compression Lugs/ Tinned coated Mechanical Lugs	**Compression Lugs:** a) Material: Aluminium b) All Aluminum lugs with anti-corrosive paste shall be long barrel type as per IS 8309: 2003. c) Dimensions shall be as annexure-I of this specification. d) 1000mm² Aluminum lugs shall be without palm hole. e) Conductivity of ferrule shall be as per IS 8309:2003. **Mechanical Lugs:** a) Tinned coated Aluminium 185-400 mm²/ 630mm²/1000mm² b) Type Test as per IEC 61238(part1):2003 c) Dimensions shall be as annexure-I of this specification.

<table>
<tr><th>S. No.</th><th>Components</th><th>Requirement</th></tr>
<tr><td></td><td></td><td>d) Approved make NILLED, PFISTERER, NEXANS, TYCO (GERMANY).
e) Dimensions shall be as annexure-I of this specification.</td></tr>
<tr><td>2</td><td>Lug Seal, Anti-tracking tube, weather sheds, Stress control tube</td><td>a) Heat Shrinkable
b) Fire resistant and weather resistant as per ENA TS 09-13 – for lug seals, weather sheds and Anti-tracking tubes
<table>
<tr><th>Sl. no</th><th>Size</th><th>Tube type</th><th>Qty</th><th>Size (min in mm)</th><th>OD (Before/After shrinking) mm</th></tr>
<tr><td>1</td><td>3C 300/400 sqmm I/D & O/D</td><td>Stress control tube</td><td>3</td><td>130</td><td>50/25</td></tr>
<tr><td>2</td><td>3C 300/400 sqmm O/D</td><td>Anti tracking tube</td><td>3</td><td>60</td><td>55/20</td></tr>
<tr><td>3</td><td>1C 630 sqmm O/D & ID</td><td>Stress control tube</td><td>1</td><td>130</td><td>65/30</td></tr>
<tr><td>4</td><td>1C 630 sqmm O/D & ID</td><td>Anti tracking tube</td><td>1</td><td>400</td><td>70/30</td></tr>
<tr><td>5</td><td>1C 630 sqmm O/D & ID</td><td>Insulating tube</td><td>3</td><td>300</td><td>35/12</td></tr>
</table>
For lower sizes length & OD of tubes should be adjusted suitably. BOM approval is mandatory before supply.</td></tr>
<tr><td>3</td><td>Mastic tape</td><td>a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant.
b) Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.
c) Stress grading mastic should be provided for both connector portion and semicon portion.
d) Water resistant sealing mastic shall also be provided.for end sealing in straight through kit and lug sealing in termination kit.</td></tr>
<tr><td>4</td><td>Heat Shrink Breakout & Lug seal</td><td>a) Fire resistant and weather resistant as per ENA TS 09-13.
b) Adhesive coated Breakouts shall be provided on outer sheath of the cable to prevent water ingress.
c) Anti tracking lug seal with adhesive coated, flame retardant.</td></tr>
</table>

S. No.	Components	Requirement
5	Tinned coated copper braid	a) Shall be completely insulated by adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug. b) Fire resistant and weather resistant as per ENA TS 09-13. c) Size and length is as follows: d) 25 mm² x 500 mm x 1 Run for 3C 70, 95, 120 &150 mm² cables. e) 50 mm² X 600 mm X 1 Run for above 150 mm² & up to 400 mm² cables. f) 70 mm² X 500 mm X 1 Run for 630 mm² & 1000mm² cables. Additionally 3 nos. X 150mm² Al lugs with sealing sleeves/ mastic for armor back fold earth bonding. For Copper screened HT ABC, continuity of armor shall be through 25 sq.mm. X 500mm insulated tinned copper braid. Additionally 1 no. 95 mm² Al long barrel lugs with sealing sleeves/ mastic shall be provided for armor back fold earth bonding in Aluminum armored 150 mm² HT ABC.
6	Tinned coated copper braid as a Leakage Current Collector	a) Leakage current collector tinned copper braid b) 1R X 7 mm² X 150 mm per core shall be provided for terminations.
7	Tinned copper wire mesh	a) Minimum 2.5mm² tinned copper mesh shall be provided on armour circumference beneath the copper braid. b) For 3 core cable 1R X 0.5mtr c) For 1 core cable 1R X 0.7mtr
8	Sub-kit components	a) GI Solid Collet dia of dia as per cable OD (1no only in 3C cables), b) Worm drive clip/ Jubilee clip of stainless steel (2 nos), c) Compatible support rings (Aluminium for single core and GI for three core cables) d) Soldering on copper screen is not acceptable e) Constant pressure roll spring shall be provided for screen connections as per compatible size. For 3 core- 3nos, for 1C - 1nos. f) Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same g) Tinned copper binding wire 20 SWG, qty 50gms h) Nylon string OD 1mm, 2mtr i) Silicone grease, 30 gms j) Cleaning liquid k) Vinyl tape l) Al oxide cloth m) Other necessary items

S. No.	Components	Requirement
9	Submission of BOM and instruction sheet	a) Participating bidder shall submit BOM (during pre-bid) with dimensions of each size and quantity of HS joint and termination. Also instruction sheet shall be provided in each kit. *Note: BOM shall be approved by TPCODL/TPWODL/ TPNODL/TPSODL authorized official at the time of pre-bid.

5.2 Components of Straight Through jointing kit:

<table>
<tr><th>S. No.</th><th>Components</th><th>Requirement</th></tr>
<tr><td>1</td><td>Heat Shrinkable insulating tube/ Sleeve</td><td>a) Surface of material: shall be smooth and free from protrusion, voids and nicks.
b) Recovered thickness: Recovered thickness of insulation tubes over ferrule or connector circumference shall not be less than 4.32 mm at any point of measurement.
c) Wall thickness ratio (before recovery) of all sleeves/ tubes shall not be less than 60% at any two points of measurement.
<table>
<tr><th>Sl no</th><th>Size</th><th>Tube type</th><th>Qty</th><th>Size (min in mm)</th><th>OD (Before/After shrinking) mm</th></tr>
<tr><td>1</td><td>3C 300/400 sqmm</td><td>Stress control tube</td><td>3</td><td>470</td><td>45/20</td></tr>
<tr><td>2</td><td>3C 300/400 sqmm</td><td>Red Insulating tube</td><td>3</td><td>460</td><td>55/20</td></tr>
<tr><td>3</td><td>3C 300/400 sqmm</td><td>Dual wall tube</td><td>3</td><td>450</td><td>65/21</td></tr>
<tr><td>4</td><td>1C 630 sqmm</td><td>Stress control tube</td><td>1</td><td>500</td><td>65/30</td></tr>
<tr><td>5</td><td>1C 630 sqmm</td><td>Red Insulating tube</td><td>1</td><td>490</td><td>70/30</td></tr>
<tr><td>6</td><td>1C 630 sqmm</td><td>Dual wall tube</td><td>1</td><td>480</td><td>85/30</td></tr>
</table>
d) For lower sizes length & OD of tubes should be adjusted suitably. BOM approval is mandatary before supply.</td></tr>
</table>

S. No.	Components	Requirement
2	Compression lugs/ Mechanical Connectors	a) Material : 99% Electrolytic grade Aluminium with Anti-corrosive paste b) Shape: As per IS 8308 c) Dimensions as per Annexure-I of this Specification d) Conductivity of ferrules/mechanical connectors shall be as per IS 8309: 2003. e) Conductivity of Aluminium shall be min. 60% of IACS. **Mechanical Lugs:** a) Tinned coated Aluminium 185-400 mm^2/ 630mm^2/1000mm^2 b) Type Tested as per IEC 61238(part1):2003 c) Dimensions shall be as annexure-I of this specification. d) Approved make NILLED, PFISTERER, NEXANS, TYCO (GERMANY). Dimensions shall be as annexure-I of this specification.
3	Mastic Tape	a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant. b) Volume resistivity of mastic shall not be less than volume resisti of insulating tube as specified in ENA TS 09-13. c) Stress grading mastic should be provided for both connec portion and semicon portion. d) Water resistant sealing mastic shall also be provided.for end sealing in straight through kit and lug sealing in termination kit.
4	Tinned coated copper braid for GI armour continuity / Ferrules for Aluminium armour continuity	a) Shall be completely insulated with adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug at one end. b) Fire resistant and weather resistant as per ENA TS 09-13 c) Size and length as per below: d) Wrap tinned copper wire mesh with 50% overlap around the joint area and continue 25 mm over the copper screen on both sides. Bind the copper wire mesh on copper screen. e) Uniformly tinned coated copper braid shall be provided for armor continuity f) Size of tinned copper braid shall be: 50 mm^2 x 1 Run for 150-400 sq.mm. three core cables. 25 mm^2 x 1 Run for below 150 sq.mm. three core cables. Ferrules for Aluminum armor continuity: a) In single core cables, 1CX400,1CX630 and 1CX1000 sq.mm., Aluminum armor continuity shall be done using 2 nos. long barrel type of size 150 sq.mm. and 185 sq.mm. ferrules respectively. Additionally 70 mm^2 x 1 Run tinned copper braid to be provided.

S. No.	Components	Requirement
		b) For Copper screened HT ABC, continuity of armor shall be through 2.5 sq.mm. copper wire mesh.
5	Tinned copper wire mesh	a) Uniformly tinned coated copper mesh shall be provided for screen continuity shall be provided on both sides of armor circumference beneath the copper braid. b) For 3C cable: 2.5mm² (2'' X 6mtr) c) For 1C cable: 2.5mm² (2" X 7mtr), (2" X10mtr) & (2"X12mtr)
6	GI wire mesh/ Copper wire mesh	a) Mechanical protection shall be provided in GI armored cables by means of heavily zinc coated GI mesh as per IS 4826. b) Minimum 3" X 15mtr GI wire mesh for 3C cable c) In 1C Aluminium armored cables, for mechanical protection, copper wire mesh shall be provided as mentioned in SL. No 5.
7	Breakouts	a) Adhesive coated Breakouts shall be provided on outer sheath at both sides on the cable to prevent water ingress.
8	Nesting & end sealing tube	a) Hot melted adhesive coated bested end sealing tube for protection of moisture ingress in cores. b) Length 200mm minimum c) 6 nos for 3C, 2 nos for 1C
9	Wrap around insulating tube/Sleeve as outer most tube	a) Material: cross-linked polyolefin (Heat Shrinkable) as a waterproof seal. b) Shape: Wrap around form with hot-melt adhesive liner on the inner surface of the sleeve (Upon heating, the sleeve shrinks and the adhesive melts, creating a water-tight bond between the sleeve and the cable). c) Stainless steel channel shall be provided along the wrap around to close the sleeve during installation. d) Excellent mechanical and corrosion protection, and atmospheric sealing. e) High split resistance. f) *Note: Overlapping of wrap around sleeve is not acceptable. Length of one sleeve: Minimum 1000mm, Qty. 2nos Insulating sleeve of 500 mm should be provided to cover mid joints Portion
10	Sub-kit Components	a) GI Solid Collet dia of dia as per cable OD (2nos only in 3C cables), b) Worm drive clip/ Jubilee clip of stainless steel (3 core- 6nos, 1C 2nos), c) Compatible support rings (Aluminium for single core and GI for three core cables) d) Soldering on copper screen is not acceptable e) Constant pressure roll spring (size 4) shall be provided for screen connections. For 3 core- 6nos, for 1C -2nos

S. No.	Components	Requirement
		f) Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same g) Tinned copper binding wire 20 SWG, qty 50gms h) Nylon string OD 1mm, 2mtr i) Silicone grease, 30 gms j) Cleaning liquid k) Vinyl tape l) Al oxide cloth m) Other necessary items
11	Submission of BOM and instruction sheet	a) Participating bidder shall submit BOM (during pre-bid) with dimensions of each size and quantity of HS joint and termination. Also instruction sheet shall be provided in each kit. b) *Note: BOM shall be approved by TPCODL/TPWODL/TPNODL/TPSODL authorized official at the time of pre-bid.

6. MARKING:

Following details shall be printed in the box:

a) Manufacture's name and address.
b) Month & Year of Manufacturing
c) Voltage Grade
d) PO No.
e) "TPCODL/ TPWODL/ TPNODL/ TPSODL" Name

HS Sleeves/tubes and breakout components shall be embossed with:

a. Manufacture's name and address.
b. Month & Year of Manufacturing
c. Batch No. / Lot No.
d. Shrink Ratio
e. Size
f. Type
g. "TPCODL/ TPWODL/ TPNODL/ TPSODL" Name

7. TESTS:

All Routine, Acceptance & Type tests shall be carried out in accordance with the Relevant IS/IEC/ ENA TS 09-13. All the components shall also be type tested as per the relevant

standards mentioned below. Following tests shall be necessarily conducted on the Joint and Termination Kits In addition to others specified in IS/IEC/ENA-TS 09-13 standards:

7.1 ACCEPTANCE TESTS:

Test	Clause No.	Reference Standard
Visual inspection	3.15	ENA -TS 09-13
Physical verification of kit contents and dimensions	As per TPCODL/TPWODL/TPNODL/TPSODL approved BOM	
Electric Strength test	3.4	ENA -TS 09-13
Ultimate Elongation tests	3.12	ENA -TS 09-13
Tensile Strength	3.12	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Wall thickness ratio	3.3	ENA -TS 09-13
Expanded and recovered diameters	3.3	ENA -TS 09-13
Longitudinal change after recovery	3.3	ENA -TS 09-13
Heat shock test	3.7.1/3.7.2	ENA -TS 09-13
Low temperature flexibility	4.5	ENA -TS 09-13
Insulation build up thickness after shrink on Ferrule	8.1	IS 10810 -6
Flame retardant test on anti-tracking tubes and anti-tracking moulded components and earth braid protective tube after shrink on mandrill for terminations	3.5.1/ 3.5.2	ENA -TS 09-13
Area measurement of tinned copper braids (Area of one wire x no. of wires x no. of carriers)	As per TPCODL/TPWODL/TPNODL/TPSODL approved BOM	
Conductivity test on ferrules/ connectors/ lugs	8.3	IS 8309/ As per IEC 61238 part 1
Uniformity of zinc coating on GI mesh (Manufacturer's TC to be provided)	4.1	IS 2633

7.2 ROUTINE TESTS

Test	Clause No.	Reference Standard
Visual inspection of tubing and moulded components for free from pin holes, cracks, nicks, protrusion and	3.15	ENA -TS 09-13

Test	Clause No.	Reference Standard
other defects		
Dimension check	As per TPCODL/TPWODL/TPNODL/TPSODL approved BOM	
Electric Strength	3.4	ENA -TS 09-13
Ultimate Elongation	3.12	ENA -TS 09-13
Tensile Strength	3.12	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Wall thickness ratio	3.3	ENA -TS 09-13
Expanded and recovered diameters of tubes	3.3	ENA -TS 09-13

7.3 TYPE TESTS:

(i) Terminations & Straight Through joints

Test	Clause No.	Reference Standard
Conductor resistance with Ferrule/Lugs/Mechanical connectors	4.1	IS 13573(Part-2)
AC Voltage withstand Test (Air)	4.2	IS 13573(Part-2)
AC Voltage withstand test (under wet conditions) (for outdoor termination only)	4.2	IS 13573(Part-2)
Partial Discharge	7.0	IS 13573(Part-2)
Impulse voltage test	6	IS 13573(Part-2)
Heat Cycle test in air and water	9.1 and 9.2	IS 13573(Part-2)
Thermal Short Circuit Test for Screen	10	IS 13573(Part-2)
Thermal Short Circuit Test for Conductor	11	IS 13573(Part-2)
DC Voltage Withstand	5	IS 13573(Part-2)
Dynamic short circuit test	12	IS 13573(Part-2)
Thermal Endurance test	IEC 60216 part 2 & 8	
Salt fog test (Only for Outdoor terminations only)	13	IS 13573(Part-2)

(II) Kit Components

a) For Tubing and Moulded Components

Test	Clause No.	Reference Standard
Corrosion Resistance	3.1	ENA -TS 09-13
Density	3.2	ENA -TS 09-13
Dimensions	3.3	ENA -TS 09-13
Electric Strength	3.4	ENA -TS 09-13
Flame Retardance	3.5	ENA -TS 09-13
Heat Shock	3.7	ENA -TS 09-13
Low temperature flexibility	3.8	ENA -TS 09-13
Relative Permittivity	3.9	ENA -TS 09-13
Tensile strength and Ultimate elongation	3.12	ENA -TS 09-13
Thermal Ageing	3.13	ENA -TS 09-13
Tracking Resistance	3.14	ENA -TS 09-13
Visual Examination	3.15	ENA -TS 09-13
Volume Resistivity	3.16	ENA -TS 09-13
Water Absorption	3.17	ENA -TS 09-13

b) For Compression Lugs, Compression Ferrules and Mechanical connectors

Test	Reference Standard
Mechanical Pull Test	IEC 61238, part - 1
Heat cycle Test (1000 Nos.)	IEC 61238, part - 1
Short circuit Test	IEC 61238, part - 1

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA** as per relevant IS. However, TPCODL/ TPWODL/ TPNODL/ TPSODL/ TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report/ Lab having accreditation from ILAC Signatory under exceptional circumstances after due diligence/ scrutiny by DISCOM. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/ TPWODL/ TPNODL/ TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/ TPWODL/ TPNODL/ TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or

material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/ TPWODL/ TPNODL/ TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/ TPWODL/ TPNODL/ TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/ TPWODL/ TPNODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/ TPWODL/ TPNODL/ TPSODL
c) TPCODL/ TPWODL/ TPNODL/ TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/ TPWODL/ TPNODL/ TPSODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of at least 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract whichever is later.

Further Bidder shall also stand guarantee towards poor workmanship in installation of straight through joint and terminations installed by bidder's jointer up to 60 months from the date of installation.

Bidder shall be liable to undertake to replace/rectify such defects at own costs, within mutually agreed time frame, and to the entire satisfaction of TPCODL/TPWODL/TPNODL/TPSODL, failing which TPCODL/TPWODL/TPNODL/TPSODL shall be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the

Company's own charges (@ 20% of expenses incurred), from the bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for free replacement for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company.

12. PACKING AND TRANSPORT:

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE:

Bidder shall be submit the sample of material during tender evaluation process with the offer (in case of first supply to TPCODL/TPWODL/TPNODL/TPSODL).

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
b) BOM
c) Work Experience details
d) Type test certificates.
e) Drawing 1 Set of Hard Copy & Soft Copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

S. No.	Parameter	Units	To be Furnished by Bidder
1	Max. Withstand System Voltage	KV	
2	Partial Discharge at 1.73 Uo	pC (Pico-coulombs)	
3	Impulse Peak Withstand	KV	
4	Continuous operation withstand Temperature	°C	
	Short Circuit withstand temperature	°C	
5	Withstand short circuit current	KA/1Sec	
6	Storage Temperature Range	°C	
7	Shelf life of kit components excluding mastic and solution	Years	
8	Shelf life of mastic and solution	Years	

A. General Technical Particulars for Heat Shrinkable Insulation Tubing/ Sleeves/ Wrap around Sleeve:

S.No.	Parameter	To be Furnished by Bidder
1	Visual Examination	
2	Wall thickness Ratio	

S.No.	Parameter	To be Furnished by Bidder
3	Internal diameter of tube after full recovery	
4	Longitudinal change	
5	Electric Strength	
6	Tensile Strength	
7	Ultimate Elongation	
8	Heat Shock	
9	Low Temperature Flexibility	
10	Volume Resistivity	
11	Tracking resistance	
12	Flame Retardant (Applicable only for Anti tracking Tubes/ sleeves)	

B. General Technical Particulars for Heat Shrinkable moulded components/ Breakouts/ Weather sheds

Sl.No.	Parameter	To be Furnished by Bidder
1	Visual Examination	
2	Wall thickness Ratio	
3	Internal diameter of tube after full recovery	
4	Longitudinal change	
5	Dielectric Strength	
6	Tensile Strength	
7	Ultimate Elongation	
8	Heat Shock	
9	Low Temperature Flexibility	
10	Volume Resistivity	

Sl.No.	Parameter	To be Furnished by Bidder
11	Flame Retardant (For anti-tracking moulded components)	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

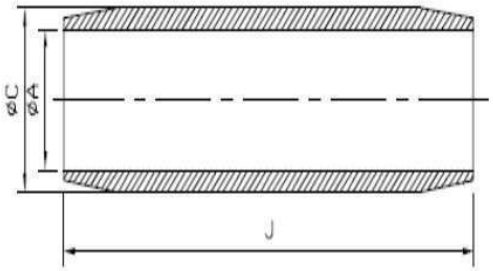
Signature

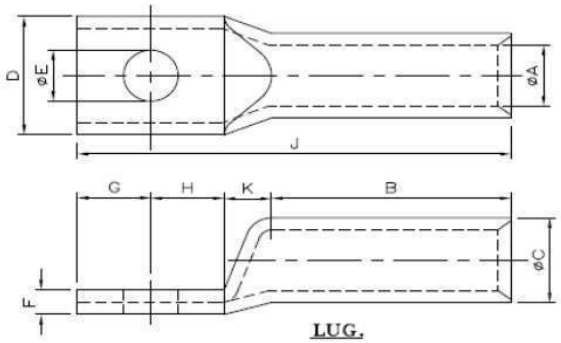
Designation

Annexure- Dimensions Ferrules & Lugs HT

Dimensional details of Aluminum ferrules for HT AL circular stranded compacted XLPE cables			
Cable Size in MM²	φA (mm) +0.3mm	φC (mm) +0.3 mm	J (mm) ±3mm
95	12	16.9	108
150	15.1	21.2	116
300	21.8	30.2	150
400	25	34.8	150
630	31.7	44.4	200
1000	41	56	250

Dimensional details of Aluminum Lugs for HT circular stranded compacted XLPE cables							
Cable Size in MM²	ΦE (mm) ±0.1mm in centre of palm	ΦA (mm) +0.5mm	ΦC (mm) +0.5 mm	D (mm) ±1.5mm	F (mm) ±0.5mm	B±3.0mm	J (mm) ±5mm
95	13	12	16.9	23.5	4.9	73	109
150	13	15.1	21.2	29.5	6	83	128
300	17	21.8	30.2	42	8.4	89	157
400	17	25	34.8	48	9.8	113	187
630	17	31.7	44.4	61	12.7	140	225
1000	-	41	56	77.5	15	160	280





For remaining cable sizes, dimensions of Ferrules & Lugs shall be as per IS.

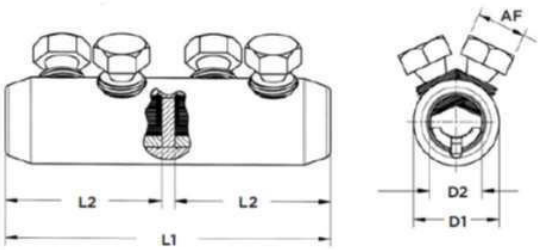
Annexure- Dimensions Mechanical connectors & Mechanical Lugs

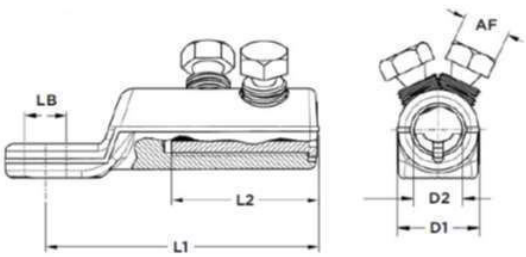
Aluminium Mechanical connectors

Cable Size in MM²	ΦD1 (mm)	ΦD2 (mm)	L (mm)
185-400	50	25.5-26	440- 450
185-400	42	25.5-26	170-200
500- 630	50	33- 33.5	180-230
1000	60	40	180-230

Tinned Aluminium Mechanical Lugs

Cable Size in MM²	ΦLB (mm)	ΦD1 (mm)	ΦD2 (mm)	L (mm)
185-400	17	42	25.5-26	137-150
500- 630	17	50	33- 33.5	150-180
1000	2x17	60	40- 40.5	180- 240





STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2028

Specification Name : Technical Specification for 11KV Polymeric Disc Insulator (70KN)

Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
BARSHA BANDITA	ASMITA JENA	JYOTIPRAKASH MOHANTY	Vijender Goyal	KHAJAN BHARDWAJ	POURUSH GARG
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
13-03-2023	21-03-2023	29-03-2023	29-03-2023	06-04-2023	26-04-2023

CONTENTS

1. SCOPE

This specification covers the technical requirements of design, manufacture, performance, testing at manufacturer's works, packing & forwarding, supply and unloading at store/ site, performance of 11 kV Ball and Socket Disc Polymer Insulator complete with all the accessories for trouble free and efficient performance.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

Ref. IS/IEC	Description
IEC:61109	Definition, test methods and acceptance criteria for composite insulators for A.C. overhead lines above 1000V.
IS:2071/ IEC:60060-1	Methods of High Voltage Testing.
IS:2486/ IEC:60120/ IEC:60372	Specification for Insulator fittings for Overhead Power Lines with a nominal voltage greater than 1000V. Ball and socket couplings of string insulator units –Dimensions Locking devices for ball and socket couplings of string insulator units - Dimensions and tests
IEC:60575	Thermal-mechanical performance test and mechanical performance test on string insulator units.
IS: 13134/ IEC: 60815	Guide for the selection of insulators in respect of polluted condition.
IEC: 60433	Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic insulators for AC systems - Characteristics of insulator units of the long rod type.
STRI guide 1.92/1	Hydrophobicity Classification Guide.
IS:8263/ IEC:60437	Methods of RI Test of HV Insulators.
IS:4759	Hot dip zinc coatings on structural steel & other allied products.
IS:2629	Recommended practice for Hot Dip galvanization for iron and steel
IS:6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles.
IS:3203	Methods of testing of local thickness of electroplated coatings.

Ref. IS/IEC	Description
IS:2633	Testing of Uniformity of coating of zinc coated articles.
ASTM D 578-05	Standard specification for glass fiber standards.
IS:4699	Refined secondary zinc

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

TPCODL/TPNODL/TPSODL/ TPWODL service area **has heavy saline conditions along the coast and High cyclonic Intensity winds with speed up to 300 Km ph**. The atmosphere is generally laden with mild acid, dust in suspension during the dry months, and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

i) The Composite insulators will be used on 11kV lines on which the conductor will be ACSR/AAAC of sizes 100 Sq.mm. The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind. Insulator shall be suitable for moderately to heavily polluted, Humid & High saline atmosphere.

ii) Bidder must be indigenous manufacturer and supplier of Composite insulator of rating 11kV or above or must have developed proven in house technology and manufacturing process for composite insulators of above rating or possess technical collaboration/association with the manufacturer of composite insulators of rating 11kV or above. The Bidder shall furnish necessary evidence in support of the above along with the bid which can be in the form of certification from Utilities concerned, or any other documents to the satisfaction of the Owner.

iii) Insulators shall be suitable for Strain type of load and shall be of B&S type. The diameter of Composite Insulator shall be as per technical specification.

iv) Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the commendation of IEC- 60815/ IS: 13134.

v) The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with-IEC 61109:

± (0.04d + 1.5) mm when d ≤ 300 mm
± (0.025d+6) mm when d > 300 mm

Where, d being the dimensions in millimetres for diameter, length or creepage distance as the case may be. **However, no negative tolerance shall be applicable to creepage distance.**

vi) The composite insulators including the end fitting connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.

vii) All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

viii) The composite insulators offered shall be suitable for use of hotline maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
		Min. requirement for 11 kV 70 KN
1	Type of Insulator	Polymeric B&S
2	Standard according to which the insulators manufactured and tested.	IEC 61109
3	Name of material used in manufacture of the insulator with class/grade)	High voltage grade Silicone rubber Wacker-Germany, Dow Corning-USA
(a)	Material of core (FRP rod) (I) E-glass of ECR-glass.	ECR or BORRON FREE
(b)	Material of housing weather sheds (silicon content)	Silicon content of minimum 40% by weight
(c)	Material of end fittings	SGI/MCI/Forged Steel
(d)	Sealing compound for end fittings	RTV SILICON
4	Colour	GREY
5	Electrical characteristics	
(a)	Nominal system voltage	11 kV
(b)	Highest system voltage	12 kV
(c)	Dry Power frequency withstand voltage	70 kV
(d)	Wet Power frequency withstand voltage	35 kV
(e)	Dry flashover voltage	75 kV
(f)	Wet flash over voltage	40 kV
(g)	Dry lighting impulse withstand voltage	
	(a) Positive	75 kVp
	(b) Negative	75 kVp
(h)	Dry lighting impulse flashover voltage	
	a) Positive	80kVp
	b) Negative	80kVp
(i)	FRP rod leakage current at 175 V/mm	< 0.05 mA
(j)	RIV at 1 MHz when energized at 10 kV/30kV (rms) under dry condition.	< 50 microvolt
(k)	Creepage distance (Min.)	320 MM
6	Minimum failing load.	70 KN
7	**Dimensions of insulator**	
(i)	Weight (Approx.)	1.2 kg
(ii)	Dia of FRP rod	16 mm
(iii)	Length of FRP rod	240 mm
(iv)	Dia of weather sheds	≥90 mm
(v)	Thickness of housing	3 mm
(vi)	Dry arc distance Dimensioned drawings of insulator (including weight with tolerances in weight)	175 mm

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
		Min. requirement for 11 kV 70 KN
8	Method of fixing of sheds to housing (specify). Single mould or Modular construction (injection moulding/compression	Injection Moulding
9	Type of sheds	Aerodynamic

5. GENERAL CONSTRUCTIONS:

Composite Insulators shall be designed to meet the light quality, safety and reliability and are capable of withstanding a wide range of environmental conditions. Polymeric Insulators shall consist of THREE parts, at least two of which are insulating parts:

(a) Core- the internal insulating part

(b) Housing- the external insulating part

(c) Metal end fittings.

5.1 CORE

It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free. Electrically Corrosion Resistant (ECR) grade fiber glass reinforced plastic (FRP) rod having at least 80% fibres by weight.

5.2 POLYMER HOUSING:

The FRP rod shall be covered by a seamless sheath of high voltage grade Silicone rubber housing of thickness 3mm minimum. It shall be one- piece housing using only Injection Moulding process to cover the core. The housing shall be designed to provide the necessary creepage distance and protection against environmental influences, external pollution and humidity. Housing shall conform to the requirements of IEC 60815 with latest amendments. All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating condition. It shall be extruded or directly moulded on core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer.

Sheath material in the bulk as well as in the sealing / bonding area shall be free from voids.

5.3 WEATHERSHEDS

The composite polymer weathersheds made of high voltage grade Silicone rubber polymer shall be moulded as part of the sheath and shall be free from imperfections. It should protect the FRP rod against environmental influences, external pollution and humidity. The weathersheds should have **silicon content of minimum 40% by weight**. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids. Housing and weathersheds material shall have tensile strength of 3 Mpa with 400% elongation minimum and tear strength of 16 N/mm.

5.4 HARDWARE FITTINGS:

a) End fitting transmit the mechanical load to the core. They shall be made of spheroidal graphite cast iron, malleable cast iron or forged steel or aluminium alloy. Metal end fitting shall be suitable for Ball and socket type hardware of respective specified mechanical load and shall be hot dip galvanized in accordance with IS 2629.

b) They shall be connected to the rod by means of a controlled compression technique. The material used in fittings shall be corrosion resistant. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process & should not damage the individual fibers or crack the core.

c) The gap between fittings and sheath shall be sealed by flexible silicone elastomeric compound or silicone alloy compound sealant, system of attached of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof.

d) The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/IS: 2486 - Part-II.

e) Outer portion of ball or socket should be Zinc sleeved with minimum 99.95% purity of Electrolytic high grade zinc.

f) **Ball pin and socket couplings**: Ball pin and socket shall be of forged steel and dimensions are as specified in IS 2486 (Part-2). Insulator metal caps shall be made of malleable cast iron conforming to IS 14329.

g) **Locking device of the coupling:** The security clips to be used as a locking device for ball and socket coupling shall be ‘R’ shaped hump type or ‘W’ type as per IS 2486. The locking device shall be resilient, corrosion resistant, and of suitable mechanical strength. Material to be used for ‘W’ locking clip is phosphor bronze and for ‘R’ type locking clip is stainless

steel. The hardness and temper of material are important for their satisfactory operation. The locking devices shall retain their ability after being operated from the locking to the coupling position at least twenty times at normal temperature. They should be effective at the lowest temperature likely to be encountered in service. Socket for use with W-clips have the lower edge of the rectangular slot at the level of bottom of the socket. The slot is so shaped that it will accept the W-clip and retain it in two distinct positions when operated for coupling and locking. The shape of the W-clip is such that complete withdrawal when moving from the locking to the coupling position prevented.

h) All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 705 gm/Sq.m, or 100mm min. thickness and shall be in accordance with the requirement of IS: 4759, The zinc used for galvanizing shall be of purity 99.5% as per IS: 4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. Before ball fittings and galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the design dimensional requirements.

6. MARKING:

Each insulator shall be legibly and indelibly marked (embossing/engraved) to show the following:

a) Name & Trade mark of the manufacturer
b) Voltage Grade
c) Year of manufacturing
d) Minimum failing load in KN
e) “TPCODL/TPNODL/TPWODL/TPSODL” Name should be mentioned on each insulator

7. TESTS

The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

i) Verification of dimensions
ii) End Sealing test (FRP rod and Silicone rubber housing)
iii) Visual examination (Free from voids, cavity, foreign particle and scratch/nick spot)
iv) Mechanical performance Test
v) Galvanizing Test

vi) Mechanical Failing Load Test
vii) Dry Power Frequency Withstand Voltage Test
viii) Wet Power Frequency Withstand Voltage Test
ix) Verification of the locking system or the tightness of the interface between end fitting and insulator housing

7.2 ROUTINE TESTS

i) Visual examination (Free from voids, cavity, foreign particle and scratch/nick spot)
ii) Mechanical Load test
iii) Electrical routine test

7.3 TYPE TESTS

A) For Insulators

i) Dry Power Frequency Withstand Voltage Test
ii) Dry Power Frequency Voltage Flashover Test
iii) Dry lightning impulse withstand voltage test.
iv) Wet Power Frequency Withstand Voltage Test
v) Wet Power Frequency Voltage Flashover Test
vi) Mechanical failing load test.
vii) Salt fog test: On insulators for 1000 hr as per IEC
viii) Galvanization test
ix) Damaged Limit Proof Test
x) Radio interference test.

B) For Silicon rubber

i) Tensile Strength
ii) Elongation
iii) Tear Strength
iv) Inclined plane Tracking & Erosion resistance test
v) Volume Resistivity
vi) Dielectric constant
vii) Dielectric Strength
viii) Density
ix) Hardness
x) Arc Resistance
xi) Silicone Content
xii) Flammability

xiii) Limiting oxygen index test

xiv) Resistance to weathering & UV.

xv) Specific gravity

C) For FRP rods

i) Verification of dimensions

ii) Specific Gravity

iii) Glass Content

iv) Water Diffusion Test

v) Hardness

vi) Dye Penetration Test

vii) Flexural Strength

viii) Brittle fracture resistance test.

ix) Water Diffusion Test

D) For End Fittings

i) Thickness of Zinc coating

ii) Uniformity of Zinc Coating

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA/Other Govt. Lab** as per the relevant IS/IEC. For **High voltage Silicone rubber material used for Polymer housing** the test are conducted at **CIPET/CPRI** as per the relevant standards. TPCODL/ TPWODL/ TPNODL/ TPSODL. TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report under exceptional circumstances after due diligence/ scrutiny by DISCOM. Type tests should have been conducted in certified Test laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPWODL/TPSODL.

9. PRE DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPWODL/TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPWODL/TPSODL's representatives at all

times when the work is in progress. Inspection by the TPCODL/TPNODL/TPWODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/ TPNODL/ TPWODL/ TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPWODL/TPSODL
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORES:

The material received at TPCODL/TPNODL/TPWODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 18 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

The bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of guarantee period for any 'latent defects' if noticed by the company.

12. PACKING:

Supplier shall ensure that all the equipment covered under this specification shall be prepared

for rail/road transport and be packed in such a manner so as to protect the equipment from damage in transit. The material used for packing shall be environmentally friendly. All insulators shall be packed in strong corrugated box of min. 7 ply duly palette or wooden crates. The gross weight of the crates along with the material shall not normally exceed 100 Kg to avoid handling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season. Each wooden case / crate / corrugated box shall have all the markings stencilled on it in indelible ink. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE:

Bidder shall submit the sample of material during submission of Bids.

14. QUALITY CONTROL:

The bidder shall submit with the offer Quality Assurance Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections. The bidder shall ensure that the material supplied is as per the Guaranteed Technical Particulars as specified in the specifications.

15. TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES:

The bidder shall get the approved drawing and GTP before start of manufacturing activity. The successful bidder will have to submit details of the offered design & components for approval as per specification. CAT-A/CAT-B is mandatory to start manufacturing.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled–in clause wise compliance of the specification

b) Schedule “B” Deviations
c) Work Experience details
d) Type test certificates.
e) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- “A” GUARANTEED TECHNICAL PARTICULARS

Bidder to submit completely clause wise compliance of this specification

20. SCHEDULE “B” DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

CONTENTS

1. SCOPE

This specification covers the technical requirements of design, manufacturing, supply, Inspection & testing of 11KV Post polymer insulator used in 11KV Overhead Transmission lines. The specific requirements are covered in the enclosed technical data sheet. This specification also covers the requirement of manufacture, testing at manufacturer's works, packing, Supply, transportation, forwarding and unloading at TPWODL/TPNODL/TPCODL/TPSODL stores/site.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International standards / IEC and shall conform to the regulations of the local authorities. In case of any conflict in the below mentioned standards, TPWODL/TPNODL/TPCODL/TPSODL specification shall prevail:

IEC: 61109:	Definition, test methods and acceptance criteria for composite insulators for A.C. overhead lines above 1000V.
IEC: 61952:	Insulators for overhead lines – Composite line post insulators for alternative current.
IEC: 62231:	Testing procedure for Station Post Polymer Insulator.
IS: 2071/ IEC: 60060-1:	Methods of High Voltage Testing.
IS: 2486/ IEC: 60120:	Specification for Insulator fittings for Overhead power Lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices.
IEC: 60575:	Thermal Mechanical Performance test and mechanical performance test on string insulator units.
IS: 13134/ IEC: 60815:	Guide for the selection of insulators in respect of polluted condition.
STRI guide 1.92/1:	Hydrophobicity Classification Guide.
IEC: 60437:	Methods of RI Test of HV insulators.
IS: 4759:	Hot dip zinc coatings on structural steel & other allied products.
IS: 2629:	Recommended Practice for Hot, Dip Galvanization for iron and steel.
IS: 6745:	Determination of Weight of Zinc Coating on Zinc coated iron and steel articles.
IS: 2633:	Testing of Uniformity of Coating of zinc coated articles.
ASTM D 578-05:	Standard specification for glass fiber strands.

**In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.*

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm
10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4. GENERAL TECHNICAL REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Type of insulator	11KV Polymeric Post Insulator
2	Reference Standard	IEC 61952/IEC 61109/IEC 62231
3	Material of Core (FRP Rod)	ECR Glass Borron Free
4	Material of Housing and Weather sheds	High voltage grade Silicone rubber Wacker-Germany, Dow Corning-USA
5	Material of end fittings	SGCI/ MCI, HDG
6	Material of sealing compound	RTV Silicon Sealant
7	Colour of sheds	Grey
8	**Electrical Characteristics**	
8.1	Rated system voltage	11 KV
8.2	Highest system voltage	12 KV
8.3	Rated Frequency	50 HZ
8.4	Visible Discharge Test	9 KV
8.5	Dry Power Frequency Withstand voltage	50 KV
8.6	Wet Power Frequency Withstand voltage	45 KV
8.7	Dry Power Frequency Flashover Voltage	55 KV
8.8	Wet Power Frequency Flashover Voltage	50 KV
8.9	Dry Lightning Impulse withstand voltage	Positive: 110 KV
		Negative: 110 KV
8.10	Dry Lightning Impulse Flashover voltage	Positive: 120 KV
		Negative: 130 KV
8.11	RIV at 1 MHz when energized at 10 Kv (rms)	< 100 Micro Volts
8.12	Creepage distance (min)	320 mm
8.13	Dry Arc Distance (min)	175 mm
9	Minimum Failing load	5 KN
10	FRP rod dia. Min	24 mm
11	Length of FRP Rod (min)	200 mm
12	Dia of weather sheds	≥90 mm
13	Thickness of housing	3 mm
14	Type of sheds	Aerodynamic
15	Method of fixing sheds to housing	Injection moulding
16	Number of Holes & Holes dia. (Top & Bottom)	4 Nos & Ø M 12
17	Pitch Circle Diameter (PCD)	76 mm
18	Type of packing	Wooden / Corrugated box
19	No of insulator in each pack	Thirty
20	Tolerance	IEC - 61952 with up to date amendments
21	Marking / Embossing	TPWODL/TPNODL/TPCODL/TPSODL, Manufacture's name or trademark, Year of Manufacture

5. GENERAL CONSTRUCTIONS:

General construction should comply to industrial standard. Polymeric Insulators shall be designed to meet the high quality, safety and reliability and are capable of withstanding a

wide range of environmental conditions. Polymeric Insulators shall consist of THREE parts, at least two of which are insulating parts: -

a. Core- the internal insulating part.
b. Housing- the external insulating part.
c. Weather Sheds
d. Metal end fittings.

5.1 CORE

Core shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free and should have high resistance to acid corrosion. Electrically Corrosion Resistant (ECR) grade fiber glass reinforced plastic (FRP) rod having at least 80% fibres by weight.

5.2 POLYMER HOUSING:

The FRP rod shall be covered by a seamless sheath of high voltage grade Silicone rubber housing of thickness 3mm minimum. It shall be one- piece housing using only Injection Moulding process to cover the core. The housing shall be designed to provide the necessary creepage distance and protection against environmental influences, external pollution and humidity. Housing shall conform to the requirements of IEC 60815 with latest amendments. All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating condition. It shall be extruded or directly moulded on core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing / bonding area shall be free from voids.

5.3 WEATHERSHEDS

The composite polymer weather sheds made of high voltage grade Silicone rubber polymer shall be moulded as part of the sheath and shall be free from imperfections. It should

protect the FRP rod against environmental influences, external pollution and humidity. The weather sheds should have **silicon content of minimum 40% by weight**. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids. Housing and weather sheds material shall have tensile strength of 3 Mpa with 400% elongation minimum and tear strength of 16 N/mm.

5.4 METAL END FITTINGS:

End fitting transmit the mechanical load to the core. They shall be made of spheroidal graphite cast iron, malleable cast iron or forged steel or aluminum alloy. Metal end fitting shall be suitable for Post type hardware support of respective specified mechanical load and shall be hot dip galvanized in accordance with IS 2629. They shall be connected to the rod by means of a controlled compression technique. The OD of end fittings should be machined to make the surface uniform round to ensure effective sealing when housing is molded over it. The material used in fittings shall be corrosion resistant. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process & should not damage the individual fibers or crack the core. The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/ IS: 2486 - Part-II /1989. Outer portion of Post should be Zinc sleeved with minimum 99.95% purity of Electrolytic high-grade zinc. Bottom end metal fitting (Shank) of Post insulator should be forged steel as per IS 2002/92. Bottom end fitting should be single unit without any joints. Nuts as per IS 1363 (P-III) and spring washer shall be as per IS 3063 with Latest amendments if any, Nuts and spring washer shall be hot dip galvanized. The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulators shall not lead to deterioration. The Post insulator shall not engage directly with hard metal.

6. MARKING:

Each Insulator shall be legibly and indelibly marked/ embossed with “PO Number with date”, “Code Number”, “PROPERTY OF TPWODL/TPNODL/TPCODL/TPSODL- ODISHA” in such that it is permanent and does not harm the body & along with the following parameters:

a) “PROPERTY OF TPWODL/TPNODL/TPCODL/TPSODL”.
b) “PO no. with date”.
c) “Manufacturer Name”.
d) Type of Designation & Serial No.

e) Month & Year of Manufacturing.

f) Minimum failing load in KN.

g) ISI Mark.

h) No. of Relevant Standard.

i) Country of Manufacture.

7. TESTS

All routine, acceptance and type tests shall be carried out in accordance with the relevant IS/IEC standards and that are mentioned in clause 2. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components should have been type tested as per the relevant standards from CPRI/ERDA. All the Type Tests as per latest IS should have been carried out on the equipment in addition to others specified in IS/IEC/IEEE/UL standards.

7.1 TYPE TEST

All the type tests have to be performed as per IS. The following Type tests for 11kV Post Polymer insulator should be done as per relevant standards:

Tests on Silicone Rubber:

1) Tensile Strength & Elongation
2) Tear Strength
3) Inclined Plane Tracking & Erosion
4) Volume resistivity
5) Dielectric Strength
6) Dielectric Constant
7) Density
8) Hardness
9) Arc Resistance
10) Silicone content
11) Flammability
12) Resistance to weathering & UV.
13) Limiting oxygen index test.
14) Specific gravity.

Tests on FRP Rods:

1) Verification of dimensions.
2) Specific Gravity
3) Glass Content

4) Water Diffusion Test
5) Hardness
6) Dye Penetration Test.
7) Flexural strength.
8) Water absorption.
9) Brittle fracture resistance test.
10) Visible discharge test.
11) Dry lightning impulse withstand voltage test.
12) Wet power frequency with-stand voltage test.
13) Power Arc test.
14) Accelerated weathering test.
15) Tracking & erosion test.

Tests on End Fittings:

1) Thickness of Zinc Coating
2) Uniformity of Zinc Coating
3) Micro-structural of metal fitting.

Test of Complete polymer insulators:

1) Dry lightning impulse withstand voltage test.
2) Wet power frequency test.
3) Mechanical failing load test.
4) Radio interference test.
5) Mechanical performance test
6) U.V Resistance as per ASTM G 53: 1000 Hrs - UV Light for 8 Hours and condensation for 4 hours in a continuous cycle. Elongation to be limited to 20% (% Elongation to break before and after the test).
7) Salt Fog test: On insulators for 1000 hours as per IEC.
8) Galvanization test.
9) Visual examination.
10) Verification of dimensions.
11) Bending test.
12) Verification of the locking system or the tightness of the interface between end fitting and Insulator housing.
13) Assembled core load time test.
14) Determination of the average failing load of the core of the assembled insulator.

Design Tests:

For composite insulators it is essential to carry out design test as per clause 4.1 of IEC 61109 / 92-93 with latest amendments. The design tests are intended to verify the suitability of the design, materials and method of manufacture (technology). When a composite insulator is submitted to the design tests, the result shall be considered valid for the whole class of insulators, which are represented by the one tested and having the following characteristics:

- The materials for the core, and sheds and same manufacturing method;
- The material of the fittings, the same design, the same method of attachment;
- Polymer insulator should have greater layer thickness of the shed material over the core (including a sheath where used);
- Polymer insulator should have smaller ratio of the highest system voltage to insulation length;
- Polymer insulator should have smaller ratio of all mechanical loads to the smallest core diameter between fittings
- Polymer insulator should have greater diameter of the core.

The tested composite insulators shall be identified by a drawing giving all the dimensions with the manufacturing tolerances.

Manufacturer should submit test reports for Design Tests as per IEC – 61109 (clause – 5) along with the bid. Additionally following tests shall be carried out or reports for the tests shall be submitted after award of contract: UV test: the test shall be carried out in line with clause 7.2 of ANSI C29.13.

In addition, chemical composition test for silicon content would also be added in the testing list.

7.2 ROUTINE TESTS

All the Routine tests & acceptance tests have to be performed as per IS. The following tests shall be conducted as per IS. Routine test to be done on the random samples (As per IS) taken from the offered lot material for the purpose of acceptance of that lot of material.

i) Visual Examination
ii) Mechanical load test as per IEC 61109 & IEC 62231

7.3 ACCEPTANCE TEST:

All the Acceptance tests have to be performed as per IS**.** Routine and acceptance tests shall be conducted at the place of manufacturer.

For Composite Insulators:

1. Verification of dimensions
2. Visual examination
3. Verification of the locking system or the tightness of the interface between end fitting and insulator housing
4. Galvanizing test
5. Verification of the specified mechanical load
6. Bending load test
7. Dry power frequency with-stand voltage test
8. Analysis of material properties of housing material
9. Analysis of material properties of core material

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA** as per the relevant IS/IEC. For **High voltage Silicone rubber material used for Polymer housing** the test are conducted at **CIPET/CPRI** as per the relevant standards. TPCODL/ TPWODL/ TPNODL/ TPSODL. TATA-POWER reserves the right to allow any other NABL accredited/ Govt. lab report under exceptional circumstances after due diligence/ scrutiny by DISCOM. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e., any test report not acceptable, same shall be carried out without any cost implication to TPCODL/ TPNODL/ TPWODL/ TPSODL.

9. PRE DISPATCH INSPECTION:

1. Material shall be subject to inspection by a duly authorized representative of TPWODL/TPNODL/TPCODL/TPSODL.
2. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.
3. Bidder shall grant free access to the places of manufacture to TPWODL/TPNODL/TPCODL/TPSODL's representatives at all times when the work is in progress.
4. Inspection by TPWODL/TPNODL/TPCODL/TPSODL or authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
5. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPWODL/TPNODL/TPCODL/TPSODL.

Following documents shall be sent along with material:

1) Test report
2) MDCC issued by TPWODL/TPNODL/TPCODL/TPSODL
3) Invoice in duplicate
4) Packing list
5) Drawings & catalogue
6) Guarantee / Warrantee card
7) Brought out (raw) material test certificates
8) Delivery Challan
9) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORES:

The material received at TPWODL/TPNODL/TPCODL/TPSODL, Odisha store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to "Engineering" department.

11. GUARANTEE:

1. Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract.

2. In the event any defect is found by the TPWODL/TPNODL/TPCODL/TPSODL, up to a period of 12 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 12/24 months could be enhanced subject to mutual agreements). Bidder shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12. PACKING:

Bidder shall ensure that all the Equipment covered under this specification shall be prepared for rail/road transport and be packed in a manner so as to protect the equipment from damage in transit. The material used for packing shall be environmentally friendly.

13. TENDER SAMPLE:

Bidder shall submit the sample of material with the offer (in case of first supply to TPWODL/TPNODL/TPCODL/TPSODL).

14. QUALITY CONTROL:

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPWODL/TPNODL/TPCODL/TPSODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES:

The successful Bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order. Manufacturing mass quantity to start only after getting approved drawings or as per intimation from TPWODL/TPNODL/TPCODL/TPSODL.

17. SPARES, ACCESSORIES AND TOOLS

Not Applicable And the bidder can submit a recommended list of commissioning spares along with item wise price.

*Note - The extra spares shall be included in PR only after furnishing requirement from user group.

18. DRAWINGS AND DOCUMENTS

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
b) Work Experience details
c) Type test certificates.
d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Type of insulator	**To be provided by Bidder**
2	Reference Standard	
3	Material of Core (FRP Rod)	
4	Material of Housing and Weather sheds	
5	Material of end fittings (B&S)	
6	Material of sealing compound	
7	Colour of sheds	
8	**Electrical Characteristics**	
8.1	Rated system voltage	
8.2	Highest system voltage	
8.3	Rated Frequency	
8.4	Visible Discharge Test	
8.5	Dry Power Frequency Withstand voltage	
8.6	Wet Power Frequency Withstand voltage	
8.7	Dry Power Frequency Flashover Voltage	
8.8	Wet Power Frequency Flashover Voltage	
8.9	Dry Lightning Impulse withstand voltage	
8.10	Dry Lightning Impulse Flashover voltage	
8.11	RIV at 1 MHz when energized at 10 Kv (rms)	
8.12	Creepage distance (min)	
8.13	Dry Arc Distance (min)	
9	Minimum Failing load	
10	FRP rod dia. Min	
11	Length of FRP Rod (min)	
12	Dia of weather sheds	
13	Thickness of housing	
14	Type of sheds	
15	Method of fixing sheds to housing	
16	Type of packing	
17	No of insulator in each pack	
18	Tolerance	
19	Marking / Embossing	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

CONTENTS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at stores/ site and performance of CT & PT Junction Box made out of Mild steel, Hot dip galvanized for trouble free and efficient operation.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

S.NO	Indian Standard	Title
1	IS 5039	Specification for distribution pillars below 1000V AC
2	IS: 8623	Specification for enclosure Box & for degree of protection provided by enclosures of electrical equipments.
3	IS: 4237 IS: 8623	Specification for general requirement of L.T. switchgears.
4	IS: 13947 (Part2)	Specification for L.T. MCCBs.
5	IS 2062	Hot Rolled Medium and High Tensile Structural Steel [MTD 4: Wrought Steel Products]

3. CLIMATIC CONDITIONS:

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	1500 mm
6	Average No. of rainy days per annum	120

7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPWODL/TPNODL/TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4. GENERAL TECHNICAL REQUIREMENTS:

Sl.No.	Particulars	CT JB	PT JB
1	Material	Mild Steel, Grade-E250A hot Dip galvanised-86 microns	Mild Steel, Grade-E250A hot Dip galvanised-86 microns
2	Thickness	3 mm	3 mm
3	Door	Stainless Steel double hinged with pad locking arrangement	Stainless Steel double hinged with pad locking arrangement
4	Gasket	Doors, removable covers and plates shall be gasketed all around	Doors, removable covers and plates shall be gasketed all around
5	Provision for glands	Knock out type / holes fixed with Grommet for following gland size. 19 mm- 25 mm- Number of holes to be finalised during detailed engineering. Bidder to provide the holes considering the gland of aforesaid cable dia./Sizes	Knock out type / holes fixed with Grommet for following gland size 19 mm- 25 mm- Number of holes to be finalised during detailed engineering. Bidder to provide the holes considering the gland of aforesaid cable dia./Sizes
6	Colour	RAl 7032	RAL 7032
7	Overall Size of the box (refer sample drg.)	450(L) x 470(H) x 150(W)	450(L) x 470(H) x 150(W)

8	Make of Disconnecting Switch	Elmex , Connect well, Phoenix Contact	Elmex , Connect well, Phoenix Contact
9	Voltage Grade	1100 V	1100 V
10	Degree of Protection	IP55	IP55
11	Earthing	Connection between neutral busbar and earth to be provided . Same shall be ensured by providing two separate M10 screw arrangement.	Connection between neutral busbar and earth to be provided . Same shall be ensured by providing two separate M10 screw arrangement.
12	Termial Block details	Stud- Disconnecting Type , Screw driver operatable. **Elmex-M4 or equivalent** 20A	Stud- Disconnecting Type , Screw driver operatable. **Elmex-M4 or equivalent** 20A
13	Preffered Make	Elmex, Connectwell, Phoenix	Elmex, Connectwell, Phoenix

5. GENERAL CONSTRUCTION:

The junction box shall be made from Mild steel hot dip galvanised minimum mass of 705 g/m^2 and 100 microns thickness of zinc coating & requirement of this specification.

The junction box shall be so constructed as to have roof tapering down for easy flow of rainwater.

The surface appearance or part of junction box must be smooth, non porous and homogeneous, free from ripples, defects and marks.

The gasket should be made out of good quality neoprene rubber.

4 nos. of pads with holes of minimum diameter 12 mm shall be provided at the four corners at the backside of the junction box to facilitate mounting of the junction box.

5.1 JUNCTION BOX FOR CT:

5.1.1. A suitable weather proof and dust proof CT junction box of suitable thickness shall be installed at each bay near the position of CT installation at the switchyard/substation for termination of all the CT secondary connection. CT junction box shall be made of mild steel hot dip galvanized GI Sheet having 3mm thickness. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. CT junction box shall be provided with Stainless Steel double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. All doors, removable covers and plates shall be gasketed all around. All gasketed surfaces shall be smooth, straight and reinforced if necessary to minimize distortion and to make a tight seal.

5.1.2. CT junction box shall be designed for entry of cables from bottom by means of weather proof and dust proof connections. Design shall be such that there shall not be any interference between the wiring entering from below and any terminal blocks or accessories mounted inside the junction box.

5.1.3. CT junction box shall be provided with **45 No.s of 'Elmex' /'Connetwell/Phoenix'** make Disconnecting type 1100V grade terminal block for shorting of the CT secondary in the junction box itself. Jam nut should be provided with shorting link.

5.1.4. The terminal block to be used shall be of best quality, rust proof and suitable for climatic condition at site as mentioned in the general condition of site.

5.1.5. Terminal blocks shall be 1100V grade and of continuous rating to carry the maximum expected current on the terminal. The terminal blocks shall be fully enclosed with removable covers of transparent, non-deteriorating type plastic material. Insulating barrier shall be provided between the terminals. The terminal blocks shall have locking arrangement to prevent its escape from the rails. There shall be a minimum clearance of 150 mm. between the coloumns of terminal block and the associate cable gland.The clearance between two coloumns of terminal blocks shall be maintained as 100 mm. All terminal blocks shall be suitable for connecting minimum of 2 nos. 2.5 sq .mm copper flexible.

5.1.6. 10mm wide with minimum thickness of 1mm SS plate having details as per Clause no-6 bearing identification mark shall be fixed under each connection at the CT junction box to indicate the CT . The CT secondary used for metering shall also be marked similarly.

5.1.7. The CT junction box shall be placed at such a height that it becomes convenient for any person to work on the CT secondary terminal block. Sufficient space shall be provided that all terminals become easily accessible. All incoming and outgoing connections in the CT junction box shall be properly marked with ferrule.

5.1.8. The enclosure of CT junction box shall provide with a degree of protection of not less than IP-55 and type test report of one identical box is to be submitted to TPCODL/TPWODL/TPNODL/TPSODL.

5.1.9. Necessary shorting links are to be provided in the terminal block for each connection.

5.1.10. Two no. of Connection between neutral busbar and earth to be provided . Same shall be ensured by providing two separate M10 screw arrangement.

5.2 JUNCTION BOX FOR PT

5.2.1 A suitable weather and dust proof kiosk of suitable thickness shall have to be installed in each bay where PT is connected near the PT installation at the switchyard for termination of all PT secondary connections from Red, Yellow and Blue before it is taken to the terminal block of the respective control panel.

5.2.2 PT junction box shall be made of mild steel , hot dip galvanized having 3mm thickness.

There shall be sufficient reinforcement to provide level surface, resistance to vibration and rigidity during transportation and installation. PT junction box shall be provided with Stainless Steel double hinged doors with padlocking arrangement. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. All doors removable covers and plates shall be gasketed all around. All gaskated surfaces shall be smooth, straight and reinforced if necessary to minimise distortion and to make a tight seal.

5.2.3 PT junction box shall be provided with **45 No.s of 'Elmex/'Connectwell/Phoenix'** make disconnecting type terminal block of 1100 V grade Jam nut should be provided. Terminal blocks shall be of 1100V grade and of continuous rating to carry the maximum expected current on the terminals.

5.2.4 The terminal blocks shall be fully enclosed with removable covers of transparent, non-deteriorating material. Insulating barrier shall be provided between the terminals. The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.

5.2.5 PT junction box shall be designed for entry of cables from bottom by means of weatherproof and dust proof connections through cable glands. Design shall be such that there shall not be any interference between the wiring entering from below and any terminal blocks inside the PT junction box.

5.2.6 All terminal blocks shall be suitable for connecting minimum of 2 nos. of 2.5 sq. mm. copper flexible.There shall be a minimum clearance of 150 mm. between the coloumn of terminal block and the associated cable gland . The clearance between coloumns of terminal blocks shall be maintained as 100 mm . (minimum).

5.2.7 Two no. Connection of neutral busbar and earth shall be ensured by providing two separate M10 Screws outside the box.

5.2.8 10mm wide with minimum thickness of 1mm SS plate having details as per Clause no- 6 bearing suitable identification of the PT secondary terminals to be used for protection and metering shall be fixed under the terminal block shall be provided in the kiosk for easy access to the terminals.

5.2.9 The enclosure of PT junction box shall be provided with a degree of protection of not less than IP-55 and type test report of one identical box is to be submitted to TPCODL/TPWODL/TPNODL/TPSODL.

6. MARKING:

SS Plate with 1mm thickness plate in which following details are to be engraved.

a) Reference to the Standards.
b) Equipment Name:
c) PO Number
d) Manufacturer's name·
e) Serial No.
f) Voltage grade.
g) TPCODL/TPWODL/TPNODL/TPSODL
h) MM/YYYY of Manufacturing

7. TESTS:

All routine, acceptcance & type tests shall be carried out in accordance with the relevant IS/IEC. All Routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards.Following tests shall be necessarily conducted on the Junction Box in additions to others specified in the IS/IEC/Other relevant standard.

7.1 TYPE TESTS

i) Degree of protection for IP- 55 on complete box shall be carried out as per IS: 13947/1993 or the latest version thereof.

ii) Mechanical Test as per IS 2062 E250A

iii) Chemical Composition Test as per IS 2062 A

iv) Galvanization Test as per IS 26029 & IS 2633

7.2 ROUTINE TESTS

i) Overall Dimensions Checking

ii) Insulation Resistance Tests

iii) High Voltage Test at 2500 V , 50 Hz AC for one minute.

iv) Galvanization tests

7.3 ACCEPTANCE TESTS

i) Overall Dimensions Checking

ii) Insulation Resistance Tests

iii) High Voltage Test at 2500 V , 50 Hz AC for one minute.

iv) Galvanization tests

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the equipment for the tests as mentioned as above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA/Other Govt. Lab** as per relevant IS. Type tests should have been conducted during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, or any/all type tests(including additional same shall be carried out without any cost implication to TPCODL/TPWODL/TPNODL/TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPWODL/TPNODL/TPSODL. Inspection may be made at any stage of manufacture

at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPWODL/TPNODL/TPSODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPWODL/TPNODL/TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPWODL/TPNODL/TPSODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPWODL/TPNODL/TPSODL
c) TPCODL/TPWODL/TPNODL/TPSODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPWODL/TPNODL/TPSODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Engineering department and contracts department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 12 months from the date of commissioning or 24 months from the date of last supplies made under the contract, whichever is later (the time scale of 12/24 months could be enhanced subject to mutual agreements). Bidder shall be liable to undertake to replace/rectify such defects at his own costs, within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as the case may be.

Bidder shall further be for "free replacement" for another period of three years from the end of

the guarantee period for any latent defects if noticed and reported by the purchaser.

12. PACKING AND TRANSPORT:

Supplier shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport and be packed in such a manner so as to protect the equipment from damage in transit. The material used for packing shall be environmentally friendly

13. TENDER SAMPLE:

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/TPWODL/TPNODL/TPSODL).

14. QUALITY CONTROL:

The bidder shall submit Quality Assurance Plan (QAP) indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections. The bidder shall ensure that the material supplied is as per the Guaranteed Technical Particulars as specified in the specifications.

15. TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant international/Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not Required

18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on TPCODL/TPWODL/TPNODL/TPSODL Specifications and statutory requirements with complete BOM and shall be submitted with bid.

a) Completely filled in Schedule "A" Guaranteed Technical Particulars.
b) Work Experience details
c) Type test certificates.
d) General descriptions of the equipment and all components including brouchers.

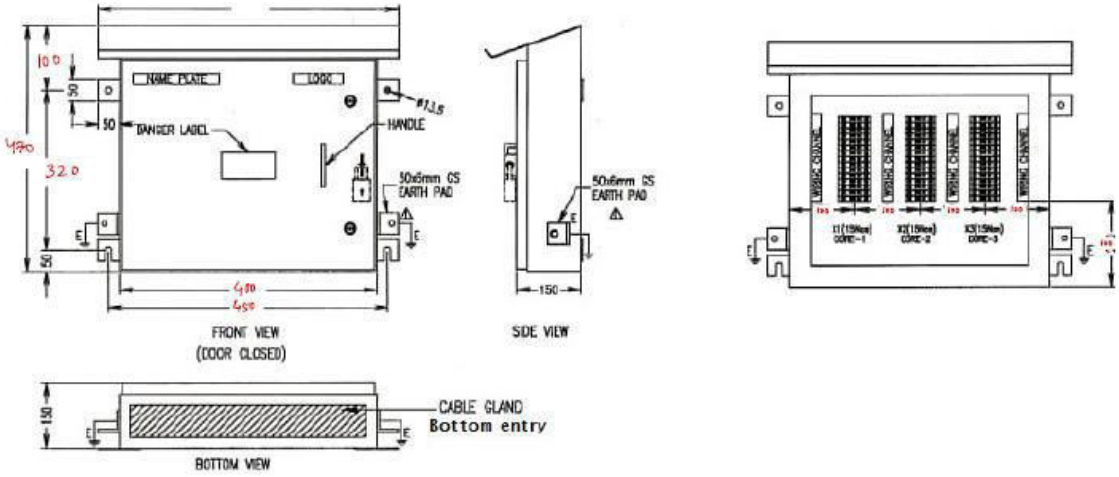
After the award of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings ,one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (compact Disk CD) of all the drawing, GTP, test certificates shall be submitted after the final approval of the same to the purchaser.

Following Drawings/Documents shall be submitted after the award of the contract.

S.No	Description	For Approval	For Review information	Final Submission
1	Technical Particulars	✓		✓
2	Manual/Catalogues/drawings for all components		✓	
3	Installation instructions		✓	✓
4	Instructions for use		✓	✓
5	Trasnsport/shipping dimension drawing		✓	✓
6	QA & QC Plan	✓	✓	✓
7	Routine,Acceptance and type test certifiates	✓	✓	✓

All the documents and drawings shall be in English language only.

Instruction Manuals : Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.



SAMPLE DRAWING. FOR TENDER PURPOSE ONLY.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS: (To be furnished by bidder)

Sl.No.	Particulars	CT JB	PT JB
1	Material		
2	Thickness		
3	Door		
4	Gasket		
5	Provision for glands		
6	Colour		
7	Size of the box		
8	Make of Disconnecting Switch		
9	Voltage Grade		
10	Degree of Protection		
11	Earthing		
12	Termial Block details		

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-LV-3004

Specification Name : 1.1kV ARMOURED CONTROL CABLES

JYOTIPRAKASH MOHANTY	SATYA PRASAD NAYAK	Vijender Goyal	SHANTAPRIYA JENA	ANUP JAWASE	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPCODL	TPSODL	TPNODL	TPWODL	TPWODL
02-01-2023	03-01-2023	03-01-2023	03-01-2023	03-01-2023	04-01-2023

CONTENTS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store and performance of 1.1kV FRLSH Armoured Control Cables for trouble free and efficient operation.

2. APPLICABLE STANDARDS:

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

Ref IS/IEC	Description
IS-1554 (Part-I)	PVC insulated (heavy duty) electric cables
IS-8130:1984	Conductor for insulated electric cables & flexible cords
IS-5831:1984	PVC insulation and sheath of electric cables
IEC-60228/3-2004	Conductor of insulated cables
IEC 60332-1:1993	Flame retardant, characteristics of electrical cables.
IS-3975:1979	Mild steel wires strips and tapes for armoring cables.
IS:3961-(Part-2)	Recommended current ratings for cables
IS 10418: 1982	Drums for Electric Cables

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDTIONS	VALUES
1	Max. altitude above sea level	1200m
2	Max. Ambient Temperature	50 °C
3	Max. Daily average ambient temp	35 °C
4	Min Ambient Temp	0 °C
5	Maximum temperature attainable by an object exposed to sun	60 °C
6	Maximum Humidity	95%
7	Minimum Humidity	10%
8	Average No. of thunderstorm days per annum	70
9	Average Annual Rainfall	150 cm

10	Average No. of rainy days per annum	120
11	Thermal Resistivity of soil	150 Deg. Ccm/W
12	Wind Pressure	126 kg/sq. m up to an elevation of 10 meter.
14	Earthquakes of intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
15	Earthquakes of intensity in vertical direction	equivalent to seismic acceleration of 0.15g
16	Wind velocity	300 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted,salty, corrosive and humid coastal atmosphere. The atmosphere is generally laden with mild acid and dust in suspension during thedry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces as mentioned above.

4. GENERAL TECHNICAL REQUIREMENTS:

Sr. No	General Technical Particulars	UNITS	DESIRED VALUE			
1	Reference Standard		IS:1554, Part-1/1988 in General			
2	Voltage grade		1.1 KV			
3	Type of cable		Control Cable			
A	**Size of cable**	**sq.mm**	**4CX2.5**	**7CX2.5**	**10CX2.5**	**12CX2.5**
1	**Conductor**					
a.	Conductor Material		Plain Annealed Copper	Plain Annealed Copper	Plain Annealed Copper	Plain Annealed Copper
b.	No. of cores	Nos.	4	7	10	12
c.	Size of conductor	sq.mm.	2.5	2.5	2.5	2.5
d.	Shape of conductor		Multi Stranded circular	Multi Stranded circular	Multi Stranded circular	Multi Stranded circular

Sr. No	General Technical Particulars	UNITS	DESIRED VALUE			
e.	No. & diameter of each wire in conductor		Minimum size shall be corresponding to meet the requirement of conductor resistance as per relevant clause of IS:8130-1984	Minimum size shall be corresponding to meet the requirement of conductor resistance as per relevant clause of IS:8130-1984	Minimum size shall be corresponding to meet the requirement of conductor resistance as per relevant clause of IS:8130-1984	Minimum size shall be corresponding to meet the requirement of conductor resistance as per relevant clause of IS:8130-1984
2	**Insulation**					
a.	Material		PVC insulation conforming to type C as per IS: 5831:1984 applied by extrusion process	PVC insulation conforming to type C as per IS: 5831:1984 applied by extrusion process	PVC insulation conforming to type C as per IS: 5831:1984 applied by extrusion process	PVC insulation conforming to type C as per IS: 5831:1984 applied by extrusion process
b.	Nominal thickness	mm	0.9	0.9	0.9	0.9
c.	Core identification		Red, Yellow, Blue & Black	All cores white with core numbers printed in black ink as per clause 10.3 of IS:1554(Part-I)/1988	All cores white with core numbers printed in black ink as per clause 10.3 of IS:1554(Part - I)/1988	All cores white with core numbers printed in black ink as per clause 10.3 of IS:1554(Part-I)/1988
3	**Inner sheath**					
a.	Material		PVC conforming to type ST-2 as per IS:5831-1984	PVC conforming to type ST-2 as per IS:5831-1984	PVC conforming to type ST-2 as per IS:5831-1984	PVC conforming to type ST-2 as per IS:5831-1984
b.	Minimum thickness (at any point of measurement)	mm	0.3	0.3	0.3	0.3
4	**Armour**					
a.	Material		Galvanized Steel round wire confirming to IS:3975-1999	Galvanized Steel round wire confirming to IS:3975-1999	Galvanized Steel round wire confirming to IS:3975-1999	Galvanized Steel round wire confirming to IS:3975-1999

Sr. No	General Technical Particulars	UNITS	DESIRED VALUE			
b.	Nominal Diameter	mm	1.4	1.4	1.6	1.6
c.	Type		Wire	Wire	Wire	Wire
5	**Outer Sheath**					
a.	Material		FRLSH PVC Type ST-2, extruded type as per IS:5831-1984 (With FRLSH Properties)	FRLSH PVC Type ST-2, extruded type as per IS:5831-1984 (With FRLSH Properties)	FRLSH PVC Type ST-2, extruded type as per IS:5831-1984 (With FRLSH Properties)	FRLSH PVC Type ST-2, extruded type as per IS:5831- 1984 (With FRLSH Properties)
b.	Color		Blue	Blue	Blue	Blue
c.	Minimum thickness (at any point of measurement)	mm	1.24	1.24	1.4	1.4
6	**Diameter**					
a.	Approx. overall diameter	mm	17	20	22	25
b.	Tolerance of diameter	mm	±3	±3	±3	±3
7	Short circuit capacity for one second	kA	0.2875	0.2875	0.2875	0.2875
8	Approx. Weight of cable	Kg/km	600	750	1100	1200
9	Standard length of cable drum with tolerance	m	500±5% / 1000±5%	500±5% / 1000±5%	500±5% / 1000±5%	500±5% / 1000±5%
10	Allowable conductor temperature at continuous current	ºC	85	85	85	85
11	Allowable conductor temperature during short circuit	ºC	160	160	160	160
12	Max. DC resistance at 20ºC – Main	Ohm/km	7.41	7.41	7.41	7.41
13	Max. AC resistance at max. Operating temp.	Ohm/km	8.89	8.89	8.89	8.89
14	Guaranteed value of min oxygen index at 27ºC	%	29	29	29	29
15	Guaranteed value of min. temp. index	ºC	250	250	250	250
16	Smoke Density Rating		Max. average 60 SDR	Max. average 60 SDR	Max. average 60 SDR	Max. average 60 SDR

5. GENERAL CONSTRUCTION:

i) The PVC Insulated Cable shall be manufactured and tested strictly in accordance with the IndianStandard IS 1554 (Part – I):1988 and its latest amendments.

ii) All material used in the manufacturing of cables shall be new and shall be selected as the bestavailable for the intended use and shall withstand the requirement of following tests:

- Tensile test & Wrapping test
- Annealing test (for copper)

iii) 1.1 kV stranded copper conductor, PVC Insulated type-C, extruded PVC inner sheath, galvanizedround wire armoured, extruded outer sheathed FRLSH type cable conforming to IS:1554 (Part-I) with latest amendment. Overall outer sheath in blue color.

5.1 ARMOURING

The armouring shall be with galvanized steel wires for multi core cables. The galvanized steel wiresshall comply with the requirements of IS: 3975 with latest amendments

5.2 OUTER SHEATH:

The Outer Sheath shall be of polyvinyl chloride (PVC) compound confirming to the requirements of Type ST2 of IS: 5831 with FRLSH properties with latest amendments. The outer sheath shall be applied by extrusion process.

The thickness of the outer sheath shall be as per IS: 1554(Part – I). No tolerance on the negative side shall be acceptable

5.3 CORE IDENTIFICATION:

Individual core of multi-core cable shall be colour-coded and/or numbered for proper identification in accordance with relevant IS/manufacturer's standard.

5.4 REELS/DRUMS:

Cables shall be supplied in the wooden drums in specified length. Wooden drums shall be strong, weatherproof, and non-returnable. The ends of the cable shall be sealed by means of non-hygroscopic sealing material as per PO terms and conditions.

6. MARKING:

Wooden drums shall be of good quality. It shall be free from any damages & sharp edges of nails/ hardware inside the drums. A protective covering of polymeric sheet shall be applied inside the drum before winding the cable on the drum.

I. **The drum shall carry the following information stenciled on both sides of the drum:**

a) Manufacturer's name
b) Type of Cable
c) Size of Cable
d) Voltage Grade
e) Length of the cable on the drum
f) Direction of the rotation of the drum
g) Gross mass
h) Country of manufacture
i) Year and month of manufacturing
j) Purchase Order no.
k) Drum No.

II. **Following details shall be embossed on the outer sheath of the Cable at regular intervals every meters**

i) Manufacturer's name
ii) Voltage grade
iii) Number of cores, size, type
iv) FRLSH
v) TPCODL/TPNODL/TPSODL/TPWODL
vi) ISI Mark
vii) PO Number
viii) Material code
ix) Year of manufacturing
x) Sequential length marking shall be provided on the outer sheath of the cable byprinting

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with theoffer: -

7.1 ACCEPTANCE TESTS

i) Tensile Test
ii) Annealing test (for copper)
iii) Wrapping Test
iv) Conductor Resistance Test
v) Test for thickness of insulation and sheath

vi) Tensile strength and elongation at break test for insulation and sheath

vii) High Voltage test at room temperature

viii) Insulation resistance test

7.2 ROUTINE TESTS

i) Conductor Resistance test.

ii) High Voltage test at room temperature

7.3 TYPE TESTS

a) Tests on Conductor

- Conductor resistance test

b) Test for round steel wires/armouring wires

c) Test for thickness of insulation and sheath (outer and inner)

d) Physical tests for insulation & outer sheath

- Tensile strength and elongation at break
- Ageing in air oven
- Hot deformation
- Shrinkage test
- Loss of mass in air oven
- Heat shock test
- Thermal stability

e) Insulation Resistance test

f) High voltage test (water immersion test) – AC & DC

g) High voltage test at room temperature

h) Flammability test

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI / ERDA/ Approved Govt. Labs by TATA ODISHA DISCOM** as per relevant IS. Type tests should have been conducted during the period not exceeding 10 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e., any test report not acceptable, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall grant free access to the places of manufacture to TPCODL/TPNODL/TPSODL/TPWODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPSODL/TPWODL.

Following documents shall be sent along with material.

a) Test reports
b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
c) TPCODL/TPNODL/TPSODL/TPWODL Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPCODL/TPNODL/TPSODL/TPWODL, Odisha store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copyof the report shall be sent to Engineering department.

11. GUARANTEE:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 60 months from the date of commissioning or 72 months from the date of last supplies made under the contract, whichever is earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs. within mutually agreed timeframe, and to the entire satisfaction of the Company, failing which the Company will be at liberty to get it replaced/rectified at supplier's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the supplier or from the "Security cum Performance Deposit" as

the case may be.

12. PACKING:

The cable shall be wound on strong weatherproof and non-returnable wooden drums packed in coil lengths of 500 meters/1000 meters in line with the requirement of IS 10418 — 1982 and its latest amendments. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.

Bidder shall ensure that cable covered under this specification shall be prepared for rail/roadtransport in a manner so as to protect the equipment from damage in transit.

13. TENDER SAMPLE:

Bidders shall have to submit the sample of material (1 meter length) with the offer to TPCODL/TPNODL/TPSODL/TPWODL.

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access tothe manufacturer's/sub-supplier's works to carry out inspections.

15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Drawings and documents shall be submitted in line with the requirement of Tender specifications:

a) Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations

b) Work Experience details

c) Type test certificates.

d) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information aboutmanufacturing.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Sr. No	General Technical Particulars	UNITS	To Be Furnished by the Bidder			
1	Reference Standard					
2	Voltage grade					
3	Type of cable					
A	**Size of cable**	**sq.mm**	**4C*2.5**	**7C*2.5**	**10C*2.5**	**12C*2.5**
1	**Conductor**					
a.	Conductor Material					
b.	No. of cores	Nos.				
c.	Size of conductor	sq.mm.				
d.	Shape of conductor					
e.	No. & diameter of each wire in conductor					
2	**Insulation**					
a.	Material					
b.	Nominal thickness	mm				
c.	Core identification					
3	**Inner sheath**					
a.	Material					
b.	Minimum thickness (at any point of measurement)	mm				
4	**Armour**					
a.	Material					
b.	Nominal Diameter	mm				
c.	Type					
5	**Outer Sheath**					
a.	Material					
b.	Color					
c.	Minimum thickness (at any point of measurement)	mm				
6	**Diameter**					
a.	Approx. overall diameter	mm				
b.	Tolerance of diameter	mm				
7	Short circuit capacity for one second	kA				
8	Approx. Weight of cable	Kg/km				
9	Standard length of cable drum with tolerance	m				
10	Allowable conductor temperature at continuous current	ºC				

Sr. No	General Technical Particulars	UNITS	To Be Furnished by the Bidder			
11	Allowable conductor temperature during short circuit	ºC				
12	Max. DC resistance at 20ºC – Main	Ohm/km				
13	Max. AC resistance at max. Operating temp.	Ohm/km				
14	Guaranteed value of min oxygen index at 27ºC	%				
15	Guaranteed value of min. temp. index at 21 oxygen index	ºC				
16	Smoke Density Rating					

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in thisschedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature

Designation

PRE-WIRED GATEWAY PANEL

Specification

Contents

Prepared By	Checked By	Approved By
Anuj Lakra	Ganesh M. Mane	Anil Kumar Ojha

I. Scope

This specification covers the technical requirements of design, general requirements and system performance of Data Concentrator (Gateway) panel for Substation automation complete with all accessories. It is not the intent to specify completely herein all details of the equipments nevertheless the equipment shall be complete and operative in all respects and shall confirm to the highest standard of engineering, design and workmanship of International Standards/IEC. The scope also covers standard IO list for signals to be integrated with SCADA.

The Vendor shall be responsible for engineering and functioning of the complete system, meeting the Intent and requirement of this specification and data sheets. Bidder should depute project manager at site for monitoring and co-coordinating commissioning activity.

II. Applicable Standards

The design, manufacture and performance of the RTU System shall comply with all the requirements of the latest editions of international codes and standards applicable. Nothing in this specification shall be construed to relieve the Bidder of this responsibility.

Emissions Standards		
1	EN55011 (CISPR 11)	ISM RF Equipment – Electromagnetic Disturbance Characteristics
2	60255-25	Electromagnetic emission tests for measuring relays and protection equipment
3	61000-3-2:2000	EMC-Limits for harmonic current Emissions.
4	61000-3-3:1994+2001	EMC Limits-Limitations in voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.
Immunity Standards		
1	61000-4-2 1995-01 60255-22-2, IEEE C37.90.3	Electrostatic discharge (ESD) immunity test
2	61000-4-3 1998-11, 60255-22-3 IEEE C37.90.2 (10V/m)	Radiated, radio-frequency electromagnetic field immunity test
3	61000-4-4 1995-01 60255-22-4 IEEE C37.90.1	Electrical fast transient/burst immunity test
4	61000-4-5 1995-02	Surge immunity test
5	61000-4-6 1996-03	Immunity to conducted disturbances, induced by radio-frequency fields

6	60255-22-6	Electrical fast transient/burst immunity test
7	61000-4-81993-06	Immunity to power frequency magnetic fields
8	61000-4-12	Oscillatory waves immunity test
9	1995-05, 60255-22-1, IEEE C37.90.1	(Damped Oscillatory and Ring wave)
Safety		
1	61010-1	Harmonized Safety Standard
2	60255-5 2000-12	Insulation coordination for measuring relays and protection equipment- Requirements and tests
Power Supply Standards		
1	61000-4-11 1994-06	AC Power supply interruptions
2	61000-4-16 1998-01	Immunity to conducted, common mode disturbances.
3	61000-4-17	Ripple on D.C. power supply
4	61000-4-29+ 2000-08 60255-11	Voltage dips, short interruptions & voltage variations on D.C. input power port immunity test
Environmental Standards		
1	60068-2-1 1994-05	Environmental Testing Cold
2	600068-2-2 1974	Environmental Testing Dry Heat
3	60068-2-6 1995-03 60255-21-1	Environmental Testing Vibration tests (sinusoidal)
4	60068-2-27 1987	Environmental Testing Shock
5	60068-2-29 1987	Environmental Testing Bump
6	60068-2-30 1980	Environmental Damp Heat cyclic (12+12 hour cycle)
7	60068-2-31 1969	Environmental Testing Drop and Topple
8	60255-21-2	Shock and bump tests
9	IEC 61850-3	Substation Environment Requirement by DNV/CPRI
Communication Standards		
1	IEC 61850-5 to 10 IEEE 802.3 CSMA/CD	Substation Comm. Standard access method and physical layer specifications
Other Applicable Standards		
1	IS 9000	Basic Environmental testing procedure for electrical and electronic items
2	IS 694-1990	PVC insulated cables for working voltage up to and including 1100V
3	IS 2629-1985	Recommended practice for Hot Dip Galvanizing of iron & Steel.
4	IS 2633-1986	Test for uniformity of Zinc Coating
5	IEC 60529	Degrees of Protection provided by enclosures (IP Code)
6	IEC 62052-11	Electricity metering equipment (a.c.) – General requirements, tests & test conditions
7	IEC 62053-22	Static meter for active energy (Class 0.2S and 0.5S)

Prepared By	Checked By	Approved By
Anuj Lakra	Ganesh M. Mane	Anil Kumar Ojha

Product Conformance as per GoI Letter No. 12/34/2020-T&R dated 8th June 2021, Ministry's Order No. 25-17/6/2018-PG dated 2nd July 2020		
1	• IEC 60870-5-101 & IEC 60870-5-104, Security Conformance • IEC 62351-100-1: *Clause 5, Clause 6, Clause 7, Clause 8* • IEC 62351-100-3: *Clause 5, Clause 6, Clause 7* (IEC 62351-3:2014 / AMDI: 2018, Clause 7), • IEC TS 62351-5/IEC TS 60870-5-7	IEC 60870-5-7 Telecontrol equipment and Systems – Part 5-7; Transmission protocols – Security extensions to IEC 60870-5-101 and IEC 60870-5-104 protocol (Applying IEC 62351) IEC 60870-5-7 Security extension & IEC 62351 series (IEC 62351-100 parts 1 & 3) and other cross-referenced standards. IEC 61850 – 5, 6, 7, 8, 9, 10 Certificate of Common Criteria as per ISO/IEC 15408

Wherever, new standards and revisions are issued during the period of the contract, the Bidder shall attempt to comply with such standards, provided there is no additional financial implication to Purchaser.

In the event of the bidder offers to supply material and/or equipment in compliance to any standard other than those listed herein, the bidder shall include with their proposal, full salient characteristics of the new standard for comparison.

III. Climatic Condition

Sl. No.	Item Description	
1.0	**Maximum Altitude above Sea Level**	1000 mtr.
2.0	**Climatic Conditions**	
3.1	**Temperatures**	
(a)	Maximum Ambient Air Temperature	50 Degree C
(b)	Maximum Daily Average Ambient Air Temperature	35 Degree C
(c)	Minimum dry bulb temperature	10 Degree C
(d)	Design temperature for electrical equipment / devices	65 Degree C
3.2	**Relative humidity**	
(a)	**Maximum during monsoon**	100%
(b)	**Minimum during December**	22%
(c)	**Design humidity**	95%
3.3	**Rainfall**	Annual average rainfall is about 150 cm (most of which occurs during the monsoon season from June to September)

Prepared By	Checked By	Approved By
Anuj Lakra	Ganesh M. Mane	Anil Kumar Ojha

(a)	Average Number of Thunderstorm days per annum	70 (isokeraunic level)
(b)	Average Number of Rainy Days per Annum	120 days
4.4	**Wind Velocity:** 300 km/hr., 200 km/hr. and 160 km/hr. environmentally, some of the regions	
7.5	**Seismic conditions**	The proposed sites are in seismic zone III as per the Indian Standard IS 1893 and importance factor of 1.75
(a)	Earthquakes of an intensity in horizontal direction	Equivalent to seismic acceleration of 0.3 g
(b)	Earthquakes of an intensity in vertical direction	Equivalent to seismic acceleration of 0.15 g (g being acceleration due to gravity)
7.6	**Air Quality**	Atmosphere polluted with industrial gases and wastes because of proximity to industrial area.
8.0	**Auxiliary Power Supply**	
(a)	**AC supply**	230V, 1 phase, 2 wire, 50 Hz Substation supply with one lead earthed shall be provided Voltage variation ⍰ 10%, Frequency variation ⍰ 5% Combined voltage & frequency variation 10%
(b)	**DC Supply**	24V to 60 VDC +/- 20%, DC from the Sub Station DC System

IV. Gateway (Data Concentrator)

1. General Requirements:

1.1. The gateway shall be of the same family of BCU and BCPUs, an industrial grade system with high availability and reliability. However, if gateway is of not same family as of BCPU, interoperability should be taken care by OEM.

1.2. The gateway shall support simultaneous communications with minimum 08 Nos. independent remote master stations. Gateway to the Purchaser's SCADA Systems shall allow scanning and control of all defined points (Physical/Pseudo points) within the substation independently to each of the SCADA systems. The proposed system shall simultaneously respond to independent scans and commands from Purchaser's SCADA Systems. The system shall support use of a different communication data exchange rate (bits per second), scanning cycle, and/or communication protocol for each remote control center. Also, each control centre's data scan and control commands may be different for different data points

within the proposed system's database. Gateway shall have continuous self-supervision function with self-diagnostic feature.

1.3. The gateway CPU shall be redundant in hot standby mode with auto changeover. Vendor shall provide CPU, Power Supply and Communication redundancy in the same gateway rack. Purchaser's SCADA system is not having provision for configuration of multiple IP's for one station.

1.4. Separate communication modules shall be used for communicating to slave IEDs and to Purchaser's FEP/Master Systems.

1.5. It shall be capable to perform all functions for entire switchgear including future requirements. It shall use industrial grade components. Processor and RAM shall be selected in such a manner that during normal operation not more than 30% capacity of processing and memory are used. Vendor shall demonstrate these features.

1.6. Vendor should clearly inform to the purchaser about the no of IED supported by RTU and the same to be demonstrated at the time of I-FAT.

1.7. Gateway shall be preferably installed in a separate pre-wired panel. Vendor can accommodate communication equipment (e.g. switch etc) in this panel.

1.8. Gateway for remote control via industrial grade hardware (SCADA-ADMS) shall be through IEC 60870-5-104 protocol. It shall be the bidder's responsibility to integrate his offered system with Purchaser's SCADA-ADMS system for exchange of desired data.

1.9. It shall be possible to configure the protection system to include, in the protection scheme, future bays as and when they are added. In such cases, the system shall be easily extendable by adding bay units for the new bays and activating the same in the protection system. Such extension work shall not require any other wiring changes to the existing system.

1.10. RTU shall support Event storage capacity. Such events shall be stored in the basis of FIFO

1.11. RTU shall support web-based monitoring from remote as well as local.

1.12. RTU shall support feature of remote configuration as well as diagnosis.

1.13. Capability of time synchronization with GPS receiver and SCADA.

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2. Communication Ports:

2.1 The Gateway shall have following communication ports:

a) 4 nos. IN & OUT Fiber optic/copper ports for fault tolerant network communicating with IEDs using IEC 61850 protocols.

b) 8 nos. RS 232/485 configurable electrical Ports for communicating with WTI, OTI and battery charger on MODBUS protocol.

c) 4 nos. Independent IP ports for communicating with SCADA-ADMS system using IEC-104 protocol.

3. Protocols:

3.1 The communication protocol for gateway to control centre must be IEC 60870-5-104.

3.2 IEC 60870-5-103, IEC60870-5-101, MODBUS (RTU/TCP-IP), communication protocol shall also be available.

4. Networking equipment & accessories (Communication system)

4.1 The proposed Gateway shall communicate with redundant Master Control Room and Backup Control Room simultaneously; through a suitable Gateway over Fiber Optic IP Network at 100/1000 Mbps using IEC 60870-5-104 Protocol (as per availability of Fiber Point of presence), or on a GPRS wireless network. However, all communication equipment including but not limited to Gateways, Switches, Cables, Fiber Optic Cables, Fiber Optic Transmitters (FOTs) as necessary, Patch Cords, Connectors, Termination Boxes, Racks for mounting of communication equipment etc. as required at respective locations for connecting the vendor supplied equipment shall be the responsibility of the vendor. All switches & FOTs shall be of industrial grade. LAN cabling shall be structured.

4.2 Vendor should supply 2 nos. GPRS wireless modems with each gateway panel to establish the communication between gateway and Master. Purchaser will take care of SIM required to establish the connectivity.

4.3 Refer attached detailed specification for modem.

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4.4 GPRS Gateway should support multi NAT configuration.

4.5 The communication scheme from Gateway to Master shall be redundant with Auto-transfer to standby equipment when the corresponding main component fails. Each BCU/BCPUs shall have redundant IP Ports with independent addresses.

4.6 All communication devices, necessary cables, other interface modules and installation and commissioning shall be in the scope of Supplier/Vendor.

4.7 Vendor shall ensure that L2 switches and other communication equipment's used to establish the communication with proposed BCPUs/Gateways shall be of industrial grade IEC-61850 compliant and certified by renowned certification body. The use of switched Ethernet with priority tagging is required since this will meet the performance requirements of specific functions within the Sub-Station Automation system.

4.8 Vendor shall consider minimum 20% spare ports for the L2 switch to take care of the failure of the port.

4.9 Vendor shall provide minimum 2 nos. of L2 ethernet switches for ensuring redundancy

4.10 Vendor shall consider configuration of RTCC (remote tap changer controller), battery charger, fire alarms, and ACDB energy meter configuration in the scope of the project. And ensure availability of the hardware required for the same.

4.11 Communication panels for mounting switches and other networking accessories shall be supplied by bidder for each of the different locations within the same station.

4.12 If BCPU's are supplied with fiber port then fiber termination box (LIU) mounting arrangement should be considered in switchgear panel. If it cannot install and mount in switch gear panel then a separate box should consider by bidder.

4.13 Armored cable should be considered in case of underground communication cable laying, flexi conduit shall be considered in case of fiber lopping within the switch gear panel. Ex. BCPU to switch or BCPU to BCPU.

4.14 For all communication equipment's bidder shall take TPWODL's approval before finalizing the offer.

Equipment	Make
L2 Switches	Ruggedcom/ Garretcom / Hirschmann
UTP Patch Cords	Systimax / Tyco
Fiber Optic Patch Cords	Systimax / Tyco
Firewall and Router	Juniper / Cisco
Armored Fiber Optic Cables	Finolex / KEC
Armored CAT6 cables	Inside UTP shall be systimax
FOTEs	Moxa / Garretcom / Hirschmann

5. System Performance

5.1 System Performance Standards The system shall meet performance standards required to maintain real-time monitoring and control of the network.

5.2 System Response

a. The system shall meet the following response and resource utilization requirements: The system functions and associated databases shall be capable of accommodating at least a 50% increase in the delivered capacity without requiring regeneration, recompilation, or any processing other than definition of the database by TPWODL.

b. All Digital Inputs shall be reported with a resolution of 10 µs.

c. The system shall report correct Time Stamping when all process inputs scanning and processing is in progress and all the data is transmitted over a Main Data Bus every sec.

d. The worst loading condition shall include the following tasks:

- All processor inputs scanning and processing is in progress and all the data is transmitted over the main data bus every sec.
- All controls are in operation.
- Control / information request is initiated from all CRTs

6. Standard IO List

S.N.	Alarm Description as on SCADA	Type of info	Alarm Text (as in SCADA-DMS VALTAB)			
			00	01	10	11
1	Bus Isolator Position	DPI	Between	Open	Close	INVALID
2	Line Isolator Position	DPI	Between	Open	Close	INVALID
3	Panel master L/R switch	DPI		L/R SW ON LOCAL	L/R SW ON REMOTE	
4	Panel master L/R switch	SPI	L/R SW ON LOCAL	L/R SW ON REMOTE		
5	Breaker position indication	DPI	BETWEEN	BREAKER OPEN	BREAKER CLOSE	INVALID
6	BKR Test/service position	DPI	BETWEEN	CB TEST POSITION	BKR SERVICE POS	INVALID
7	Relay group setting status	DPI		RLY GRP.B SET	RLY GRP. A SET	
8	BCPU Logic-L/R	DPI	BCPU-L/R INACT.	BETWEEN	BCPU-L/R ACTIVE	INVALID
9	Bkr Trip circuit supervision-1	SPI	CB TRP CKT FAULT	CB TRP CKT HLTHY		
10	Bkr Trip circuit supervision-2	SPI	CB TRP CKT FAULT	CB TRP CKT HLTHY		
11	Bkr spring charge	SPI	CB SPRG DISCHRGD	CB SPRG CHARGED		
12	Relay local Alarm/LED Status	SPI	RLY RSTCMD-VR	RLY LED ACTVE-VR		
13	Master trip 86	SPI	MSTR TRIP 86 RST	MSTR TRIP 86OPTD		
14	A phase start	SPI	A-PH START RESET	A-PH START OPTD.		
15	B phase start	SPI	B-PH START RESET	B-PH START OPTD.		
16	C phase start	SPI	C-PH START RESET	C-PH START OPTD.		
17	Earth fault start	SPI	EARTH FAULT RST	EARTH FAULT OPTD		
18	51 O/C	SPI	51 POL RESET	51 POL		

				OPERATED		
19	50 O/C	SPI	50 POL RESET	50 POL OPERATED		
20	51N Earth fault	SPI	51 E. FAULT RST	51 E. FAULT OPTD		
21	50N Earth fault	SPI	50 E. FAULT RST	50 E. FAULT OPTD		
22	Breaker closing time	SPI	CB CLS TIME NRML	CB CLS TIME HIGH		
23	Breaker opening time	SPI	CB OPN TIME NRML	CB OPN TIME HIGH		
24	Breaker Contact Wear	SPI	CNTCT WEAR NRML	CNTCT WEAR ABNRM		
25	Relay communication status	SPI	RLY COMM. FAULTY	RLY COMM HEALTHY		
26	Cable/Line	SPI	CABLE BCKCHARGD	CABLE/Line DEAD		
27	TNC close	SPI	TNC CLOSE RESET	TNC CLOSE OPTD.		
28	TNC open	SPI	TNC OPEN RESET	TNC OPEN OPTD.		
29	46 Protection	SPI	Normal	Operated		
30	Earth Isolator Status	DPI	Open	Close		
31	Relay inter-trip	SPI	Normal	Operated		
1	Breaker Control	DCO				
2	Bus Isolator CMD	DCO				
3	Line Isolator CMD	DCO				
4	86 Master Trip Reset CMD	SCO				
5	Relay group setting change command	SCO				
6	Relay Alarm/LED reset command	SCO				
1	Fault Current A Phase	MFI				
2	Fault Current B Phase	MFI				

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3	Fault Current C Phase	MFI				
4	Fault Current N Phase	MFI				
5	R Phase Current	Floating				
6	Y Phase Current	Floating				
7	B Phase Current	Floating				
8	N Phase Current	Floating				
9	RY Phase Voltage	Floating				
10	YB Phase Voltage	Floating				
11	BR Phase Voltage	Floating				
12	3- Phase Real power	Floating				
13	3- Phase Reactive power	Floating				
14	3- Phase apparent power	Floating				
15	Frequency	Floating				
16	Power factor	Floating				
17	R phase current THD(total hormonic distortion)	Floating				
18	Y phase current THD(total hormonic distortion)	Floating				
19	B phase current THD(total hormonic distortion)	Floating				
20	Total Active Energy Import	Floating				
21	Total Reactive Energy Import	Floating				
22	Total Active Energy Export	Floating				
23	Total Reactive Energy Export	Floating				

7. RTU Enclosures:

Floor mounted enclosures conforming the IEC 529, with an index of protection (IP), IP55 with CANOPY in case of in open outdoor. RTU panel shall be provided with arrangement of housing RTU hardware, space for communication modems. The enclosure shall be fabricated using 2 mm thick CRCA for panel door, side top bottom cover using 2 mm thick CRCA, mounting plate 1.6 mm thick CRCA.

The dimension shall be suitable to accommodate RTU I/O modules, Power supply accessories, terminal blocks and communication modems. The front access door shall be hinged on cabinet with a common lock and key, locking arrangement should be special type of extra protection from theft. Removable type gland plates shall be provided at bottom of enclosure with required knock out holes. Provision of entry shall be kept for extending GSM modem antenna outside the enclosure.

7.1.1 All panels shall be supplied with 230 VAC, 50 Hz, single-phase switch and 15/5A duplex socket arrangement for maintenance.
7.1.2 All panels shall be provided with an internal maintenance lamp, and gaskets.
7.1.3 The safety ground shall be isolated from the signal ground and shall be connected to the ground network. Safety ground shall be a copper bus bar. The contractor shall connect the panel's safety ground of to the owner's grounding network.
7.1.4 There shall be no sharp corners or edges. All edges shall be rounded to prevent injury.
7.1.5 Droppable disconnecting type link should be used for AC and DC power source termination and it should mount on horizontal C channel.
7.1.6 Panel should be design such way that Replaceable accessories like Modems, RTU power supply card etc can easily removed from the panel.

8. Troubleshooting:

RTU shall have proper diagnosis tool for trouble shooting the failures related to the following from remotely as well as locally,

8.1.1.1 Communication of RTU with master
8.1.1.2 Communication of MFM with RTU.

9. Training:

Bidder shall give 50 man-day's on-site training on operation and configuration to TPWODL. This training to be conducted during the time of FAT.
RTU training course shall cover the following:

- RTU operation including data flow.
- Troubleshooting, identification and replacement of faulty Modules.

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- Preventive maintenance of the RTU
- Database modification and configuration of RTU
- Use of RTU configuration and Maintenance tool.
- All functional and Diagnostic testing of RTU

10. Documentation:

The bidder shall submit all the standard and customized RTU documents for review and approval which includes the following:

- RTU Function design document
- RTU Hardware description document & all the documents referred therein to meet all the clauses of the specification.
- RTU Test equipment user documents.
- RTU user guide
- RTU Operation & Maintenance document
- RTU Training documentation
- RTU database document
- RTU I/O list (as build) after the execution
- RTU Test procedures
- Data Requirement Sheet (DRS) of all items
- Protocol documentation including implementation profile etc.
- RTU installation and Layout, GA, BOQ, schematics and internal wiring drawings for each RTU site
- RTU to C&R panels/ field device cabling details for each RTU site
- RTU version and license should be a part of documentation. It is responsibility OEM to provide all licensed software for configuration of IEDs

11. Nameplate and Markings:

Nameplate showing all technical parameters shall be provided on all equipment's. "PROPERTY OF TPWODL" shall be suitably embossed on the nameplate.

- **Painting:**
  I. All paints shall be applied on clean, dry surfaces under suitable atmospheric and other conditions in accordance with the paint manufacturer's instructions. All paints used shall be compatible with each other and capable of being used as a system. The system shall be capable of performance for five years in the environment specified without any need for maintenance.
  II. Color Code:

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III. Exterior- SMN SIEMNES GRAY –RAL 7035(Texture)
IV. Interior- SMN SIEMENS GRAY – RAL 7035(Texture)
V. Paint thickness: 60-90 Microns
VI. No consecutive coats of paint shall be of the same shade.
VII. Minimum standards acceptable are cleaning by shot blasting to Grade As 2.5 of ISO 8501-1 and Al sheet steel surfaces shall be degreased, pickled and phosphate in accordance with IS 6005 - "Code of practice for phosphating of iron and steel."
VIII. Immediately following phosphating the surfaces shall be painted with two coats of high quality zinc chromate primer. All rough surfaces of coatings shall be filled with approved two pack filler and rubbed down to a smooth finish.
IX. Interior surfaces of terminal boxes, after preparation, cleaning and priming shall be painted with one coat of zinc chromate primer, one coat of phenolic based undercoating, followed by one coat of phenolic based finishing paint to white color followed by a final coat of anti-condensation white paint of a type and make to the approval of the Project Manager. A minimum overall paint film thickness of 150 microns shall be maintained throughout. The first coat of primer shall be applied on the same day, preferably within two hours of shot blasting.
X. Exterior steel surfaces and metalwork, after preparation and priming shall be painted with one coat of zinc chromate primer, one coat of phenolic based under coating and two coats of micaceous iron oxide paint, then painted with a final coat of phenolic based hard glass finishing paint of the light grey shade No 631 of IS 5, to provide an overall minimum paint thickness of 200 microns.

a. Galvanizing:

I. All galvanizing shall be carried out by the hot dip process, in accordance with Specification ISO: 1460 or IS: 2629. However, high tensile steel nuts, bolts and spring washers shall be electro - galvanized to service condition four. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.
II. Before pickling, all welding, drilling, cutting, grinding and other finishing operations must be completed and all grease, paint, varnish. Oil, welding slag and other foreign matters completely removed. All protuberances that would affect the life of galvanizing shall also be removed.
III. The weight of zinc deposited shall be in accordance with BS 729 and shall not be less than 0.61 kg/m2 with a minimum thickness of 86 microns for items of thickness more than 5 mm, 0.46 kg!m2 (64 microns) for items of thickness between 2 mm and 5 mm and 0.33 kg! 012 (47 microns) for items less than 2 mm thick.
IV. Parts shall not be galvanized if their shapes are such that the pickling solution cannot be removed with certainty or if galvanizing would be unsatisfactory or if their mechanical strength would be reduced.

V. In the event of damage to the galvanizing the method used for repair shall be subject to the approval of the Project Manager or that of his representative. Repair of galvanizing on site will generally not be permitted.

VI. The threads of all galvanized bolts and screwed rods shall be cleared of shelter by spinning or brushing. A die shall not be used for cleaning the threads unless specifically approved by the Project Manager. All nuts shall be galvanized. The threads of nuts shall be cleaned with a tap and the threads oiled. Partial immersion of the work shall not be permitted and the galvanizing tank must therefore be sufficiently large to permit galvanizing to be carried out by one immersion.

VII. After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing.

VIII. To avoid the formation of white rust, galvanized material shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

IX. The galvanized steel shall be subjected to tests as per IS-2633 and BS : 729.

12. Tests & Test Certificates:

RTU shall have been type tested as per latest IEC. The bidder shall submit Type test reports for RTU, Battery/ Battery charger.

The RTU's Shall have passed type tests carried out by government accredited labs and in accordance with IEC 255-4, 255-6, 801-2 and 801-3 to demonstrate that the RTU's comply with the ratings stated in these standard. As a minimum, certificates for the following type tests shall be furnished:

- Dielectric test
- Impulse Voltage withstand test
- High frequency disturbance test
- Thermal requirement test
- Mechanical requirement test
- Limiting dynamic value test
- Contact performance test
- Electromagnetic radiation susceptibility test
- Electrostatic discharge susceptibility test
- The RTU shall pass manufacture's standard routine test in accordance with the reference standard. In addition to the tests described in the IEC standard, the routine test and test reports of the FTU's shall include the following:
- Visual test to confirm that construction and sizing requirement have been met.

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- Rigorous testing of each input and output functions of the RTU's. This shall include the Fault detection and the disturbance data storage functions as well as the operation of the RTU time and the date facilities.
- Verification of the use of the RTU test equipment for maintenance and testing.
- Verification that RTU software and firmware support RTU sizing and expansion requirements.
- Verification of successful communication (i.e. protocols) all the required data rates.
- Testing of secure operation.

Verification of the ability to download parameter and configuration data from SCADA master station.
TPWODL reserves right to ask, type test certificate for any component used.

13. Pre-dispatch inspection:

During the course of manufacture, TPWODL's representative shall have the right to inspect the materials, workmanship, labour and the progress of manufacture of the equipment and may reject any material which is defective or unsuitable for the purpose intended of which is not in accordance with the intent of the specification. Supplier, upon demand by TPWODL shall remedy or replace such defective or unsuitable material. Supplier shall provide all reasonable inspection facilities to TPWODL Inspector. Supplier shall give sufficient notice of readiness for inspection of component parts and before final assembly and tests, so that the TPWODL representative may witness such final and acceptance tests before shipment. TPWODL representative may, at any time inspect and copy any or all test data. Material shall be dispatched after specific Material Dispatch Clearance Certificate is issued by TPWODL.
Factory acceptance test will be conducted in integrated way where all the signals will be tested from TPWODL control center as well as locally. Bidders has to be ready with complete configuration of RTU as well as BCPS at the time of FAT itself.

14. Inspection of material after receipt at store:

Material after receipt at TPWODL Store / site will be inspected by special team designated by TPWODL team.

15. Guarantee:

Supply of all equipment's and associated accessories shall be guaranteed for satisfactory performance for period of 60 months from the date of commissioning. In case of failure of equipment / part of equipment's during guarantee period it shall be replaced or repaired by supplier free of cost.

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16. Packing and Shipping:

I. **Packing:**

The equipment's are to be transported adequately sealed against water ingress, All accessories and spares shall be packed and securely clamped against movement in robust, wooden, non returnable packing cases to ensure safe transit in rough terrain, cross country road conditions and in heavy rains from the manufacturer's works to the specified destinations.

Equipment or material liable to deterioration by sea water, moisture, or ingress of foreign matter shall be totally sealed in strong polythene bags and those -liable to deterioration due to condensation shall be protected by packs of silica gel or other approved desiccant.

All accessories shall be carefully packed so that they are fully protected during transport and handling operations and in storage. Internal surfaces of loose accessories shall be sealed by means of gaskets and blanking off plates. All parts liable to rust shall receive an anti-rusting coat and shall be suitably protected. It shall be the responsibility of the Contractor to make good any damage caused through insufficient packing.

Each packing case shall be indelibly marked, on two adjacent sides and on the top, with the following,

- Individual serial number
- Purchaser's name
- Order number
- Destination (A color coded marking to indicate destination)
- Manufacturers /Suppliers name
- Name and address of Agent in Delhi
- Description and numbers of contents
- Country of origin
- Case measurements
- Gross and net weights in kilogram.
- Necessary slinging and stacking instructions.

Each crate or container shall be marked clearly on the outside of the case to show TOP and BOTTOM positions with appropriate signs to indicate where the mass is bearing and the correct positions for slings. All component parts, which are separately transported, shall have permanent identification marks to facilitate correct matching and assembly at site. Welded parts shall be marked before welding.

II. **Shipping:**

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The supplier shall be responsible for the shipping of equipment supplied from abroad to the ports of entry and for the transport of all goods to the various specified destinations including customs clearance, off-loading, warehousing and insurance.

The supplier shall inform himself fully as to all relevant transport facilities and requirements and loading gauges and ensure that the equipment as packed for transport shall conform to these limitations. The supplier shall also be responsible for verifying the access facilities specified.

The supplier shall be responsible for the transportation of all loads associated with the contract works and shall take all reasonable steps to prevent any highways or bridges from being damaged by his traffic and shall select routes, choose and use vehicles and restrict and distribute loads so that the risk of damage shall be avoided.

All transport accessories, such as riding lugs, jacking pads or blanking off plates shall become the property of the Purchaser.

All items of equipment shall be securely clamped against movement to ensure safe transit from the manufacturer's facilities to the specified work sites.

The supplier shall advise the storage requirements for any plant and equipment that may be delivered to the TPWODL. The supplier shall be required to accept responsibility for the advice given in so far as these arrangements may have a bearing on the behavior of the equipment in subsequent service.

III. **Hazardous Substances:**

The supplier shall submit safety data sheets in a form to be agreed for all hazardous substances used with the equipment. The supplier shall give an assurance that there are no other substances classified as hazardous in the equipment supplied and shall accept responsibility for the disposal of such hazardous substances, shall any be found.

17. Tender Sample:

Not applicable

18. Quality control:

Manufacturer shall have adequate Quality Control Facilities. Quality assurance plan & Field quality plan shall be submitted.

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19. Testing facilities:

Manufacturer shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

20. Manufacturing activities:

Separate sheet showing detail-manufacturing activities shall be submitted along-with bid.

21. Schedules of deviations:

The Bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the purchaser's specifications. (Format is attached)

22. Guaranteed Technical Particulars:

Bidder shall submit separate sheet showing guaranteed technical particulars.

23. Drawings, data and manuals:

To be submitted with bid.
Completely filled-in Technical Schedules.
General description of the equipment and all components including brochures
General arrangement drawings
Type Test Certificates
Experience List
Detail bill of material

To be submitted after the award of the contract:

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Sr. No.	Description	For Approval	For Review Information	Final Submission
1	Technical Schedules	√		√
2	General Arrangement drawings	√		√
3	Single Line Diagram	√		√
4	Installation Instructions		√	√
5	Instruction for Use		√	√
6	Transport/ Shipping dimension drawing		√	√
7	Foundation Plan & loading details		√	√
8	QA &QC Plan	√	√	√
9	Test Certificates	√	√	√

24. Sub-contractors:

The supplier shall ensure that any sub-contractors appointed by him under the Contract follow the Quality Assurance requirements of this specification. The supplier shall assess the sub-contractor's Quality Assurance arrangements prior to his appointment to ensure compliance with the appropriate ISO standard and the specification. Auditing of the sub-contractor's Quality Assurance arrangements shall be carried out by the supplier and recorded in such a manner that demonstrates to the TPWODL the extent of the audits and their effectiveness.

25. Special maintenance tools, tackles and spare parts:

The Bidder shall provide lists of recommended special maintenance tools, tackles and spare parts together with their individual prices for equipment to be supplied against this specification. This list shall identify all essential spares items for any recommended maintenance for a period of five years after commissioning.

The Bidder shall give an assurance that special maintenance tools & tackles and spares will continue to be available through the life of the equipment, which shall be 25 years minimum. However, the supplier shall give a minimum of 12 months notice in the event of plan to discontinue manufacture of any component used in this equipment.

Any special maintenance tools & tackles apparatus, parts or tools shall be subject to the same specification, tests and conditions as similar material supplied under the Contract. They shall be strictly interchangeable and suitable for use in place of the corresponding parts

supplied with the plant and must be suitably marked and numbered for identification.

Spanners and other maintenance equipment provided under this contract shall not be used for the purpose of erection.

26. Completeness of contract:

The bidder without extra charges, although not specifically mentioned herein, but necessary or useful for similar equipment and their efficient performance shall provide all fittings or accessories. The bid shall clearly indicate if any additional equipment or parts would be necessary to give a complete offer and if so the details and the prices shall be included in the bid.

V. Annexure #1

GTP for RTU

Sr. No.	Description	Offered
General		
1	SCOPE of work	
2	Applicable Standard	
3	Ambient Temperature	
RTU Functions		
4	RTU make	
5	Master Protocol	
6	Slave protocol	
7	Ethernet Interface Port and Data Rate	
8	Ethernet Port expandability	
9	Serial Interface Port and Data rate	
10	User configurability of the serial Port	
11	Max I/O tag handling capacity	
12	Local event storage capacity	
13	Retrieval of SOE	
14	Web based monitoring	
15	Feature of remote configuration as well as diagnosis	
16	Number of Multi master reporting possible with same ASDU	
17	Number of Multi master reporting possible with different ASDU	
18	Support to SNMP	
19	Automatic Startup after power failure	
Sr. No.	**Description**	**Offered**
20	Support SSL/VPN based security	
21	Support remote restart of RTU as well as Modem	
22	Support to Time Synchronization with GPS	

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23	Support to Time Synchronization with Master	
RTU Communication Ports		
24	No of Ethernet Interface Port	
25	No. of Serial Interface Port	
26	No. of configuration Port	
27	Configuration port type	
RTU Enclosure		
28	Panel Dimension [mm(H)*mm(W)*mm(D)]	
29	IP protection	
30	If External relays required, then Make, Type and rating of the relays	
31	Consideration of Plug type connector	
Communication Package		
Sr. No.	**Description**	**Offered**
32	Modem Type, Make	
33	No. of various Ports, Type	
34	Antenna length	
35	Rated Voltage	
36	No. of DNATs support	
37	Support to remote configuration and monitoring	
38	Support to monitoring of signal strength	
Troubleshooting		
39	Availability of diagnostic tool	
40	Failure of Communication of RTU to master	
41	Failure of Communication of RTU to DCDB	
Power Supply		
42	RTU power supply requirement	
43	Consideration of the power supply requirement for Modem.	
Sr. No.	**Description**	**Offered**
Training		

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44	No. of man-day's considered	
Test and Test certificates		
45	Compliance to type tests	
46	Consideration of FAT	
47	Location of FAT	
48	Consideration of SAT	
Material Delivery		
49	Duration for drawing approval	
50	Duration for Material delivery	
Guarantee		
51	Consideration of No. of months for Guarantee	

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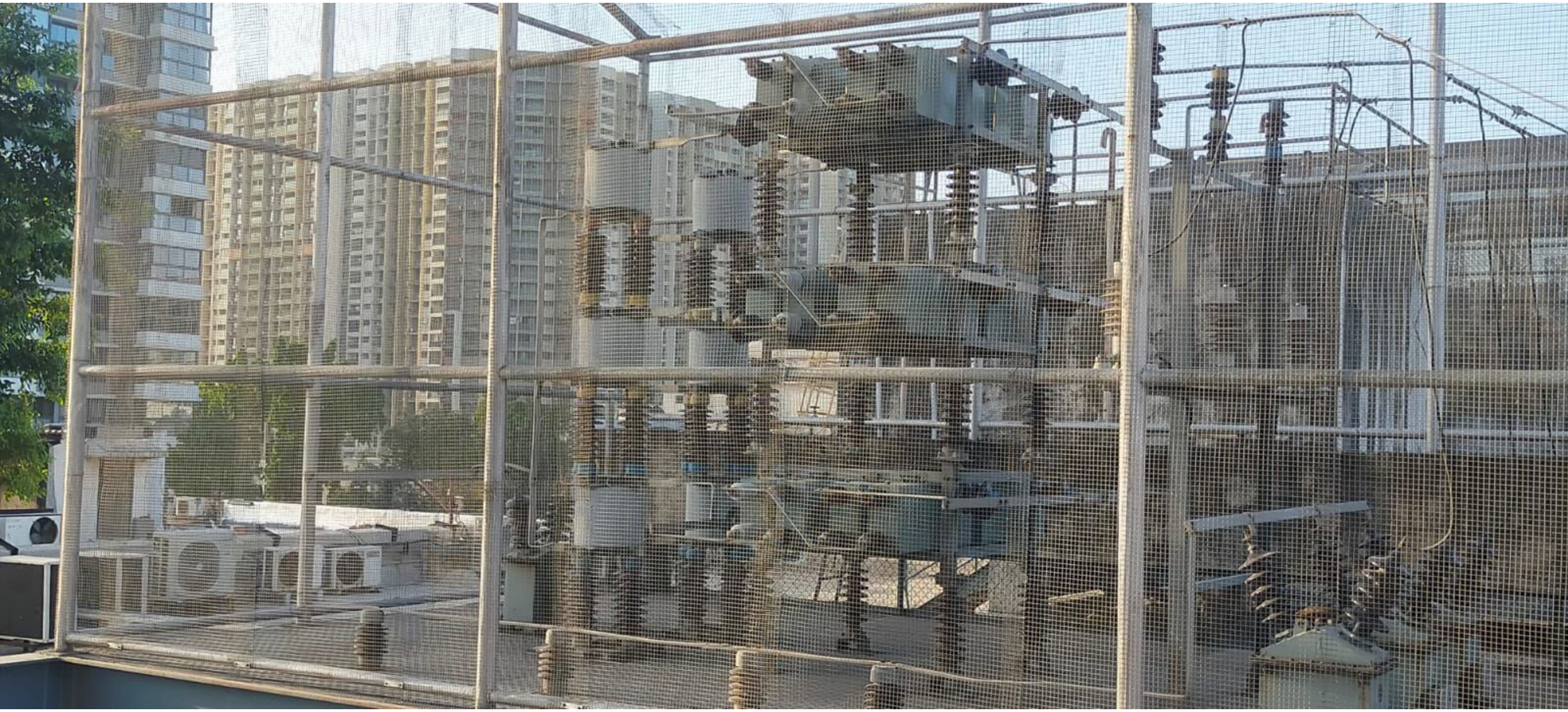
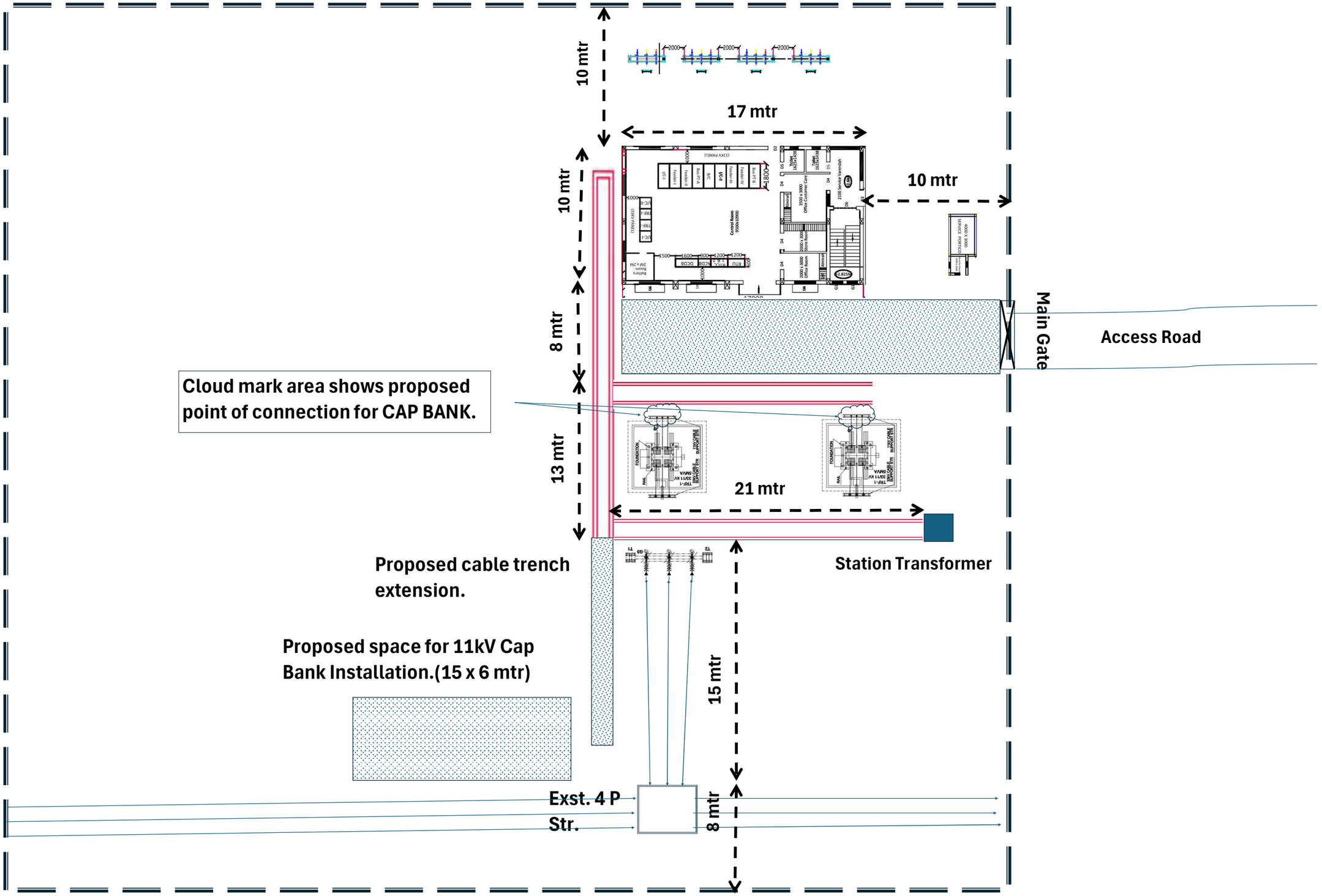
CAPACITOR
BANK # 1



INDICATIVE LAYOUT OF SALEBHATA PSS, BOLANGIR CIRCLE



ANNEXURE VIII

GENERAL CONDITIONS OF CONTRACT

(GCC-Composite)

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1.0 ORGANIZATIONAL VALUES

The Tata Group has always been a value driven organization. These values continue to direct the Group's growth and businesses. The Six core Tata Values underpinning the way we do business are:

Integrity - We must conduct our business fairly, with honesty and transparency. Everything we do must stand the test of public scrutiny.

Understanding - We must be caring, respectful, compassionate and humanitarian towards our colleagues and customers around the world and always work for the benefit of India.

Excellence - We must constantly strive to achieve the highest possible standards in our day to day work and in the quality of goods and services we provide.

Unity - We must work cohesively with our colleagues across the group and with our customers and partners around the world to build strong relationships based on tolerance, understanding and mutual co-operation.

Responsibility - We must continue to be responsible and sensitive to the countries, communities and environments in which we work, always ensuring that what comes from the people goes back to the people many times over.

Agility - We must work in a speedy and responsive manner and be proactive and innovative in our approach.

2.0 ETHICS

In our effort towards Excellence and in Management of Business Ethics at TPWODL, an Ethics Management Team is constituted.

The main objective of the Ethics Management Team is to:

1. Record, address and allay the issues and concerns on ethics raised by different stakeholders like employees, consumers, vendors, associates etc. by initiating immediate corrective actions.
2. Ensure proper communication of the ethics policies and guidelines through prominent displays at all offices of TPWODL and through printed declarations in all concerned documents where external stakeholders are involved.
3. Ensure proper framework of policies as preventive measures against any ethics violation recorded by them.
4. Prepare and submit MIS of all issues and concerns, corrective and preventive actions on monthly basis to the top management for their information.
5. All Associates and Stakeholders are requested to register any grievance on ethics violation on TPWODL website www.tpWesternodisha.com

3.0 CONTRACT PARAMETERS

3.1 Issue/Award of Contract

TPWODL awards the contract to the Associate in writing in the form of Purchase order or Rate Contract (RC) hereafter referred as Contract, through in any or all of following modes- physical handover / post / e-mail / web document / fax with all the attachments/enclosures which shall be part of the contract document

On receipt of the contract, the associate shall return to TPWODL copy of the contract document duly signed by legally authorized representative of associate, within two days of Effective Date of Contract for contracts having contract execution time less than 30 days and within five days for all other contracts.

3.2 Contract Commencement Date

The date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

3.3 Contract Completion Date

The date of expiry of Guarantee Period (detailed in section 12 of this document) shall be deemed as the Contract Completion Date.

3.4 Contract Period/Time

The period from Contract Commencement Date to Contract Completion Date shall be deemed as the Contract Period/Time.

3.5 Contract Execution Completion Date

The stipulated date for completing the execution of all items in the schedule of quantities (Supply, Service and or both as applicable) shall be deemed as the Contract Execution Completion Date.

3.6 Contract Execution Period/Time

The Period from Contract Commencement Date to Contract Execution Completion Date shall be the Contract Execution Period/Time**.** Timely Completion of Works/Timely Delivery of Materials is the essence of the contract. The period from effective date of contract to the date stipulated for completion of delivery of all items/completion of all the works/services, as per schedule of quantities of the contract is defined as contract execution completion time. The Delivery of Materials /The Completion of Works, as applicable, should be achieved in all respects as per schedules of quantities and all the terms and conditions of the contract, in the contract execution time.

Any revision/amendment in the originally stipulated contract execution time has to be approved by authorized representative of TPWODL.

3.7 Contract Price /Value

The total all inclusive price/value mentioned in the LOI/PO/RC of the contract document is the Contract Price/Value and is based on the quantity, unit rates and prices quoted and awarded and shall be subject to adjustment based on actual quantities supplied/actual measurement of work done and accepted and certified by the authorized representative of the company unless otherwise specified in schedule of quantities or in contract documents.

3.8 Contract Document

The Contract Document shall mean and include but not limited to the following:

- NIT/Tender Enquiry, QR, Instruction to Bidders, Special Condition of Contract (SCC) of tender, GCC, Technical & Commercial Specifications including relevant annexure and attachments).
- Bids & Proposals Received from Associate including relevant annexure/attachments.
- Letter of Intent (LOI/RC/PO) with agreed deviations from the tender/bid documents.
- All the Inspection and Test reports, Detailed Engineering Drawings.
- Material Dispatch Clearance Certificate (MDCC).
- Minutes of Meeting (MoM)

3.9 Contract Language

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

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

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

3.10 Reverse Auction

TPWODL reserves the right to conduct the reverse auction (instead of public opening of price bids) for the products / services being asked for in the tender. The terms and conditions for such reverse auction events shall be as per the Acceptance Form attached in Annexure J. The bidders along with the tender document shall mandatorily submit a duly signed copy of the Acceptance Form as mentioned in the Annexure J as a token of acceptance for the same.

Bid validity will stand get automatically extended from the date of latest Negotiation event i.e. Reverse Auction or Manual Negotiation and accordingly bid shall be valid further

i. For minimum 45 days if original bid validity duration is lesser than 45 days at latest negotiation date.
ii. For actual bid validity duration if original bid validity is more than 45 days at latest negotiation date.

4.0 SCOPE OF WORK

All the activities that are to be undertaken by the Associate to realize the contractual deliverables in completeness form Scope of Work. Following clauses list, but not limited to, major requirements of the scope of work.

The associate shall satisfy himself and undertake fully the technical/commercial requirements of items to be supplied as listed in the Schedule of Quantities together with the tests to be performed /test reports to be furnished before dispatch, arrangement of stage and final inspections during manufacturing as per terms and conditions of contract, technical parameters & delivery terms and conditions including transit insurance to be met in order to fully meet TPWODL’s requirements.

Completeness: Any supplies and services which might have not been specifically mentioned in the Contract but are necessary for the scope mentioned in Special Terms & Conditions and/or completeness of the works at the highest possible level, including any royalties, license fees & compensation to be paid, whether incurred by the associates or by a third party for the work covered in the scope, regardless of when incurred, shall be supplied/provided by the associate without any extra cost and within the time schedule for efficient , smooth and satisfactory operation and maintenance of the works at the highest possible level under Indian conditions (but according to international standards for facility of this type), unless expressly excluded from the scope of supplies and services in this Contract.

TPWODL have the right, during the performance of the Contract, to change the scope and/or technical character of the Project and/or of the supplies and services stipulated in the Contract by submitting a request in writing to the Associate. The Associate shall, within fifteen days of receipt of such request from the TPWODL, provide Purchaser with a reasonably detailed estimate of the cost of the change outlined in the request.

In the event, TPWODL requests a change, the Contract price and time shall be adjusted upwards or downwards, as the case may be and shall be mutually agreed to. The associate shall not be entitled to any extension of time unless such changes adversely affect the time schedule.

The Associate shall not proceed with the changes as requested till adjustment of contract price and time schedule where so applicable in terms of or otherwise directed by the TPWODL.

4.1 Indemnity

Associates shall undertake to fully indemnify TPWODL (also referred to as the Company in the GCC) against all kinds of liabilities or damages, of whatsoever nature, including compensation arising from any accident to the person or property of those in Associate's employment or to any other person or properties including those of TPWODL, arising due to reasons attributable to any, act, omission or negligence of the Associate the Associates, for the entire period of contract including period of guarantee.

Within 7 days of award of work, the Associates shall submit Indemnity Bond in the format as per Annexure-E to Order Issuing Authority.

Contract having value more than Rs 2 Cr per Annum, Associates shall submit Indemnity Bond on Rs 100/- Non Judicial Stamp Paper in the format as per Annexure- E to Order Issuing Authority.

4.2 Display of Notice Boards at Work Sites

The Associate shall put up display notice board at each project site where the works are in progress indicating the information given below:

- Name of the Project.
- Estimated Cost of Project.
- Date of Commencement.
- Expected date of completion.
- Name of Associate and his telephone number.
- Name of Engineer-in-Charge and his telephone number.

4.3 Disposal of Waste at Site

Significant quantities of waste are generated during the execution of project and an integrated approach for effective handling, storage, transportation and disposal of the same shall be adopted. This would ensure the minimization of environmental and social impact in order to combat the climate change.

The associates shall follow the below criteria for disposal of waste at site during the execution of project.

- Associate shall ensure that the detailed project plan include the waste management, segregation of all designated waste material (Recyclable/ Non-Recyclable), collecting, storing, disposing and transferring the same to pre-arranged facility/destination in timely and safe manner as per environmental legislations during the execution of project. The project plan shall also include the innovative construction practice to eliminate or minimize waste, protect surface/ground water, control dust and other emissions to air and control noise during the execution of project. The copy of same shall be given to EIC before the commencement of project.
- The purchase policy of BA shall encourage the procurement of material with recycled and minimum packaging of goods during delivery. Associate shall provide the appropriate means for site to site transportation of materials to avoid damage and litter generation.
- Associate shall educate and inform to its project team about the requirement and responsibilities for waste minimization and disposal in general and provide training of practices that support this. Waste management should be treated like a safety program.
- In the event that area of contaminated or biological hazard is identified, Associate shall ensure that plant, equipment, personnel and any activity associated with the work is carried out in consultation with EIC of TPWODL.
- Associate shall ensure that the residents living near the site are kept informed about proposed working schedule and shall informed timings and duration of any abnormal noise full activity that is likely to happen.
- Associate shall ensure the regular maintenance and monitoring of vehicles and equipment for efficient fuel use so that emissions and noise are within acceptable limits to avoid air pollution.

4.4 Deployment of Work Force

Associate shall deploy adequate labour as considered necessary by TPWODL for execution of the contract including Sundays and Holidays whenever required to do so with no extra cost to TPWODL. However, prior permission shall be taken from the site Engineer to carry out the work beyond normal working hours or on Sundays and Holidays. Female employees shall not be deployed beyond normal working hours/days and no child labour shall ever be deployed. Associate shall depute full time qualified and experienced engineers to supervise the work at site. All such staff shall be maintained from commencement to completion of all works to the entire satisfaction of the Engineer-in-Charge. Associate's employees deployed for the works under this contract will not be considered in Company's employment at any time. Associate shall continue to be responsible for all such employees, their safety, all types of statutory compliances related thereto and in any other manner whatsoever. The company

will stand indemnified by the Associate in respect of all the above. At the same time Company upon noticing any breach or default on any statutory compliances, may at their sole discretion, decide to act in a manner as deemed fit at the risks and costs of the Associate.

TPWODL shall have the right to instruct the Associate to change the Sub- Associates or skilled /unskilled workers in case the conduct, the workmanship or speed of the work is not satisfactory.

Associates shall submit duly signed undertaking regarding engagement of competent staff / employee commensurate to the nature of job to Engineer–in–charge in the format attached as Annexure – H.

4.5 Damages to Properties

The Associates shall take necessary steps to ensure that the equipment and installations of the Company, third parties, including other utility services like water supply pipelines; open drains telephone cables etc. are not damaged during execution of the works. The Associates shall be responsible for all such damages and shall have to repair/ replace and/or compensate for the entire claims in respect of such damages at its own cost.

4.6 Issuance of Material

The material issued to the Associate shall be in the custody of the Associates who shall be fully responsible for the same. After completion of the works, the Associates will reconcile the material. Any cost of material which is short or damaged/lost will be deducted from Associate bill/ deposits.

4.7 Company's Right To Use Works

If Taking Over Certificate is delayed for any reason, for which TPWODL's decision shall be final and binding upon the Associate, the Company shall be entitled to use the works or portion thereof without affecting Associate's responsibility and liability to complete the balance works as per company's directives from time to time, though Associate shall be afforded reasonable opportunity by the company to enable Associates to complete all balance works required for issuance of 'Taking Over Certificate' by the company.

4.8 Rights of TPWODL to vary the scope work

TPWODL shall have the right, during the performance of the Contract, to change the scope and/or technical character of the Project and/or of the supplies and services stipulated in the Contract by communicating the intent to do so in writing to the Associate. On receipt of such communication the Associate shall, within the time frame specified in the contract shall provide TPWODL with a reasonably detailed estimate of the cost of the change in scope outlined in the TPWODL communication. The change in the Contract price and time shall be revised upwards or downwards, as the case may be, and shall be mutually agreed to. The Associate shall not be entitled to any extension of time unless such changes adversely affect the time schedule.

The Associate shall not proceed with the changes in the scope of work till such time revision of Contract price and time schedule are approved and communicated to the associate by TPWODL.

Any change in the Scope of Work and/or Terms & Conditions of the order shall be intimated by TPWODL through an amendment to the contract. The amendment shall be treated valid only if signed by the authorized signatory of the original contract.

5.0 PRICES/ RATES/ TAXES

5.1 For Supply part of Contract

Unless specified elsewhere in the contract document, the prices/rates are inclusive of cost of finished product for which MDCC will be issued by TPWODL, packaging and forwarding charges, freight and transit insurance charges covering loading at Associate's works, transportation to TPWODL store/site & unloading & delivery at TPWODL stores/TPWODL site, cost of documentation including all the relevant test certificates and other supportive documents to be furnished.

The Prices/Rates are inclusive of all taxes, levies, cesses and duties, particularly Goods and Services Tax as applicable. All government levy / taxes shall be paid only when the invoice is submitted according to the relevant act.

The prices/rates shall remain firm till actual completion of entire supply of goods/material/equipment as per contract is achieved and shall remain valid till the completion of the contract.

The prices shall remain unchanged irrespective of TPWODL making changes in quantum in all or any of the schedules of items of contract.

5.2 For Service part of Contract

The Prices and Rates are inclusive of cost of materials supplied as per contract terms and for which MDCC is issued by TPWODL and to the extent required for completion of works, cost of service executed as per schedule of quantities, cost of testing as per contract terms, cost of documentations including all relevant test certificates and other supportive documents to be furnished as per contract terms. The rates shall remain firm till actual completion of contract.

The Prices/Rates are inclusive of all taxes, levies, cesses and duties, particularly Goods and Services Tax as applicable. All government levy / taxes shall be paid only when the invoice is submitted according to the relevant act.

The prices shall remain unchanged irrespective of TPWODL making changes in quantum in all or any of the schedules of items of contract.

5.3 Changes in Statutory Tax Structure

If rate of any or all of the statutory taxes and duties applicable to the contract changes, such changes shall be incorporated by default if the changes occur within the contract execution time and shall be applicable if the contract is executed by the Associate within the Contract Execution Time.

For execution of contracts beyond contract execution time, where the delay is not attributable to TPWODL no upward revision in tax /duties shall be considered irrespective of changes in the statutory tax structure either within the contract execution time or beyond. However, in such cases, benefits due to any downward revisions in statutory tax rates shall be passed on to TPWODL.

6.0 TERMS OF PAYMENT

A. 5% of the Release Order/ Purchase Order price shall be paid as initial interest free advance on fulfillment of the following by the Associate:

a) Acceptance of PO/ LOI.
b) Submission of advance payment BG of 15% of the Release Order/ Purchase Order price which shall remain valid till the advance is fully adjusted.
c) Submission of Contract Performance Bank Guarantee of 5/10% of the RC/ PO price valid till 30 days after taking over of the works.

B. 10% of the Release Order/ Purchase Order price shall be paid as interest free advance against approval of drawings under Category-1 of major drawings, Quality Plans, Pert Chart, Field Quality Plan, posting of Project Manager and commencement of the first mile stone of the work mutually agreed including C-3 Form, and submission of a true copy of 'Erection All Risk Insurance Policy' taken for the awarded jobs. The drawing list shall be mutually agreed at the time of award of work.

C. 50% on account payment of the total of item wise cost of material Release Order/ Purchase Order shall be paid against receipt of material at site in good condition and certification by TPWODL along with bills complete in all respects viz. MDCCs etc.

D. 20% on account payment of the actual executed value shall be paid against mechanical completion of erection on prorate basis against monthly bills and 70% on account of the actual executed value shall be paid against the service line item including composite line item. In case this milestone is not completed beyond 120 days for reasons attributable to TPWODL, the payment corresponding to supply part shall be released subject to submission of BG of equivalent amount by the BA valid for a period of further 12 months. If required, it shall be extended by the BA on request of TPWODL.

E. 15% payment of the actual executed Release Order/ Purchase Order shall be paid after completion of acceptance test and Taking Over of the complete systems specified in the enquiry, including clearance of Electrical Inspection, compliance of final punch point and after reconciliation & adjustment of payments, if any, towards Quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job. In case this milestone is not completed beyond 120 days beyond schedule for reasons attributable to TPWODL, the payment corresponding to supply part shall be released subject to submission of BG of equivalent amount by the BA valid for a period of further 12 months. If required, it shall be extended by the BA on request of TPWODL.

The Contractor shall submit all Operation & Maintenance manuals and "As Built Drawings" etc. and shall also submit Equipment Warranty Bank Guarantee (EWBG) equivalent to 5/10% of actual executed contract price before the release of this last payment and return of CPBG. The validity of EWBG shall be for a period of 15 months from the date of taking over of the works or specified guarantee period in drawing/tender/technical specification documents etc. whichever is later. The associate shall also submit 'No Demand Certificate' at the time of receipt of full and final payment.

6.1 Pre-Requisites for Payment

- Associate should have completed execution of that part of contract, for which payment is sought, to the satisfaction of TPWODL's Engineer-in-Charge responsible for the contract and obtained certification for execution of the work.
- Associate has undertaken joint measurement of the work executed along with TPWODL's Engineer-in-charge
- Associate's bills/invoices submitted have been certified by Engineer-In-Charge.

6.2 Bills & Invoices

Unless specified otherwise in the special conditions of contract, Associate shall raise not more than one invoice/contract per month for the services rendered in the prescribed Tax Format and the invoice shall be submitted within 15 days of the following month at Bill Inward Receipt Desk (BIRD) Receipt Desk / Invoice Desk / Office of CFO, TPWODL located at TPWODL Corporate Office, Burla,Sambalpur, Odisha, India – 760 004

All Bills shall be supported by joint measurement of work done, quality test report and a copy of wage sheet, if applicable (showing proof of having disbursed wages as per applicable law) and a copy of statement substantiating that statutory payments having been affected.

Bills/ invoices shall mention Associate's 'Sales, Service, WCT Tax Registration Number, PAN number as applicable.

Final bill submission after completion of project or execution of job must be within 30 days from the actual date of completion/execution of work awarded.

6.3 Payment & Statutory Deductions

Payment shall be released within 30 days from the submission of the bills. The associate shall submit "No Demand Certificate" in the format as per Annexure-D at the time of receipt of full and final payment. In case any non-compliance to contract conditions comes to TPWODL's notice, TPWODL will be entitled to deduct 30% of estimated wages plus 20% of wages as TPWODL's overheads. Associates would be obliged to provide the copy of monthly wage sheet in any case, failing which no payment shall be made. TPWODL at their sole discretion may deposit the PF etc. with statutory authorities. TPWODL will deduct the amounts of TDS as per statutory requirement under the income tax act and the DVAT Act and certificates (wherever applicable) will be issued to associate accordingly.

In case of non-submission of PAN No TDS @ 20% shall be deducted from all payable amounts for which no TDS certificate shall be issued. TDS once deducted as above shall not be revised in any condition.

6.3.1 Statutory Deductions

TPWODL will deduct the amounts of TDS, TCS as per statutory requirement under the income tax act, the Goods and Services tax act, BOCW Act, or any other applicable tax act and certificates (wherever applicable) will be issued to associate accordingly. For consumption of TPWODL's Water and Electricity by Associate for execution of Contract, Associate shall pay 0.5% & 1.0% respectively of contract value and it shall be deducted from the running bills. The Engineer-in-Charge as stated in the Order shall be responsible for certification of the work executed and the bills. Bills (including original) shall be submitted in

triplicate at Bill Inward Receipt Desk (BIRD) / Invoice Desk / Office of CFO, TPWODL located at TPWODL Corporate Office, Corporate Office, Burla-768017,Odisha,

6.4 Guidelines for Raising Running/Final Bills

Contract Value Up to 5 Lakhs	One Final Bill
Contract Value More than 5 lakhs	Monthly Running Bill & One Final Bill

All Bills shall be processed only when all bank Guarantees are in place and before payments of Final Bill Associate have to furnish NDC.

6.5 Quantity Variation

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

6.6 Full and Final Payment

Full & Final Payment in all contracts shall be made subject to the associate submitting “No Demand Certificate” in the format as per Annexure-D.

7.0 MODE OF PAYMENT

Payment shall be made through RTGS mode for which Business Associated shall submit the details of Bank Account and other details as per annexure K. Further, for any payments made, TPWODL is not responsible for any consequences/disputes Associate have among the owners channel partners, sub-Associates and all such dispute/concerns shall be settled solely by the Associate.

The quantities of items indicated are estimated and preliminary. However, payments shall be made on the basis of actual quantity of work carried out and measured jointly by the Company and the Associate. Associates shall be responsible to organize joint measurements of works with TPWODL Engineer-in-Charge before raising any bill of work done. In the event Associate fails to do so, TPWODL at their sole discretion, may take measurements of work done and proceed as deemed fit and in such an event Associate’s right to lodge any subsequent claim shall stand forfeited.

8.0 SECURITY CUM PERFORMANCE DEPOSIT

Associates shall submit within 15 days from the effective date of issue of PO/RC, Security cum Performance Guarantee (SPBG) in the format as per Annexure B of this document from banks acceptable to TPWODL for:

(a) 5% of the PO value if purchase order value is more than Rs 5 Crores.
(b) 10% of the PO value if purchase order value is less than Rs 5 Crores.
This shall remain valid till the end of the Guarantee Period of contract, plus one month.

(c) 5% of the RC value in case of Rate Contract. This shall remain valid till the Guarantee period plus one month.

- For PO/RC values less than Rs. 5 lacs, Associate may request for deduction of amount equivalent to SPBG value from their first invoice. Such amount shall be withheld by

TPWODL while processing the invoice and shall be released after completion of Guarantee Period plus one month.

- For PO/RC values less than Rs. 3 lacs, the clause (8.0) for Security cum Performance Bank Guarantee (SPBG) shall not be applicable.
- In case of RC (Rate Contract) after the expiry of RC validity, Associate shall have to submit SPBG. However, the Associate has the option to re-submit the SPBG as per actual RO (Release Order) value issued against the RC, valid for Guarantee Period plus one month. The Guarantee Period shall be considered as per the last RO issued against the said RC. The original SPBG as submitted against the RC shall be released on submission of the new SPBG to TPWODL. Alternatively, Associate may extend the validity of original SPBG only till the requisite period, i.e. Guarantee Period plus one month.

9.0 STATUTORY COMPLIANCE

9.1 Compliance to Various Acts

Associate should ensure adherence to all applicable laws, rules and regulation applicable under this contract from time to time. In case of violation any risk, costs etc shall be in associates account and keep TPWODL indemnified always till completion of contracts.

9.2 Social Accountability

TPWODL expects its Associates to follow guidelines of best practices on the following aspects

1. Child Labour
2. Forced or Compulsory Labour
3. Health & Safety
4. Freedom of Association & Right to Collective Bargaining
5. Discrimination
6. Disciplinary Practices
7. Working Hours
8. Remuneration
9. Management System

9.3 Affirmative Action

TPWODL appreciate and welcome the engagement/employment of persons from SC/ST community or any other deprived section of society by their business associates.

Relaxation in Contract Clauses under Affirmative Action for SC/ ST Business Associates**

TPWODL believes that inclusive growth is the key to sustainable development, and to promote the same Policy on Affirmative Action for Scheduled Caste & Scheduled Tribe Communities has been adopted across the company.

Under the same pre-text, and to promote entrepreneurship among SC/ST community TPWODL has taken initiative by proposing relaxations in contract clauses as per below:

S. No.	Initiative	for SC/ ST BA's	Guideline Document
1	Tender Fees	100% waiver for SC/ST community	All Open Tenders
2	Earnest Money Deposit	50 % relaxation of estimated EMD value	All limited and Open Tenders
3	Performance Bank Guarantee	25% relaxation in PBG for order value above 50 lacs else 50% relaxation	All limited and Open tenders
4	Turnover	25% relaxation in company turnover under qualifying requirement criteria	All Open Tenders

****Classification of BAs under SC/ST shall be governed under following guidelines:**

- Proprietorship/ Single Ownership Firm: Proprietor of the firm should be from SC/ST community. Governing document shall be duly audited balance Sheet for the last FY bearing the name of proprietor.
- Partnership Firm: Only such firms shall qualify which have SC/ST partners holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Partnership Deed and audited balance sheet/ ITR for last FY.
- Private limited company: Only such firms shall qualify which have SC/ST directors holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Memorandum of Understanding (MoU) and/or Article of Association (AoA).

Certification from SC/ST commission shall be required for deciding upon SC/ST status of a person.

9.4 MSME Development ACT 2006

Provisions for Firms falling in The Micro, Small and Medium Enterprise Development Act 2006:-

i. Business Associate is requested to inform the TPWODL if they fall under provisions of the Micro, Small and Medium Enterprises Development Act, 2006 legislation, and provide necessary documents to TPWODL. The Associate also needs to mention the relevant details on their invoice / bill.

iii. Business Associate shall submit the self-undertaking of registration in MSME category at the time of bidding as well as on an annual basis to TPWODL, enabling them to avail the consequent benefits, failing which TPWODL may take appropriate action against such defaults.

iv. Business Associates falling in MSME category are exempted from submitting the Tender Fee when participating in TPWODL tenders. Also they are eligible to submit concessional EMD at 50% of the EMD otherwise applicable.

9.5 Compliance to Labour Laws

Bidder needs to ensure compliance to applicable labour laws including timely disbursement of wages. In case wages are not disbursed as per the stipulated timelines, then TPWODL shall pay the wages to BA employees on behalf of BA. Apart from deducting the amount of wages paid, TPWODL shall deduct an additional service charge equivalent to 25% of the wages paid from the payment due to BA.

9.6 Compliance to Construction and Demolition Waste Management Rules & Environment (Protection) Amendment Rules

BA is liable to follow the Construction and Demolition Waste Management Rules- 2016, Environment (Protection) Amendment Rules- 2018 and Guidelines on dust mitigation measures in handling construction material and C&D wastes issued by CPCB.

Following are some main points of above Rules/Guidelines for Construction work, cable laying jobs etc.

1. Barricading to be provided at site to cover complete area.
2. Construction material and waste should be inside the closed area made by using barricading.
3. Water sprinkling/fine spray from nozzles to be done to suppress the dust.
4. The board of Dust mitigation measures shall be displayed at site for public viewing with required details.
5. Loose sand or soil and construction material that causes dust shall be covered.
6. Transport material that are easily wind borne need to be covered by a sheet made of either jute, tarpaulin, plastic or any other effective material.
7. All areas for storing C&D waste/construction material to be demarcated and preferably barricaded particularly those materials that have potential to be dust borne.
8. Grinding and cutting of building materials in open area shall be prohibited.
9. Construction material and waste should be stored only within earmarked area and roadside storage of construction material and waste shall be prohibited.
10. No uncovered vehicles carrying construction material and waste shall be permitted.
11. Construction and demolition waste processing and disposal site shall be identified and required dust mitigation measures to be notified at the site.

10.0 QUALITY

10.1 Knowledge of Requirements

The Associate shall be deemed to have carefully examined and to have knowledge of the equipment, the general and other conditions, specifications, schedules, drawings, etc. forming part of the Contract and also to have satisfied himself as to the nature and character of the work to be executed and the type of the equipment and duties required including wherever necessary of the site conditions and relevant matters and details. Any information thus procured or otherwise obtained from TPWODL/Consultants shall not in any way relieve the Associate from his responsibility and executing the works in accordance with the terms of contract.

10.2 Material/Equipment/Works Quality

The items / works under the scope of the Associate shall be of the best quality and workmanship according to the latest engineering practice and shall be manufactured from

materials of best quality considering strength and durability for their best performance and, in any case, in accordance with the specifications set forth in this Contract. All material shall be new. Substitution of specified material or variation from the process of fabrication/construction/manufacture may be permitted but only with the prior written approval of the TPWODL.

10.3 Adherence to Rules & Regulations

The Associate shall procure and/or fabricate/erect all materials and equipment in accordance with all requirements of Central and State enactment, rules and regulations governing such work in India and at site. This shall not be construed as relieving the Associate from complying with any requirement of TPWODL as enumerated in the Contract which may be more rigid than and not contrary to the above mentioned rules, nor providing such construction as may be required by the above mentioned rules and regulations. In case of variance of the Technical Specification from the laws, ordinance, rules and regulations governing the work, the Associate shall immediately notify the same to the TPWODL. It is the sole responsibility of the Associate, however, to determine that such variance exists. Wherever required by rules and regulations, the Associate shall also obtain the statutory authorities' approval for the plant, machinery and equipment to be supplied by the Associate.

10.4 Specifications and Standards

The Associate shall follow all codes and standards referred in the Contract Document. Codes and standards of other may be followed by the Associate with the prior written approval of TPWODL, provided materials, supplies and equipment according to the standard are equal to or better than the corresponding standards specified in the Contract.

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

11.0 SAFETY

All Associates shall strictly abide by the guidelines provided in TPWODL’s Contractor Safety Management System (CSMS) as applicable at all stages during the contract period. Associate shall execute the contracts ensuring the following in and as order of priority:

- Safety of Human Beings.
- Safety of equipment/Assets.
- Timely Completion of Contract.

Safety related requirements as mentioned in our Contractor Safety Management System is attached as annexure L and is an integral part of this GCC.

12.0 INSPECTION/PARTICIPATION

12.1 Right to Carry Out Inspection

TPWODL reserves the right to send its representatives for inspection or participation at various stages of contract execution listed below, applicable as per contract construction.

- During basic design and detail engineering of material/ Equipment carried out by Associate /Outsourced Agencies.
- During manufacturing stages of the product at Associate's/Associate's Outsourced Agency's Plant/Facility.
- During Pre-dispatch Inspection and Testing of finished/manufactured product at Associate's/Associate's outsourced Agency's Plant/Facility.
- During Installation & Commissioning Activities/Stages.
- Prior to Clearing of the completed installation for commissioning.
- Any other stage as find appropriate by TPWODL during contract execution time.

All inspections and participations shall be carried out within maximum of two weeks of TPWODL giving written intimation to the Associate or receiving appropriate advance written inspection call from the Associate, unless otherwise specified elsewhere in the contract document.

12.2 Facilitating Inspection

The Associate shall provide all opportunities and information to TPWODL's engineers to get acquainted with the technical know-how and the methods and practices adopted by the Associate in basic and detail engineering. The Associate shall provide documents, drawings, calculations etc. as may be required by TPWODL's Engineers.

The Associate shall provide free of charge office accommodation, office facilities, secretarial services, communication facilities, general and drawing office stationery, etc. as may be reasonably required by the TPWODL's engineers. Similarly, facilities shall also be provided by Associate's outsource agencies/partners/authorized dealers (collectively termed as sub-associates) if such basic and detail engineering activities are carried out in the design offices of sub-Associates.

The Associate shall be responsible for the safety of employees of TPWODL/Third Party Agency when they are at the Associate's /Associate's outsource agency's plant or facility for carrying out/witnessing inspection/testing. All statutory safety precautions as applicable shall be followed by the Associate during Inspection Testing. If TPWODL inspectors are not satisfied with the safety arrangements at the plant, TPWODL have the right to call off inspection till such time corrective action is taken by the Associate.

Before raising the call for pre-dispatch final inspection and testing, the Associate shall conduct all the tests—type tests, routine tests etc.-as specified in the contract document and submit copies of the test certificates to TPWODL along with the inspection call, for scrutiny of TPWODL.

The Associate and TPWODL shall jointly document all the observations, comments and action points after completion of inspection and it shall be binding on the Associate to

provide compliance on all the points requiring compliance and furnish the compliance report to the designated authority of TPWODL for receiving clearance for dispatch of materials.

12.3 Third Party Nomination

TPWODL also may nominate a third party for the purpose of carrying out the inspection and such an agency shall be entitled to all the rights and privileges of TPWODL as far as conducting the inspection.

12.4 Waiver of Inspections

TPWODL on its own discretion shall chose to waive off any inspection and ask the Associate to submit all the test reports as applicable as per contract specifications, related to inspection and testing of the goods ordered for scrutiny and clearance for dispatch.

12.5 Incorrect Inspection Call

In case it is observed that the material offered for inspection is not ready at the time of TPWODL inspection visit rendering it as futile, all costs towards such inspection shall be recovered from the BA. Taxes as applicable on such recoveries shall be borne by the BA.

13.0 MDCC & DELIVERY OF MATERIALS

13.1 Material Dispatch Clearance Certificate

Associate shall deliver material/goods/equipment against Supply Contracts or Supply Part of Composite/Service Contracts only after receiving Material Dispatch Clearance Certificate (hereafter termed as MDCC) issued by designated authority of TPWODL. Material delivered at TPWODL stores or at project site without a valid MDCC issued by the designated official of TPWODL shall be rejected. MDCC shall be issued to associate furnishing compliance report on the action points documented during pre-dispatch inspection and testing at Associate's/ Sub-Associate's plant/ facility. In case Pre-dispatch inspection is waived at the discretion of TPWODL, then, MDCC shall be issued on receiving all the test reports-routine& type-from the Associate and finding them in order.

The associate shall include and provide for securely protecting and packing the materials so as to avoid loss or damage during handling and transport by air, sea, rail and road or any other means.

All such packing shall allow to the extent possible for easy removal and checking at Site. The associate shall take special precautions to prevent rusting of steel and iron parts during transit by sea. Gas seals or other materials shall be utilized by the associate for protection against moisture during transit of all Plant and Equipment.

Each Equipment or parts of Equipment shall be tagged with reference to the assembly drawings and corresponding part numbers. Each bale or package shall contain a packing note quoting specifically the name of the associate, item description, quantity, item / package identification.

All packing cases, containers, packing and other similar materials shall be new and supplied free by the associate and it shall not be required to be returned to the associate.

Notwithstanding anything stated in this clause, the associate shall be entirely responsible for loss, damage or depreciation or deterioration to the materials and supplies due to faulty

and/or insecure packing or otherwise during transportation to the Site until otherwise provided herein.

In case of the consignments dispatched by road, the associate shall ensure that it or its sub-contractors:

i) Identify and obtain the correct type of trucks/trailers, keeping in view the nature of consignments to be dispatched.

ii) Take such actions as may be necessary to avoid all possible chances of damages during transit and to ensure that all packages are firmly secured.

Timelines for inspection and MDCC is as below:

S. No.	Inspection	MDCC issuance time including inspection time (max.)
1	Outside Sambalpur	12 days
2	Within Sambalpur	5 days
3	Waiver*	3 working days

* Associate is expected to raise the inspection call assuming that Inspection shall be carried out by TPWODL. The decision for waiver of inspection shall be on sole discretion of TPWODL.

13.2 Right to Rejection on Receipt

Goods/Material/Equipment delivered in condition physically damaged & incomplete as a product ordered, or not packed and transported as per the terms and conditions of the contract is liable to be rejected. Such item shall be lifted back by Associates within 15 days from receipt of rejection note from TPWODL and have to supply back the material within next 30 days or within the timeframe mutually decided by Associate and TPWODL.

If delivery of the material is beyond the agreed time, Liquidated damage clause, mentioned in this GCC separately shall be applicable; but the period for levy of LD shall be considered as per the original delivery schedule and not from the agreed timelines for material rectification.

13.3 Consignee

Unless otherwise specified in the Contract Document / Purchase Order/ Release Order, Materials/Goods/Equipment shall be consigned to “Stores-In-Charge”, TPWODL Sambalpur

13.4 Submission of mandatory documents on Delivery

Following documents shall be mandatorily submitted by BA along with supply of material to TPWODL stores/site:

S. No.	Documents	Requisite
1	Invoice copy in original	With all consignments
2	LR copy	Wherever required
3	Packing list	With all consignments
4	MDCC	With all consignments
5	Purchase order / Release order	Signed copy

6	Test certificates	With all consignments
7	Inspection/JVR report	In case pre-dispatch inspection is conducted
8	Device data in CD as per template for metering items	Wherever applicable

13.5 Dispatch and Delivery Instructions

S. No.	Instructions
1	Purchase order/ Release order no. shall be mentioned on invoice and on material
2	TPWODL material code and material description shall be mentioned in invoice and on material.
3	"Property of TPWODL" shall be embossed on material.
4	The material shall be properly sealed and packed in standard packing as per purchase order terms & conditions.
5	The weight and quantity of material shall be mentioned wherever applicable
6	The material supplied shall be co-related with the packing list.
7	The name plate detail on equipment shall include Material code, Material description, specification detail of material [as applicable], Serial No. Year of manufacturing, PO/RO no. and date, "PROPERTY OF TPWODL, Sambalpur", Guarantee period and Associate's name.
8	In case of manual unloading, supplier / transporter shall deploy sufficient Labour for unloading the material at TPWODL Western store. For heavy item(s), crane will be provided by TPWODL [unloading cost will be recovered from the associate].
9	The driver should have valid License and one helper in truck. All the documents of truck like registration papers, PUC etc. should be available in Truck.
10	BA representative should accompany the material and get it unloaded / stacked in his presence wherever possible.

14.0 GUARANTEE

14.1 Guarantee of Performance

Associates 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 (as elaborated elsewhere in this clause) The Associate 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.

14.2 Guarantee Period

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Standard Specifications of TPWODL for the equipment/material/service/work and where standard specifications are not part of contract documents or guarantee period is not specified in the standard 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 standard specifications or SCC, Guarantee Period will be 15 Months from the Date of

Commissioning or 24 months from the date of delivery of final lot of supplies made, whichever is earlier.

14.3 Failure in Guarantee Period (GP)

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 associate is liable to undertake repair/rectify/replace the equipment and material supplied/service or work rendered under the contract within time frame specified in the SCC or elsewhere in the contract documents at associate'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 Associate fails to repair/rectify/replace the equipment or material supplied/service or work rendered under the contract, failed in Guarantee Period, TPWODL will be at liberty to get the same done at Associate's risks and costs and recover all such expenses plus the TPWODL's own charges (@ 20% of expenses incurred), from the Associate or from the "Security cum Performance Deposit" 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.

Any repairs during the Guarantee Period shall be carried out by the Associate within 30 days of reporting the issue to Associate by TPWODL. However, if replacement of the Equipment is required, Associate shall notify the same to TPWODL within 7 days of reporting the issue by TPWODL. Thereafter, the total time for supply of new equipment/ material shall be equal to the original delivery period of that equipment/ material as specified in the Contract. In case the Associate is not able to rectify/ replace the faulty equipment/ material within the stipulated timelines as mentioned above, penalty shall be levied as per the Liquidated Damages clause mentioned in this document. The penalty amount shall be recovered from the payment due to the vendor or by encashment of the SPBG as the case may be.

14.4 Cost of repairs on failure in GP

The cost of repairs/rectification /replacement, apart from the actual cost of repairs/rectification/replacement is also inclusive of all associate costs of required transportation, site inspection /mobilization/dismantling and re-installation costs as applicable, to be borne by the Associate. The Associate 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.

14.5 Guarantee period for Goods Outsourced

If the Associate outsources partly equipment/materials/services from third party as mutually agreed upon at the pre award stage of contract, TPWODL shall have the benefit of any additional guarantee period if provided by the third party for the part supplied/executed by them.

14.6 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. Associates shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Company.

14.7 Support beyond the Guarantee Period

The Associate shall ensure availability of spares and necessary support for a period of at least 10 years post completion of guarantee period of equipment supplied against the contract.

15.0 LIQUIDATED DAMAGES

Liquidated damages @1% of the total executed contract value per week or part thereof, for the period of delay in integrated completion, subject to maximum 10% of the value of the contract shall become leviable without prejudice to other rights of the TPWODL. This amount shall be recoverable from any amount due or becoming due to the Business Associates under this or any other contract. In specific cases, TPWODL reserves the right to apply LD only on the unexecuted portion of the supply and works for standalone use, provided full quantity is executed within a maximum 30% additional time. Deduction of LD shall be on landed cost i.e. contract value inclusive of taxes and in pursuant statutory compliance GST would be applicable at the stipulated rate and the same shall be borne by Business Associate. In case of LD deduction, a GST invoice shall be issued by TPWODL as a proof of deduction/ recovery.

15.1 LD Waiver Request

Any request of LD waiver shall be submitted within thirty (30) days of deducting LD. Request submitted beyond the timeline shall not be entertained.

15.2 Material Recovery

In case of any recoveries for materials or services (for material free issued by TPWODL and not reconciled by BA or for services claimed and paid in excess at the time of running bills), the total cost which shall be recovered from the BA, shall be the gross amount of material or services (i.e. including taxes) plus applicable taxes as prevailing at the time of such recoveries.

16.0 ASSIGNMENT OR SUBCONTRACTING

Associates shall not assign/subcontract/outsource the schedule of activities of contract TPWODL enters with the associate, in part or full, without TPWODL's prior written approval. However, outsourcing of materials/equipment/services by Associate to make the integrated product for which TPWODL's has placed the contract with the associate from suppliers, makes and agencies which have been mutually agreed upon during contract pre-award stage is permitted subject to following conditions.

In such cases where outsourcing is done by the Associate

- Shall ensure that outsourced suppliers comply with the technical and financial qualification requirements specified by TPWODL in the contract document
- Shall furnish all particulars about the proposed outsourcing agencies and the details of the goods/services/work outsourced to the Associate while seeking approval of

TPWODL for inclusion for outsourcing. The Associate shall give approval or shall refuse approval in writing within thirty (30) days of receipt of such request. However, the Associate shall not be entitled for any additional contract execution time whatsoever in lieu of the process for approval for outsourcing agencies and shall be held responsible for any delay in the project execution time.

- Shall remain jointly and severally liable for any action, deficiency, and/or negligence on the part of his outsourcing agencies. The approval extended by the Associate to outsourcing agencies recommended by the Associate shall not discharge the later from his Contract obligations.

Shall submit to the Associate unpriced copies of purchase orders with technical specifications included in the orders, placed on outsourcing agencies as soon as the respective orders have been placed by the Associate.

17.0 UNLAWFUL ACTIVITIES

The Associate shall have to ensure that none of its employees are engaged in any unlawful activities (whether covered under the scope of the present GCC or not) subversive of the TPWODL's interest failing which appropriate action (legal or otherwise) may be taken against the Associate by the TPWODL, in accordance with the terms of the present GCC.

18.0 CONFIDENTIALITY

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

18.1 Documents

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

18.2 Geographical Data

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

18.3 Associate's Processes

Title to secret processes if any developed by the Associate on an exclusive basis and employed in the design of the equipment shall remain with the Associate. TPWODL shall hold in confidence such processes and shall not disclose such processes to the third parties without prior approval of the Associate and execution by such third parties of secrecy agreements satisfactory to the Associate prior to disclosure. Upon completion of contract, such processes shall become the property of the TPWODL. Title to technical specifications, drawings, flow sheets, norms, calculations, diagrams, interpretations of test results, schematics, layouts and such other information, which the Associate has supplied to the TPWODL under the Contract shall be passed on to the TPWODL. The TPWODL shall have the right to use these for construction, erection, start-up, Trial Run, operation, maintenance, modifications and/or expansion of the works including for the manufacture of spare parts.

18.4 Exclusions

The provision of Clauses 16.1 to 16.3 shall not apply to information:

- Which at the time of disclosure are in the public domain which later on become part of public domain through no fault of the party concerned, or
- Which were in the possession of the party concerned prior to disclosure to him by the other party, or
- Which were received by the party concerned after the time of disclosure without restriction on disclosure or use, from a third party who did not acquire such information directly or indirectly from the other party or has no obligation of confidentiality for such information.

18.5 Violation

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

19.0 INTELLECTUAL PROPERTY RIGHTS

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

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

20.0 INDEMNITY

The Associate shall at all times indemnify, keep indemnified and hold harmless the TPWODL and its officers, directors, employees, affiliates, agents, successors and assigns against all actions, claims, demands, costs, charges and expenses arising from or incurred by reason of any infringement of patent, trade mark, registered design, copy rights and/or industrial property rights by manufacture, sale or use of the equipment supplied by the Associate whether or not the TPWODL is held liable for by any court judgement. In this connection, the TPWODL shall pass on all claims made against him to the Associate for settlement.

The Associate assumes responsibility for and shall indemnify and save harmless the TPWODL from all liability, claims, costs, expenses, taxes and assessments including penalties, punitive damages, attorney's fees and court costs which are or may be required to be paid by the TPWODL and its officers, directors, employees, affiliates, agents, successors and assigns arising from any breach of the Associate's obligations under the Contract or for which the Associate has assumed responsibilities under the Contract including those imposed under any local or national law or laws, or in respect to all salaries, wages or other compensation for all persons employed by the Associate or his Sub-Associates or suppliers in connection with the performance of any work covered by the Contract. The Associate shall execute, deliver and shall cause his Sub-Associate and suppliers to execute and deliver, such other further instruments and to comply with all the requirements of such laws and regulation as may be necessary there under to conform and effectuate the Contract and to protect the TPWODL.

The TPWODL shall not be held responsible for any accident or damages incurred or claims arising, due to the Associate's error there from prior to completion of work. The Associate shall be liable for such accidents and after completion of work for such accidents as the case may be due to negligence on his part to carry out Work in accordance with Indian laws and regulations and the specifications set forth herein.

21.0 LIABILITY & LIMITATIONS

21.1 Liability

Except for any specific liability which may be identified in the Contract and which may be payable hereunder, Associate shall not be liable for any special, incidental, indirect, or consequential Damages or any loss of business Contracts, revenues or other financial loss (or equivalents thereof no matter how claimed, computed or characterized) arising out of or in connection with the Performance of the Work or supply of Goods ***unless caused by Associate's negligence, willful misconduct or breach of contract.***

TPWODL shall have no liability or any special, incidental, indirect or consequential Damages for any loss of Business Contracts, revenues or other financial loss arising out of this Contract.

21.2 Limitation of Liability

The total liability of Associate against any contract shall be limited to the Total All Inclusive Contract Value.

22.0 FORCE MAJEURE

Force Majeure applies if the performance by either Party ("the Affected Party") of its obligations under Contract is materially and adversely affected.

"Force Majeure" shall mean any event or circumstance or combination of events or circumstances referred below and their consequences that wholly or partly prevents or unavoidably delays any Party in the performance of its obligations under this Agreement, but only and to the extent that such events and circumstances are not within the reasonable control, directly or indirectly, of the Affected Party and could not have been avoided even if the Affected Party had taken reasonable care:

- Act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, embargo, blockade, revolution, riot, bombs, religious strife or civil commotion, etc.
- Politically motivated sabotage, or terrorism, etc.
- Action or Act of Government or Governmental agency for which remedy is beyond the control of the affected parties.
- Any act of God.

Note: Causes like power breakdown/ shortages/fire/strikes, accidents etc. do not fall under Force Majeure.

Time being the essence of the Contract, if either party is prevented from the performance of its obligations in whole or in part due to an event of Force Majeure, then provided Notice of happening of any event by the Affected Party is given to the other party within seven (7) days from the date of occurrence of such event, which DIRECTLY has impact on works and submitted details and quantum of resulting effect, but at the same time had made all possible efforts to mitigate and overcome effects thereof, the Affected Party's performance under this Contract shall be suspended until such event ceases and the Scheduled Completion shall be delayed accordingly.

If Force Majeure event(s) continue for a period of more than three months, the parties shall hold consultation to discuss the further course of action.

Neither party shall be considered to be in default or in breach of its obligation under the Contract to the extent that performance of such obligation by either party is prevented by any circumstances of Force Majeure which arise after effective date of Contract.

Neither party can claim any compensation from the other party on account of Force Majeure.

23.0 SUSPENSION Of CONTRACT

23.1 Suspension for Convenience

TPWODL may, at any time and at its sole option, suspend execution of all or any portions of the schedule of items of contract to be supplied/work to executed by Associate under the contract by providing to the Associate at least two business days written notice for contracts having contract completion period less than sixty days and at least seven business days' notice for all other contracts.

Upon receipt of any such notice, the Associate shall respond as follows as applicable as per contract construction.

- Immediately discontinue further supply of material/goods specified in the suspension notice for supply contracts

- Immediately discontinue further service/work and supply of materials of those services/materials/work specified in the suspension notice for service /composite contract
- Promptly make every reasonable effort to obtain suspension, upon terms satisfactory to TPWODL, of all orders, outsourcing arrangements, and rental Contracts to the extent that they relate to performance of the portion of Work suspended by the notice.
- Protect and maintain the portion of the service/Work already completed, including the portion of the Work suspended hereunder, unless otherwise specifically stated in the notice.
- Continue delivering/carrying out the supply/service/work items as per contract conditions, which do not fall under purview of the suspension notice.

On receipt of resumption notice from TPWODL, the Associate shall resume execution of contract as specified in the resumption notice, within the time frame specified in the resumption notice,

23.2 Suspension for Breach of Contract conditions.

TPWODL shall suspend execution of whole/or part thereof the contract till such time Associate complies with the conditions stipulated under section clause 27 for breach/default of contract conditions.

23.3 Compensation in lieu of Suspension

If the suspension of the contract in whole or in part is for convenience of TPWODL and not due to any breach of contract conditions by the associate, TPWODL at its discretion shall consider compensating all reasonable additional costs incurred by Associate in lieu of suspension of whole or part of contract, on representation of the Associate providing justified estimates of such additional costs and such estimates are found acceptable and approved by competent authority of TPWODL.

If the suspension of contract in whole or part thereof is due to breach of contract conditions (refer clause 24.3) by the Associate, Associate shall not be entitled for any compensation for any cost incurred in lieu of suspension of whole or part of contract and also shall be liable for compensating all the losses arising to TPWODL in lieu of suspension of contract. Resumption notice shall be subject to the Associate taking corrective action for the breach of contract conditions within the time frame and as per the terms specified in the suspension notice.

24 TERMINATION OF CONTRACTS

24.1 Termination for Default/Breach of Contract

The contract / PO shall be subject to termination by TPWODL in case of breach of the contract by the Associate which shall include but not be limited to the following:

a. Withdrawal or intimation by the Associate of its intent to withdraw or surrender the execution / completion of the contracted work /PO or failure in ensuring adherence to any delivery schedules, in deviation of the contract/ PO.

b. Refusal or neglect on the part of the Associate to supply material/equipment of quantity or quality as specified by TPWODL and within the timeframe as specified in the contract document or refusal or neglect to execute the services/work in terms of the agreed standards of quantity or quality and/or within the timeframe specified in the contract/PO.

c. Failure in any respect to perform any portion of the Work contracted with promptness, diligence, or in accordance with the terms of the contract.

d. Failure to furnish guarantees as specified and /or failure to comply with the terms thereof.

e. Failure to furnish such relevant documents or information within the time specified which may be necessary for due execution / completion of the works and documentation.

f. Liquidation, bankruptcy either voluntary or involuntary OR entering into any composition or compromise with its creditors, or Insolvency.

g. In case any reasonable information has been received by TPWODL that Associate has adopted/ or attempted to adopt any unethical conduct, action in award of the contract /PO or at any time thereafter.

h. Failure to comply with applicable statutory provisions as contained in the contract or failure to comply with the applicable laws.

i. Failure to comply with safety regulations/clauses stipulated in the contract or as may be generally instructed by TPWODL.

If the default or breach as specified under clause 24 (except sub clause g thereof) be committed by the associate for the first time, TPWODL shall issue, along the with notice of default or breach, a warning notice instructing the associate to take remedial/corrective action within the time frame stipulated in the warning notice and not to repeat the same in future. The timeframe for corrective action by the associate shall be specific to the nature of breach of contract and the same shall not be objected to by the Associate. If the Associate fails to comply with the instructions in the warning notice or in taking corrective action to the satisfaction of TPWODL then TPWODL may terminate the entire or part of contract at its discretion by issuing termination notice without incurring any liability on this ground.

In case the contract is terminated for any breach of the nature specified in clause 24 g stated above, TPWODL shall have the right to terminate all the contracts TPWODL is having with the Associate by issuing termination notice which shall be without prejudice to the other rights of TPWODL available to it under law.

Without prejudice to its right to terminate for breach of contract, TPWODL may, without assigning any reason, terminate the Contract in whole or in part at any time at its discretion while the contract is in force by serving a written notice of two weeks to the Associate.

In the event of TPWODL having proceeded with termination of the contract the associate shall comply and proceed further in the following manner:

i) Associate shall discontinue the supply, on the expiry of the said period of two weeks.

ii) Associate shall ensure that no further steps are being taken towards discharge of the obligations, terms and conditions as contained in the contract/PO. This shall include initiation of actions not limited to discontinuation of other allied and associated arrangements which

the associate might have entered with third parties for due discharge of its obligations under the contract with TPWODL.

iii) The Associate shall perform thereafter such tasks as may be necessary to preserve and protect the terminated portion of the material/service/work in progress and the materials and equipment at TPWODL sites or in transit thereto. However, the associate shall continue to fulfill its contractual obligations with regard to the part of contract not terminated.

iv) It shall be open for TPWODL to conduct a joint assessment with the associate of the material ,supplies, equipment ,works or in general as to the subject matter of the contract in regard to which the associate claims having completed its obligations before or during such termination.

v) It shall be open to TPWODL to seek invocation of the performance bank guarantee or any other guarantee or other security deposit by whatever name called submitted by the associate, which shall not be objected to or protested by the associate.

In case of termination of the contract the parties agree to be governed inter alia by the following:

a) In case TPWODL exercises its right of termination as stated above the associate shall not dispute or object to the same.

b) The Associate shall be entitled to receive and claim only such payments OR sums of money from TPWODL as may be found payable to it in regard to works executed by it under the terms of the contract and no other claim of any nature whatsoever shall be made by the Associate.

c) All such provisions which the parties have agreed to survive and prevail even after termination of the contract shall remain effective despite the termination.

In the event of such termination, TPWODL may finish the Work by whatever method it may deem expedient, including the hiring of services and /or purchase of material equipment from such third parties as TPWODL may deem fit or may itself provide any labor or materials and perform any part of the Work. The associate undertakes to bear the incremental costs if any paid by TPWODL in such a case attributable to failure on the part of the associate. The Associate in such a case shall not be entitled to receive any further payments and any sums found payable to it may be adjusted by TPWODL against the amount recoverable from him on this ground. The same shall be without prejudice to other rights available to TPWODL under law against the associate.

Upon the termination of any of the contract due to occurrence of any circumstances provided in clauses stated above and constituting repeated breach or misconduct , TPWODL shall be entitled to bar the associates its agents , affiliates from undertaking any negotiation / tendering, bidding, participation activities concerning TPWODL for a period of two years from date of such termination. The same shall be without prejudice to other rights available to TPWODL.

24.2 Termination for convenience of Associate

Associate at its convenience may request for termination of contract, clearly assigning the reason for such request. TPWODL has full right to accept, reject or partially accept such request. This convenience will be available to associate only after one year from the contract effective date. For this purpose, associate will provide a notice period of 90 days to

TPWODL, Associate will have to pay TPWODL a 'termination convenience fee' equivalent to 5% of unexecuted contract value.

24.3 Termination for Convenience of TPWODL

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

25.0 DISPUTE RESOLUTION & ARBITRATION

In case of any dispute or difference the parties shall endeavor to resolve the same through conciliatory and amicable measures within 15 Days failing which the matter may be referred by either party for resolution by the sole arbitrator to be appointed mutually by both the parties. The arbitral proceedings shall be conducted in accordance with Arbitration and Conciliation Act 1996 and the place of arbitration shall be Sambalpur. The language to be used at proceedings shall be English and the award of the arbitrator shall be final and binding on the parties. The parties shall bear their respective costs of arbitration. The associate shall continue to discharge its obligations towards due performance of the works as per the terms of the contract during the arbitration proceedings unless otherwise directed in writing by TPWODL or suspended by the arbitrator. Further, TPWODL shall continue making such payments as may be found due and payable to the associate for such works.

25.1 Governing law and jurisdiction

The parties shall be subject to the jurisdiction of the courts of law in Sambalpur and any matter arising here from shall be subject to applicable law in force in India.

26.0 ATTRIBUTES OF GCC

26.1 Cancellation

The Company reserves the right to cancel, add, delete at its sole discretion, all or any terms of this GCC or any contract, order or terms agreed between the parties in pursuance without assigning any reasons and without any compensation to the Associates.

26.2 Severability

If any portion of this GCC is held to be void, invalid, or otherwise unenforceable, in whole or part, the remaining portions of this GCC shall remain in effect.

26.3 Order of Priority

In case of any discrepancies between the stipulations in General Conditions of the Contract (GCC) and Special Conditions of Contract (SCC), the GCC shall stand superseded by the SCC to the extent stipulated hereinabove while balance portion of respective clauses of GCC shall continue to be applicable.

27.0 INSURANCE

The Associate shall arrange accident insurance policy for his foreign experts/specialists/personnel deputed to Site and Associate's/his sub-Associates' manufacturing works as well as for his Indian engineers and supervisory staff. The Associate

shall also take out for his Indian workmen, where applicable, a separate policy as required under Workmen's Compensation Act.

Associates shall be responsible to suitably insure their entire work-force (to the extent of at least meeting requirements under Workmen Compensation Act) Tools, Plant, Third party liability at the project site, All Risk comprehensive insurance for the entire works (insurance for free issue items will be in TPWODL scope) for total contract (PO/RO) value or any other such risks during execution of works, till the works are handed over to the company, in consultation with TPWODL and shall submit copies of such insurances to the Engineer-in-Charge for review / acceptance before commencing the work. Engineer-in-charge must ensure compliance to insurance requirement by Associate before commencement of works. TPWODL shall stand fully indemnified in this respect.

BA will also ensure purchase of Special Covid Insurance policy of ₹ 5 lacs for the legal heir(s) of deceased BA employees (in case of death due to Covid- 19)

i. BA to take appropriate Special Covid Insurance policy from a reputed insurance agency prevailing in the market so that all the BA employees are covered under the purview of ₹ 5,00,000/- compensation, in case of death due to Covid -19.

   BA shall be required to purchase the policy immediately post receipt of LOI / Work Order.

ii. If it is found that the BA employee(s) is/are not covered under the purview of Special Covid Insurance Policy, the concerned BA shall be liable to pay the entire sum of ₹ 5,00,000/-.

iii. Cost of the Covid Insurance policy shall be borne @50% each by the BA and TPWODL. BA will be reimbursed @50% of the Annual Premium based on the original money receipt and policy copy.

28.0 ERRORS AND OMISSIONS

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

29.0 TRANSFER OF TITLES

The title of ownership and property to all equipment, installations, erections, constructions materials, drawings & documents shall pass to the TPWODL after Commissioning and complete handing over-taking over.

However, such passing of title of ownership and property to the TPWODL shall not in any way absolve, dilute or diminish the responsibility and obligations of the Associate under this Contract including loss or damages and all risks, which shall vest with the Associate.

The Associate shall take all corrective measures arising out of discrepancies, errors and omissions in drawings and other information within the time schedule and without extra cost to the TPWODL.

The Associate shall also be responsible for any delay and/or extra cost if any, in carrying out engineering, and site works by other agencies arising out of discrepancies, errors and omissions stated in as well as of any late revision/s of drawings and information submitted by the Associate.

30.0 SUGGESTIONS & FEEDBACK

We welcome all our Business Associates to write to us about their experience with TPWODL; be it our Company, our services or our people. Each and every concern, issue, query and suggestion from you will help us to become a better company to work with and shall help us develop a strong bonding of trust and a long term relationship with you.

You may send your feedback by filling up our Business Associate Feedback Form enclosed herewith as Annexure-I. You can also log on to our website www.tpWesternodisha.com to provide your feedback according to the guidelines mentioned below:

31.0 CONTACT POINTS

In case Business Associate needs information with respect to payments or has any grievances, same may be lodged by log on to our website www.tpWesternodisha.com

32.0 LIST OF ANNEXURES

S. No.	Subject	Annexure
1.	Performa for Bid Security Bank Guarantee	A
2.	Performa for Advance Payment Bank Guarantee	B
3.	Performa for Performance Bank Guarantee (CP cum EP)	C
4.	Performa for No Demand Certificate by Associate	D
5.	Performa for Indemnification on Statutory Compliance	E
6.	Performa For Application For Issuance of Consolidated TDS Certificate	F
7.	HR Service Level Agreement	G
8.	Under taking for competence of workmen	H
9.	Business Associate Feedback Form	I
10.	Acceptance Form For Participation In Reverse Auction Event	J
11.	NEFT or RTGS payment request form	K
12	Contractor Safety Management System	L
13	Vendor Appraisal Form	M
14	Manufacturers Authorization Form	N

ANNEXURE-A

PROFORMA FOR BID SECURITY BANK GUARANTEE

TP Western Odisha Distribution Limited

Burla

WHEREAS, (Name of the Bidder) _____ (hereinafter called "the BIDDER") has submitted his bid dated_____ for the (Name of Contract) _____ (hereinafter called "the BID").

KNOW ALL men by these presents we (Name of the Bank) _____ of (Name of the Country) _____ having our registered office at_____(hereinafter called "the BANK) are bound unto TP Western Odisha Distribution Limited (TPWODL) in the sum of _____ for which payment well and truly to be made to the TPWODL the Bank binds himself, his 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**:**

i) If the Bidder withdraws his Bid during the period of bid validity specified in the Proforma of Bid

or

ii) If the Bidder having been notified of the acceptance of his Bid by the TPWODL during the period of bid validity fails or refuses to furnish the Contract Performance Bank Guarantee, in accordance with the Instructions to Bidders.

We undertake to pay the TPWODL up to the above amount upon receipt of its first written demand, provided that in its demand the TPWODL will note that amount claimed by it is due to it owing to the occurrence of one or both conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date (No of days as mentioned in tender enquiry) days after the closing date of submission of bids as stated in the Invitation to Bid or as extended by you at any time prior to this date, notice of which extension to the Bank being hereby waived, and any demand in respect thereof should reach the Bank not later than the above date.

DATE…… SIGNATURE OF THE BANK……..

WITNESS……. SEAL……..

(Signature, Name & Address)

(At least 2 witnesses)

ANNEXURE-B

PROFORMA FOR ADVANCE PAYMENT BANK GUARANTEE

(On Rs.100/- Stamp Paper)

Note:

(a) Format shall be followed in toto

(b) Claim period of six months must be kept up

(c) The guarantee to be accompanied by the covering letter from the bank confirming the signature to the guarantee

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TP Western Odisha Distribution Limited

Burla

Advance Payment B.G.No……

Contract No……dated……

1. You have entered into a Contract No_____ with M/s._____ (hereinafter referred to as "the Vendor") for the supply and delivery of _____

   (hereinafter referred to as" the said Equipment") for the price and on the terms and conditions contained in the said contract.

2. In accordance with the terms of the said contract, you have agreed to make an advance payment of Rs._____ (Rupees_____ only) being _____% (_____percent) of the total value of the contract on "the Vendor" furnishing you with an irrevocable, unconditional and acceptable bank guarantee to be valid till the date of receipt of "the said equipment" covered by your above mentioned contract. For this purpose you have agreed to accept our guarantee.

3. In consideration thereof, we, _____ hereby irrevocably and unconditionally guarantee to pay to you on demand but in any case before the end of five working days from the date of the claim and without demur and without reference to "the Vendor" such amount or amounts not exceeding the sum of Rs._____ (Rupees _____ only) being _____% (_____percent) of the total value of the contract on receipt of your intimating that "the Vendor" has not fulfilled his contractual obligations. You shall be the sole judge for such non-fulfillment and "the Vendor" shall have no right to question such judgment.

4. You shall have the right to file / make your claim on us under the guarantee for a further period of three months from the date of expiry.

5. This guarantee shall not be revoked without express consent and shall not be affected by your granting time or any other indulgence to "the Vendor", which shall include but

not be limited to, postponement from time to time of the exercise the same in you or any right which you may have against "the Vendor" and to exercise the same in any covenant contained or implied in the said contract or any other course or remedy or security available to you, and our Bank shall not be released from its obligations under this guarantee by your exercising any of your rights with reference to matters aforesaid or any of them or by reasons of any other act or forbearance or other acts of omission or commission on your part or any other indulgence shown by you or by any other matter or thing whatsoever which under the law would, but for this provision have the effect of relieving our bank from its obligation under this guarantee.

6. We also agree that you shall be entitled at your option to enforce this guarantee against our bank as a principal debtor, in the first instance, notwithstanding any other security or guarantee that you may have in relation to "the Vendor's" liabilities in respect of the premises

7. This guarantee shall not be affected by any change in the constitution of our Bank or "the Vendor" or for any other reason whatsoever.

8. Any claim / extension under the guarantee can be lodge-able at outstation banks or at sambalpur branch and claim will also be payable at Sambalpur Branch (**to be confirmed by Sambalpur Branch by a letter to that effect)**

9. Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs._____
(Rupees_____ only) and the guarantee will remain in force up to and including _____(Date) and shall be extended from time to time for such period or period as may be desired by "the Vendor".

10. Unless a demand or claim under this guarantee is received by us in writing within one month from_____ (expiry date) i.e. on or before _____ (claim period end date), we shall be discharged from all liabilities under this guarantee thereafter.

Dated at _____this _____ day of _____ 200_____

Witness

Bank's rubber stamp

1. _____ Banks full address

Designation of Signatory

2. _____ Bank official number

ANNEXURE- C

PROFORMA FOR PERFORMANCE BANK GUARANTEE (CP cum EP)

(On Rs.100/- Stamp Paper)

Note:

(a) Format shall be followed in toto

(b) Claim period of one month must be kept up

(c) The guarantee to be accompanied by the covering letter from the bank confirming the signature to the guarantee

---

TP Western Odisha Distribution Limited

Burla

CP cum EP BG No…….

Order/Contract No……dated……

1. You have entered into a Contract No _____ with M/s._____ (hereinafter referred to as "the Vendor") for the supply cum erection / civil work of _____ (hereinafter referred to as" the said Equipment") for the price and on the terms and conditions contained in the said contract.
2. In accordance with the terms of the said contract, "the Vendor" agreed to furnish you with an irrevocable, unconditional and acceptable bank guarantee for 10% of the value of contract and to be valid till the end of Guarantee period plus one month towards "Contract cum Equipment performance". For this purpose, you have agreed to accept the guarantee.
3. In consideration thereof, we, _____ hereby irrevocably and unconditionally guarantee to pay to you on demand but in any case before the end of five working days from the date of the claim and without demur and without reference to "the Vendor" such amount or amounts not exceeding the sum of Rs._____ (Rupees _____ only) being _____% (_____ percent) of the total value of the contract on receipt of your intimating that "the Vendor" has not fulfilled his contractual obligations. You shall be the sole judge for such non-fulfillment and "the Vendor" shall have no right to question such judgment.
4. You shall have the right to file / make your claim on us under the guarantee for a **further period of three month** from the date of expiry.
5. This guarantee shall not be revoked without express consent and shall not be affected by your granting time or any other indulgence to "the Vendor", which shall include but not be limited to, postponement from time to time of the exercise the same in you or any right which you may have against "the Vendor" and to exercise the same in any covenant contained or implied in the said contract or any other course or remedy or security

available to you, and our Bank shall not be released from its obligations under this guarantee by your exercising any of your rights with reference to matters aforesaid or any of them or by reasons of any other act or forbearance or other acts of omission or commission on your part or any other indulgence shown by you or by any other matter or thing whatsoever which under the law would, but for this provision have the effect of relieving our bank from its obligation under this guarantee.

6. We also agree that you shall be entitled at your option to enforce this guarantee against our bank as a principal debtor, in the first instance, notwithstanding any other security or guarantee that you may have in relation to "the Vendor's" liabilities in respect of the premises
7. This guarantee shall not be affected by any change in the constitution of our Bank or "the Vendor" or for any other reason whatsoever.
8. Any claim / extension under the guarantee can be lodge-able at outstation banks or at Sambalpur branch and claim will also be payable at Sambalpur Branch (to be confirmed by Sambalpur Branch by a letter to that effect in case BG is from the branch outside Sambalpur)
9. Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs._____ (Rupees_____ only and the guarantee will remain in force up to and including _____(Date) and shall be extended from time to time for such period or period as may be desired by "the Vendor".
10. Unless a demand or claim under this guarantee is received by us in writing within one months from_____ (expiry date) i.e. on or before _____ (claim period end date), we shall be discharged from all liabilities under this guarantee thereafter.

Dated at_____ this_____ day of _____ 200__

Witness

Bank's rubber stamp

1. _____ Banks full address

Designation of Signatory

2. _____ Bank official number

ANNEXURE-D

PROFORMA FOR "NO DEMAND CERTIFICATE" BY ASSOCIATE

(On Company's Letter head or with Company Seal)

(To be submitted by the Associate to TPWODL Accounts Department at the time of receipt of full and final payment)

(Certificate No. CCP/002)

Name of the Project

Order/ Contract No.

Dated

Name of the Associate

Scheme No. / Job No.

We, M/s._____ (Associate) do hereby acknowledge and confirm that we have received the full and final payment due and payable to us from TPWODL, in respect of our aforesaid Order No _____ dated_____ including amendments, if any, issued by TPWODL to our entire satisfaction and we further confirm that we have no claim whatsoever pending with TPWODL under the said contract / W.O.

Notwithstanding any protest recorded by us in any correspondence, documents, measurement books and / or final bills etc., we waive all our rights to lodge any claim or protest in future under this contract.

We are issuing this "NO DEMAND CERTIFICATE" in favor of TPWODL, with full knowledge and with our free consent without any undue influence, misrepresentation, coercion etc.

Dated **Signature**

Place **Name**

Designation

(Company Seal)

ANNEXURE – E

PROFORMA FOR "INDEMNIFICATION ON STATUTORY COMPLIANCES"

(To be submitted by the successful Bidder within seven days of award of work)

(Certificate No. CCP/001)

Name of the Project

Letter of Award / Contract No.

Dated

Name of the Associate

Scheme No. / Job No.

By this confirmation we, _____ (Associate) are formally bound to M/s. TPWODL towards any sum which may be imposed, levied or hereinafter recovered by the Provident Fund Organization under the provisions of the Employees of the Provident Fund and Miscellaneous Provisions Act 1952 in respect of employees employed by us.

We well and truly bind ourselves and our heirs executors administrators and representatives jointly severely and respectively for the above payment only to be paid to M/s. TPWODL.

AND WHEREAS we, _____ (Associate) is making compliance of the Employees Provident Fund and Miscellaneous Provisions Act 1952, have entered into the above written bond for the indemnity to M/s. TPWODL against all losses from the acts or default of the said Associate in respect of compliance of the Provident Fund Act.

Similarly, we hereby confirm that we have complied with all statutory and local laws and nothing is outstanding with regard to Local Sales Tax, Labor Laws, Local Municipal dues, Electricity dues etc. We have entered into the above written bond for the indemnity to M/s. TPWODL against all losses from the acts or default of the said Associate in respect of compliance of the Local Sales Tax Laws, Local Laws, Labor Laws, Local Municipal Dues, Electricity dues etc.

NOW THE CONDITION, of the above written bond is as such that if the Associate during the period of this contract commits any default or fails to make payment of Contributions in respect of his employees to the Employees Provident Fund Organization, he shall indemnify the Principal Employer M/s. TPWODL from all and every loss and damage caused to them from any act, omissions or negligence of the said Associate in respect of compliances under the Employees Provident Fund and Miscellaneous Provisions Act, 1952.

IN WITNESS to the above written bond we have here to set our hands, with our free consent.

Dated **Signature**

Place **Name**

Designation (Company Seal)

ANNEXURE-F

PROFORMA FOR APPLICATION FOR ISSUANCE OF CONSOLIDATED TDS CERTIFICATE

To be printed on the letterhead

To,

TP Western Odisha Distribution Limited,

Burla

Sub: Application for issuance of Consolidated TDS Certificate for the FY _____

Dear Sir,

I / we hereby request / authorize you to issue me / us a consolidate TDS Certificate for the financial year _____ against tax deducted at source by you from my / our payments / bills during the said year from time to time under Chapter XVII – B of the Income Tax Act, 1961.

For and on behalf of

Signature

Name

Address

Contact No. (Land Line)

(Mobile)

PAN #

Assessing authority

ATTACH THE COPY OF PAN CARD

ANNEXURE - G

SERVICE LEVEL AGREEMENT

(To be adhered to by Business Associates (BAs) in TPWODL on Human Resource Issues)

1.0 The following shall be adhered to by the Business Associates during his / its association with TPWODL:

Shall Abide by Tata Core Values:

a) Integrity – We must conduct our business fairly, with honesty and transparency. Everything we do must stand the test of public scrutiny.

b) Understanding – We must be caring, show respect, compassion and humanity to our colleagues and customers and always work for the benefit of the communities we serve.

c) Excellence – We must constantly strive to achieve the highest possible standards in our day to day work and in the quality of services we provide.

d) Unity – We must work cohesively with our colleagues across the group and with our customers and partners to build strong relationships based on tolerance, understanding and mutual co-operation.

e) Responsibility – We must continue to be responsible and sensitive to the communities and environments in which we work and always ensuring that what comes from the people; goes back to the people many times over.

f) Agility- We must work in a speedy and responsive manner and be proactive and innovative in our approach.

2.0 The Business Associate / his manager / supervisor who is responsible for managing the project site / performance contract etc. in TPWODL would also ensure adherence of these values by his employees / persons deployed by him in connection with his works undertaken in TPWODL.

3.0 The Business Associates are required to:

a) Support and respect the protection of human rights and make sure that they are not complicit in human right abuses.
b) Respect freedom of association and effective recognition of the right to collective bargaining.
c) Not to resort to any form of forced and compulsory labour.
d) Shall ensure abolition of child labour in his area of work.
e) There is no discrimination in respect of employment and occupation in respect of his employees.
f) Support precautionary approach to environmental challenges.
g) Promote greater environmental responsibility by himself and his employees in his areas of work.
h) Deploy and defuse environmental friendly technologies while carrying out the works.
i) Work against corruptions in all its form including extortion and bribery by himself and his employees.

4.0 The Business Associates are required to adhere to all applicable labour Laws with special reference to the following:

a) No person below the age of 18 years and no child labour will be engaged directly or indirectly for executing the work connected with the business of TPWODL.

b) Minimum wages along with other statutory dues like PF, ESI, etc. as applicable to the workers shall be made within the prescribed period of 7th / 10th day of the following month.

c) Deduction / deposit / record keeping and all other requirements under Employees PF Act 1952, Employees State Insurance Act 1948 and other applicable acts (if any) shall be adhered to.

d) Only statutorily authorized deductions (if any) shall be made in accordance with the relevant statutes.

e) All the provisions of Contract Labour (R&A) Act 1970 shall be complied with in respect of the workers engaged for TPWODL work. The work will be commenced only after completing necessary formalities for obtaining Labour License (if applicable).

f) Necessary registers / records, filing of returns etc. shall be maintained for verification by Statutory / TPWODL authorities.

g) Payment of wages shall be made only in presence of and with certification of authorized representative of TPWODL or shall be made in the form of cheque / bank transfer to the employee.

h) During the period of contract, the Business Associate will arrange for deployment of his supervisor / manager for total supervision and control of the work and their manpower. All the activities related to their manpower e.g. attendance, leave, wage disbursement etc. will be done under the supervision & control of Business Associates, while adhering to the prescribed standard / norms of production / productivity & quality. During execution of the work, Business Associate shall engage only such qualified / skilled manpower as may be envisaged / required for ensuring level of production / service into the contract / work order.

i) Clearances as follows shall be obtained from IR & Welfare Group:

   i. Clearance for commencement (before start of the work).
   ii. No Objection Certificate (after completion / before final settlement).
   iii. Copies of PF / ESI Challans shall be deposited with IR & Welfare Group every month

j) The Business Associate shall indemnify TPWODL from any liabilities under applicable Labour Statutes.

k) The Business Associate shall ensure safety and health of his employees and shall also maintain hygienic working environment / condition in his area of work.

l) The Business Associate and his employee shall abide by Laws of Land and shall not violate any applicable provisions.

m) The Business Associate appreciates with and acquiesces to the right of TPWODL as principal employer to fulfil any of his legal obligations, if he fails to do so under applicable labour laws and deduct the same from his running bills / final payments / enchasing security deposit / Bank Guarantee as the case may be. If there is any further shortfall TPWODL has the right to recover the same from the Business Associate.

n) The Business Associate ensures that person employed by him adhere to the moral and legal conduct and shall not violate any standard conduct envisaged in the premise of

TPWODL by all such as, Transparency, Safety, Discipline, Integrity etc. The Business Associate or his employees should refrain from corrupt practices, giving or taking bribe in connection with any TPWODL business.

5.0 The '<u>Statutory Compliance Enforcement System</u>' in TPWODL is detailed below for adherence by all concerned. Business Associate Cell (BA Cell) will be the process owner for implementation of the system with the help of concerned Engineer I/c or Officer I/c.

a) Statutory Compliance being a professed value in TPWODL Code of Conduct, the concerned Engineer / Officer in charges are requested to adhere to the provisions and advise respective Business Associates in their domain to comply in letter and spirit.

b) Immediately after issuance of letter of intent, the authorized representative of the Business Associate will report to BA Cell for completion of statutory requirements.

c) Normally, the work will be started only after 'Clearance for Commencement of Work (CCW) is issued by BA Cell to the Business associate. However, in exceptional exigencies in engineer I/c / Officer I/c may direct the Business Associate to start the work and inform BA Cell about the same. Statutory requirements in this case may be completed in parallel.

d) First monthly bill will be released only after producing CCW to the finance department. Similarly closure of work and final settlement will be affected after issuance of no objection certificate from BA Cell group.

6.0 <u>Requirements for 'Clearance for Commencement of Work' (CCW):</u>

a) Submission of filled up Form 'A' for database (Annexure-1).
b) Copy of PF Code allocation letter.
c) Copy of ESI Code allocation letter.
d) Submission of duly filled up Form IV CL(R&A) act (In case more than or equals to 20 workers during the period of contract).
e) Submission of duly filled up Form VI A (Notice of Commencement).
f) Copy of insurance cover note under WC Act 1923 (if applicable).
g) Copy of Contract Agreement.
h) Copy of indemnity bond (if applicable).
i) Affidavit with regard to payment of wages through cheque / bank transfer only.

7.0 <u>Requirements during execution of work:</u>

a) Copy of receipt of application for license / license (if applicable).
b) Copy of PF Challan (latest by 26th day of every Month).
c) Copy of ESI Challan (latest by 26th day of every Month).
d) Copy of Wage disbursement sheet / Bank statement.
e) Filing / Maintenance of all statutory registers / reports / returns for inspection by Statutory/ TPWODL authorities.
f) Certification of wage disbursement by authorized representative of TPWODL.
g) Copy of 'Labour Welfare Fund' deposit certificate / Challan.
h) Insuring safe working practices at the workplace.

8.0 <u>Requirements for 'No Objection Certificate' (NOC) for closure of work:</u>

a) Submission of duly filled up Form VI A (Notice of Completion).
b) Copy of Half yearly / Annual return for ESI / PF / CL(R&A).

c) Consolidated copy of wage sheet of last month indicating full & final settlement of all dues like retrenchment benefit, bonus, leave encashment etc. Copy of individual declaration by employees in Form X regarding termination of employment.

d) Confirmation certificate regarding filling up of form for transfer / withdrawal of PF by the concerned workers.

In case any of the above are deviated / not complied with the Letter of Award/Order shall be liable to be withdrawn / cancelled.

Enclosure:

1) Form A
2) Form X
3) Form XI
4) Form VI A
5) Form XXIV

FORM (A)

[To be submitted by the Business Associate to the Principal Employer within a week from LoA issuance]

A. Details of the Agency

1. Name of Agency :
2. Nature of work :
3. Local Address with Ph.No. :

   (With Father's name) :
4. Permanent Address (Full) :
5. PF code no. & Place :
6. ESI Code no. & Place :
7. Name and address of :

   Sub-contractor (if any)

B. Details of Work

8. Name of work (as specified in LOI/LOA) :
9. LOI/LOA Nos. & Dates :
10. Period of contract (Specify Dates) :

    [Including Extension period, if any] :
11. Work Area [Department / Location] :
12. Name / Cell no. of Officer I/c :
13. Maximum No. of workers and staff to be engaged on any day during the year.
    - Supervisory Staff :
    - Workers :
14. Do you have any other contract in TPWODL : Yes/No

    If yes, furnish details:

15. Details of Workmen's compensation Policy, if applicable

Name of Insurance Company ……..
……Policy No …… Number of persons covered …… Period of coverage: From …… To ……..

If no, I hereby undertake the liability arising out of Workmen's Compensation Act and Rules made there under.

C. Details of workers to be engaged

No. of Workers

S. No.	Unskilled*	Semi-skilled*	Skilled*	Clerical / Supervisory

*** Number to be indicated**

I/We shall fulfill all obligations arising from and under all relevant law in force from time to time. I/We undertake to keep the TPWODL indemnified against any loss or liability arising out of failure of my / our abiding the relevant laws.

The name of my / our representatives is …… to enter the TPWODL Premises on my behalf.

Date:

(Signature of the Business Associate

or his Authorized Representative)

This Business Associate is / will be engaged in TPWODL.

(Signature and seal of

Officer I/c of the Work)

Form X

Undertaking

I _____ hereby undertake that all the dues in respect of my employment with M/s _____ for the period of _____ to _____have been settled and final payments including retrenchment benefit have been made to me in full.

( )

_____

Date:

Form XI

Undertaking

With reference to the contract job awarded by M/s TP Western Odisha Distribution Limited to M/s_____ vide work order No._____ dated_____

I _____on behalf of

M/s _____hereby undertake:

1. that the dues in respect of the workmen/ employee(s) engaged by us for the said contract, payable as per the provisions of relevant statute pertaining to
   i. wages/ salary
   ii. PF & ESI, Burla Labour Fund
   iii. All other statutory obligation

   has been paid /settled in full and no amount/ compliance is due/ pending.

2. That in case any dispute / claim is raised by the concerned workers i.r.o. any dues / payments, M/s _____ will settle the same on its own and such liability will be borne by M/s _____

3. That M/s _____ hereby indemnify M/s TPWODL from any future liability i.r.o. any statutory obligation in respect of said contract.

Date:

_____

( )

Authorized Signatory

For M/s _____

FORM- VI A

Notice for Commencement /Completion of contract work

I/We, Sh. / M/s _____ (Name and Address of the Contractor) hereby intimate that the contract work _____ (name of work) in establishment of the _____ (name and address of the Principal Employer) for which License No._____dated_____has been issued to me/us by the Licensing Officer _____(name of the Headquarters), has been commenced / completed with effect from _____date / on date.

Signature of Contractor

With Office Seal

The Inspector

_____

_____

FORM XXIV

[See Rule 82(1)]

Return to be sent by the Contractor to the licensing Officer (in duplicate)

Half -Yearly Ending_____

1. Name and address of the Contractor
2. Name and address of the Establishment
3. Name and address of the Principal Employer
4. Duration of Contract: From _____to _____
5. No. of days during the half year on which
   (a) the establishment of the principal employer had worked
   (b) the contractor's establishment had worked
6. Maximum No. of contract labour employed on any day during the half –year:

Men	Women	Children	Total

7. (i) Daily hours of work and spread over
   (ii) (a) whether weekly holiday observed and on what day
   (b) if so, whether it was paid for
   (iii) No. of man – hours of overtime worked
8. No. of man days worked by

Men	Women	Children	Total

9. Amount of wages paid

Men	Women	Children	Total

10. Amount of deductions from wages, if any

Men	Women	Children	Total

Whether the following have been provided –

(i) Canteen : _____

(ii) Rest rooms : _____

(iii) Drinking water : _____

(iv) Crèches : _____

(v) First Aid : _____

Signature of contractor

Place _____

Date _____

ANNEXURE – H

UNDERTAKING FOR COMPETENCE OF WORKMEN

Name of Associate :

Tender No. :

Item :

With reference to the tender mentioned above, I/We _____, hereby undertake that the workmen/ employee(s) engaged by M/s _____ for the job against said tender shall be competent in all respect, commensurate to the nature of job.

Date:

_____

( )

Authorized Signatory

For M/s

Seal

ANNEXURE-I

BUSINESS ASSOCIATE FEEDBACK FORM

With an objective to improve our internal processes and systems, and serve you better, we solicit your valuable feedback & suggestions. It is estimated that it will take about 10 minutes to complete this survey. We assure you that your feedback shall be kept confidential. Please send the duly filled feedback form in the "TPWODL addressed - attached envelop"

You are associated with us as
☐ OEMs ☐ Service Contractor ☐ Material Suppliers ☐ Material & Manpower Supplier

You are associated with us for
☐ Less than 1 year ☐ More than 1 year but less than 3 years ☐ More than 3 years

Your office is located at
☐ Sambalpur ☐ Within 200 kms from Sambalpur ☐ More than 200 kms from Sambalpur

Your nearly turnover with TPWODL
☐ Less than 25 Lacs ☐ 25 Lacs to 1 Crore ☐ More than 1 Cr.

Additional information

Your Name	
Your Designation	
Your Organization	
Contact Nos.	
Email	

We once again thank you for your participation in this survey. Please spare 10 minutes to give your feedback on following pages (Section A to E)

SECTION - A

(Please √ mark in the relevant box and give your remarks / suggestions / information for our improvement.).

S. No.	Parameters	1 Do Not Agree	2 Slightly in Agreement	3 In Fair Agreement	4 Mostly in Agreement	5 Fully Agree	Remarks/ Suggestion
1	You receive all relevant queries / tenders from us in timely manner.						
2	We provide you enough lead time to respond to our queries / tenders.						
3	We provide you adequate support (drawings, documents, clarifications, briefing etc.) to enable you meet our requirements.						
4	All following elements of our contract / purchase order are rational :						
4.1	Scope of Work						
4.2	Delivery / Execution Schedule						
4.3	Payment Terms						
4.4	Liquidated Damages						
4.5	Performance Guarantee						
5	Our purchase orders / contracts are simple, specific & easy to understand						
6	TPWODL demonstrate willingness to be flexible in administration of Contract / Purchase Order						
7	We provide timely responses / clarifications to your queries						
8	TPWODL representative you interact / coordinate with is adequately empowered to support you in meeting contractual obligations						
9	TPWODL provide you all necessary infrastructure support for timely and quality completion of work (including AMC)						
10	TPWODL Engineer-in-Charge timely certifies the jobs executed/						

S. No.	Parameters	1	2	3	4	5	Remarks/ Suggestion
		Do Not Agree	Slightly in Agreement	In Fair Agreement	Mostly in Agreement	Fully Agree	
	material supplied						
11	TPWODL Engineer-in-Charge efficiently supervises the job execution for timely completion of job						
12	BIRD (Bill Inward Receipt Desk)* initiative has improved payment disbursement process (under development)						
13	Our approach for Inspection and Quality Assurance effective to expedite project completion?						
14	TPWODL never defaults on contractual terms						
15	In TPWODL Contracts closure is done within set time limit						
16	Our material receiving procedures are well defined and efficiently deployed to reduce mutual inconvenience						
17	Bank Guarantees are released in time bound manner						
18	Our processes related to payment / account settlement are effective.						
19	You get payments on time						
20	TPWODL Employees follow Ethical behavior						

SECTION - B

(Please rate the following parameters on a scale of 1 to 5, where 1 - Minimum; 5 - Maximum)

SN	Parameters	1	2	3	4	5	Remarks/ Suggestion
1	How do you rate courtesy/ empathy/ attitude level and warmth of TPWODL employees you interact with from following team?						
1.1	Project Engineering						
1.2	Division / Sub-Division						
1.3	Projects/HOG						
1.4	Inspection & Quality Assurance						
1.5	Stores						
1.6	Metering & Billing						
1.7	Accounts / Finance						
1.8	Administration						
1.9	IT & Automation						
2	How would you rate TPWODL in comparison to your other clients in terms of **fairness of treatment and transparency** with its Business Associates?						
3	How would you rate TPWODL in comparison to your other clients in terms of **processes and systems to manage partnership** with its Business Associates						
4	How would you rate TPWODL in comparison to your other clients in terms of **building long term & mutually relations**hip with its Business Associates						

SECTION–C

Please √ mark in the relevant box and give your remarks / suggestions / information for our improvement.

SNo	Parameters	Certainly NO	Probably NO	Probably YES	Certainly YES	Remarks/ Suggestion
1	Based on your experience with TPWODL, would you like to continue your relationship with TPWODL?					
2	If someone asks you about TPWODL, would you talk "positively" about TPWODL?					
3	Would you refer TPWODL name to others in your community, fraternity and society as a professional & dynamic organization?					

SECTION - D

If we ask you to rate us on a scale of 1 to 10, how will you rate TPWODL, that truly represents your overall satisfaction with us (please tick appropriate box) -

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SECTION – E

Please √ mark in the relevant box and give your remarks / suggestions / information for our improvement.

Please spare your thoughts for TPWODL's improvement in particular areas of weaknesses, particularly relating to some great practices, attitudes that you have seen elsewhere in Indian and International Organizations, which you recommend TPWODL to adopt. Please give your valuable salient recommendations.

Please spare your thoughts for TPWODL's improvement in particular areas of major concerns for you. We also welcome your suggestions to adopt any best practices, altitudes that you have observed / experienced elsewhere in Indian/ International organization.

Recommendation	*Please tick (√) your top 5 expectations out of the following 10 points listed below -*	
(Please list down improvement you expect from TPWODL)	*Timely payment*	
1	*Flexibility in Contracts/PO*	
	Clarity in PO,s & Contracts	
2	*Timely response to quarries*	
	Timely certification of works executed	
3	*Clarity in Specs, drawings, other docs etc.*	
	Adequate information provided on website for tender notification, parties qualified etc.	
4	*Timely receipt of material at site for execution*	
	Performance Guarantee/EMD released in time	
5	*Inspection & quality assurance support for timely job completion*	

We thank you for your time and courtesy!!

ANNEXURE-J

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder prior to participation in the auction event)

In a bid to make our entire procurement process fair and transparent, TPWODL intends to use the reverse auctions through SAP-SRM tool as an integral part of the entire tendering process. All the bidders who are found as technically qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

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

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

Signature & Seal of the Bidder

ANNEXURE-K

To,

DGM (Finance)

The TP Western Odisha Distribution Limited
Burla

Sub: **e-Payments through National Electronic Fund Transfer (NEFT) OR Real Time Gross Settlement System (RTGS)**

Dear Sir,

We request and authorize you to affect e-payment through NEFT/RTGS to our Bank Account as per the details given below: -

Vendor Code :

Title of Account in the Bank :

Account Type :

(Please mention here whether account is Savings/Current/Cash Credit)

Bank Account Number :

Name & Address of Bank

:

Bank Contact Person's Names :

Bank Tele Numbers with STD Code :

Bank Branch MICR Code :

(Please enclose a Xerox a copy of a cheque. This cheque should not be a payable at par cheque)

Bank Branch IFSC Code :

(You can obtain this from branch where you have your account)

:

Email Address of accounts person (to

send payment information)

Name of the Authorized Signatory :

Contact Person's Name :

Official Correspondence Address :

We confirm that we will bear the charges, if any, levied by our bank for the credit of NEFT/RTGS amounts in our account. Any change in above furnished information shall be informed to TPWODL well in time at our own. Further, we kept TPWODL indemnified for any loss incurred due to wrong furnishing of above information.

Thanking you,

For _____

(Authorized Signatory)

(Signature with Rubber Stamp)

Certification from Bank:

We confirm that we are enabled for receiving NEFT/RTGS credits and we further confirm that the account number (specify Bank a/c no.) of (Please mention here name of the account holder), the signature of the authorized signatory and the MICR and IFSC Code of our branch mentioned above are correct.

This also is certified that the above information is correct as per Bank record

(Manager's/ Officers Signature under Bank Stamp)

ANNEXURE-L
CONTRACTOR SAFETY MANAGEMENT SYSTEM

1. OBJECTIVE

The objective of the Contractor Safety Management System is to lay down clear guidelines for all Business Associates (including their associates, staff and agents) which would facilitate them to observe all statutory rules and regulations, comply with applicable standards of Central Electricity Authority (Measures relating to safety and electric supply) Regulations, 2010 & (safety requirements for construction, operation and maintenance of electrical plants and electric lines) Regulations,2011, TPWODL Safety Manual and Guidelines and thus, ensure creation of safe working environment for all stakeholders of our network.

2. SCOPE

All contracts (minor and major) will be subject to the provisions of this document.

Minor Contracts: Contracts which satisfy all the criteria listed under the head "Minor Contracts".

Major Contracts: Contracts which satisfy any two or more criteria listed under the head "Major Contracts"

Criteria	Minor Contracts	Major Contracts
Value of Contract	< Rs. 1500000/- (less than Rs. Fifteen Lac)	>= Rs. 1500000/- (Equal or more than Rs. Fifteen Lac)
Period	Period less than 1 year	Any period
Working on energized electrical equipment	No	Yes
Working on height (above 1.8 Mtrs from ground)	No	Yes
Work involving construction activity	No	Yes
Working with hazardous goods or chemicals	No	Yes
Work involving danger to general public	No	Yes

Note: *Exceptions for major and minor contract are – in house software development, supply of material or equipment but no direct or indirect installation of the same material, administration contracts (courier, water supply, printing, security, transport, etc.), minor civil work like plastering at ground level or flooring, etc. The facility management (housekeeping) contract will always be treated as a minor contract.*

3. INFORMATION REQUIRED AT TIME OF VENDOR REGISTRATION OR BEFORE COMMENCEMENT OF CONTRACT

3.1 Business Associate is required to fill the Safety Management System Questionnaire as per *annexure 1* and submit along with the vendor registration process / bid / tender document. The filled questionnaire will be scrutinized by Engineer In-charge / indenting group and recommend suitability of the BA with respect to safety requirements. The fulfilment of statutory requirements for vendor registration pertaining to labour laws etc. shall be done by BA Cell on being referred to it.

3.2 Business Associate is required to take suitable risk control measures mentioned against the identified Hazards and Risk document provided for all contracts as per *annexure 2*. The primary objective of this is to evaluate the understanding of the BA towards risk mitigation and employment of safe work procedures. BA is required to conduct the Hazard identification and Risk Assessment study as per the procedure and deploy more or other measures if deemed necessary.

3.3 Business Associate shall comply with **Statutory Requirements related to Safety and Occupational Health** and submit the "Safety Undertaking" as per *annexure 4*.

4. GENERAL SAFETY CONDITIONS REQUIRED TO BE FULFILLED BY BUSINESS ASSOCIATES

The requirements of the contractor safety management system applicable to the minor or major contracts related to various groups are as following –

4.1 Maintenance of Distribution Network – *Annexure 3.1*
4.2 Distribution Projects – *Annexure 3.2*
4.3 EHV Projects – *Annexure 3.3*
4.4 Maintenance of Sub transmission network – *Annexure 3.4*
4.5 Civil / Generation Projects – *Annexure 3.5*
4.6 Meter Management Group (MMG), Revenue Recovery Group (RRG), Energy Auditing Group, AMI, MRG, etc. – *Annex3.6*
4.7 Maintenance and Operation of Street Light. **–** *Annexure 3.7*

1. *Please note that hydra cranes used by any dept should be ACE Model No. FX 150 ACE SX 150, Escorts Model No. TRX 1550 or contemporary. Use of old generation hydra cranes like ACE 14XW or ACE 12 XW, etc are prohibited.*

(*Details as per Annexure attached)*

Note: *For minor contracts, the BA shall assign the duties of Safety Representative to the Work Supervisor. Work Supervisor will deliver all duties and responsibilities of Safety Supervisor as detailed in this document.*

The Business Associate (BA) having major contract will appointing Safety supervisor, engineer / manager for the TPWODL work. The BA shall make all necessary arrangements for getting their workforce safety trained and competency checked from the concerned official of TPWODL before deployment in the field. BA Cell shall recommend the suitability after competency checked by Engineer In-charge and SAFETY group (or his representative) of TPWODL. After getting the clearance from concerned official, BA cell and receiving temporary I-card issued by TPWODL, Business Associate shall commence the working.

Safety Representative of Business Associates will formally become the nodal point for safety concerns for TPWODL. ***BA shall not frequently transfer or terminate the services of any of the safety representatives appointed for TPWODL work site. BA needs to ensure***

***that Safety representative is available at all points of time; failing which the work being carried out in the interim (period when Safety representative is not available) shall be treated as working under improper supervision and due penal provisions shall be initiated against the BA*.** BA will be required to provide all applicable infrastructure and power to ensure smooth working of the safety representative to maintain a sound safety management system. **In all contracts safety representative will not be assigned any other activity at site apart from the works related to safety management. The duties are detailed in clause 5.5 of this document.** TPWODL will be auditing the facilities provided to the BA`s safety team time to time.

The Safety Representative of the BA shall be required to meet and follow the instructions of the Engineer In-charge and SAFETY Group of TPWODL. He shall be responsible for providing the MIS and/or any other relevant information, as and when desired, within the stipulated time frame as per the requirements of TPWODL. Any non-conformance to safety will lead to the negative marking or issue of safety violation challan/ tokens which shall affect the monthly evaluation and performance of BA.

All contracts where BA has to depute vehicle for their staff and equipment to move from one location to other, the BA shall ensure that vehicle complies all required statutory clearances and requirement as per The Motor Vehicle Act, 1988 as well as TPWODL Road Safety Policy and are in good & safe state of working.

5. QUALIFICATION AND EXPERIENCE OF THE SAFETY AND SITE PERSONNEL

Qualification and experience required for the safety and site personnel are as following:

5.1 Safety Supervisor: It is mandatory that educational qualification of safety supervisor be ITI (of relevant trade) / Diploma (Any branch of engineering) and he has a working experience on electrical system / relevant field of work at least 5 yrs for ITI and 3 years for Diploma holder. Having formal experience of the safety systems will be an added advantage

5.2 Safety Engineer: It is mandatory that educational qualification of safety engineer be at least Diploma (relevant branch) and he has working experience on electrical system of at least 3 yrs. Having the formal experience of the safety systems will be an added advantage.

5.3 Safety Manager: The educational qualification of safety manager should be graduate engineer with working experience on electrical system / network of at least 3 yrs. OR Diploma in Industrial Safety with working experience of 05 years including at least 02 years on electrical network.

However, clause 5.1, 5.2 and 5.3 are not applicable for minor contracts. In such cases, BA shall assign the duties of Safety Representative to the Work Supervisor. Work Supervisor will deliver required duties of Safety Representative (as per clause 5.5) in addition to other duties without diluting the importance of safety.

5.4 Site Skilled Personnel: For all responsibility related to site activities and operations, the BA shall employ only qualified and skilled persons and shall comply the provisions of section 19 & 29 of Western Electricity Authority (Measures relating to safety and electric supply) Regulations, 2010. Persons holding valid approvals only by any Government approved agency or a competency assessment panel or a team set up by TPWODL

shall be allowed to perform the High Risk / High Hazard activities (refer page 1). The skill / qualification required for the electrician and electrical supervisor are given in *annexure 5*. The contracts related to maintenance of Distribution Network, Distribution Projects, EHV Projects, maintenance of Sub-Transmission Network, MMG & EAG, maintenance and operation of streetlights, shall preferably have at least 20 per cent of ITI qualified electricians in the first year of the contract. This figure shall preferably be incremented by 15 per cent every subsequent year.

Note: For the competency assessment may please refer the work instructions. An employee shall have to necessarily undergo the competency assessment check once in every eighteen months.

5.5 **Requirements from the Safety Representative(s) of the Business Associate:**

5.5.1 Safety training of 2 hrs/employee/month and one day of safety induction training to all new employees joining the BA will be conducted by the BA as per Safety training modules of TPWODL.

5.5.2 Safety Talk / toolbox talk before start of shift to BA employees.

5.5.3 Ensuring the availability & proper usage of the standard safety equipment (PPE)

5.5.4 Periodic inspection of PPE to ensure their serviceability and maintaining the 10% buffer stock of standard PPEs.

5.5.5 Ensuring the adherence to standard operating procedures of TPWODL as mentioned in TPWODL Safety standard and O & M and concerned function's manual.

5.5.6 Safety inspections / audits as per the process of TPWODL

5.5.7 Working in close coordination SAFETY Group of TPWODL.

5.5.8 Reporting of unsafe acts, unsafe conditions, near miss, incident or accident to Engineer In-Charge and SAFETY Group of TPWODL immediately after its occurrence.

5.5.9 Regular HIRA at site and comply the control measures as stated in the detailed HIRA as per the *annexure* 2. Also, deployment of JSA based checklist shall be ensured.

5.5.10 Ensuring compliance with safety and other laws as may be applicable and providing for safety assurance.

5.6 **Training and Syllabus:** The BA shall not deploy any person at workplace / site or send newly recruited personnel directly to concerned official for competency assessment without Safety Induction Training.

5.6.1 All new BA employees have to necessarily undergo one and half days Safety training and Competency assessment at training centre of BA cell. This training will be conducted once in a week. After the completion of Safety training & Competency assessment I-card will be issued to all competent BA employees

5.6.2 BA is expected to initially train and judge the capability of the workman at his own end before further recommending the workmen for Competency assessment. If any BA workman sent for competency assessment. In case any BA workman fails in the Competency test at concerned official, it will be deemed that BA has not imparted sufficient training at his end and actual cost of training ₹ 7500/ BA employee/ failed attempt will be recovered.

5.6.3 The workers who have imparted Safety Training and issued I-Cards of TPWODL, are not deployed at TPWODL worksites/ voluntarily left the job by workers/ used somewhere else other than TPWODL by the BA, in that case Management reserves the rights to intervene and recover the actual cost of training i.e. ₹ 7500/BA employee. (*Exempted for attrition rate of BA workers less than or equal to 10% of total workforce deployed at TPWODL)*

5.7 It is desired that Safety representative of the BA to impart the general safety training to each employee of duration 2 hrs per month. The training will be organized at BA level and the record to be sent to engineer in-charge and SAFETY group of TPWODL every month. Please refer schedule and syllabus in *annexure 6*.

List of Personal Protective Equipment (PPE) and Maintenance schedule: BA shall commence the project or any work only when the required PPE are made available to the team of employees involved in the work. Each PPE of BA shall be checked / inspected by the safety representative / supervisor at zone before the work start or as prescribed in the list. Safety representative shall regularly check the healthiness of each PPE allocated to lineman. Suitable record shall be maintained at zone. Defective PPE shall be immediately replaced or within 24 hours by the BA. In no case linemen or any other official of BA may be allowed to work with defective PPE. It is preferred that BA ensures minimum stock of each PPE at zone for immediate replacement with defective one. The PPE shall be IS / BS / CE marked and exactly as per the standard or specification mentioned in the *annexure 7*. Working without PPE / non-standard PPE shall be treated as safety violation and penalty as stated in section 6.0 of this document. If TPWODL finds that BA has not provided the adequate / appropriate PPE to their staff, TPWODL reserves the rights to stop the work and call the BA to provide appropriate PPEs at the risk. If the BA fails to provide the required PPEs at the risk then the same shall be provided by TPWODL at the actual cost of the PPE. The amount shall be charged to BA and same shall be first recovered from the current bill of BA or any future payment to be made to BA. In the event of any balance amount still left for recovery, the same shall be adjusted against retention amount or by invoking bank guarantee submitted by BA.

5.8 Safety Audit / Inspection & HIRA: The BA shall get the required safety inspection / audit conducted by his technical team comprising of safety representative as per the *annexure 8*. The safety representative will be required to conduct the HIRA (Hazard Identification and Risk Assessment) *as per annexure 2* of the process and work undertaken at least two times in a year or every time if a new process / activity / machine is introduced or whenever an accident take place. The risk identified to be addressed suitably with –

- Engineering Control
- Management Control, and
- Personal Protective Equipment.

The safety representative of BA shall inform and educate for the identified risk and hazard control methods to employees, supervisor and engineer as well as the engineer in-charge and SAFETY group of TPWODL.

5.9 Safety Performance and Safety MIS: The BA shall maintain good practice of safety all through the contract duration. Safety shall always be of paramount importance during the contract period. Safety performance will be monitored on yearly basis throughout the period and no relaxation will be given for bad performance. BA with good track record and excellent performance will be rewarded suitably as per clause 6.0 of this document. The BA has to provide monthly “Performance Report – Safety” to engineer in-charge and SAFETY group TPWODL this shall be part of monthly bill along with training details. Performa of the report is enclosed as *annexure 9*.

5.10 Pre – Employment Medical Check-up and Fitness of employees engaged for the critical works: The BA shall submit the health fitness certificate for all those workers involved in climbing the pole or working at height for following diseases:

5.10.2 Epilepsy

5.10.3 Colour blindness
5.10.4 Deafness
5.10.5 Vertigo & height phobia

Every year BA will give an undertaking stating that all the employees are fit to work and have not developed aforesaid diseases. The Record of such medical check-ups shall be submitted to BA Cell before issue of temporary identity card. The records shall be maintained at BA Cell. All such medical check-ups shall be repeated once in a year for all workers involved in climbing the pole or working on electrical network.

6. REWARD AND PUNITIVE MEASURES

6.1 To support the enforcement of good SHE & DM practices by the Business Associate and to eliminate repeated or continuing safety violations, use of appropriate reward and punitive measures shall be made. Each unsafe act or violation of the safety guidelines as described in the Safety Manual of the TPWODL will be audit criteria of this system. Broadly the measures identified are following:

6.1.1 Working without PPE/ Safety Gadgets
6.1.2 Working without proper tools and tackles, barricading, Poor condition of Crane / Hydra / Vehicle, using without certification / Licence, Incompetent driver/ Helper
6.1.3 Working without creation of effective safety zone
6.1.4 Improper Supervision at worksite, Lineman/ Supervisor working without competency
6.1.5 Working without adherence to PTW process or authorization/ not adherence to SOPs / W.I. of TPWODL.
6.1.6 Improper Working at height equal to or above 1.8 mtrs without taking proper fall protection measures/ Poor condition of Ladder

6.2 Measures of Reward and Punitive Measures

The Engineer In-Charge, NSO, SC, ASOs, CSI / SIs and SHE &DM group will conduct the surprise audits of the work / project and if any non-conformance is found the same will be booked and entered in the format “Safety Violation Record” *annexure 10*. The flow of the information is given below:

Safety Violation Escalation & Monitoring process	
Action	**Responsibility**
Safety Violation form has been filled and counter foil sent to SAFETY team for information. The main form is to be given to BA supervisor / Engineer in-charge. *(Automatically generated if Site audit done through Mobile App.)*	Engineer In-charge/ NSO / SC / SAFETY Group /CSI/ ASO/ Any authorised TPWODL official.
↓	
Entry of the violation in the master record and sending the information to concerned Manager, HoG, HoD, Head and Chief (O &S). *(Automatically generated if Site audit done through Mobile App.)*.	SAFETY Group
↓	
Forwarding the information Centralized Account Payable (CAPS) for amount deduction from the current bill of the BA,	Engineer In-charge

if any.	
↓	
HoG (Safety – II) & HoG (Safety & Quality – Commercial) and CAPS to generate the MIS of the violations and the amount deducted.	SAFETY Group
↓	
The pool of the amount generated after the deduction to be utilized in safety welfare of BA employees.	SAFETY Group with approval of CFO/Chief (O & S) /CEO&MD

The safety violations have been rated from 1 to 5 (figure 6.3) as per the gravity of the violation. If the same violation is repeated it may escalate into a higher penalty. If a particular Business Associate employee violates safety norms three times, he shall not be allowed to work in TPWODL for a period of one year from the date of the 3rd violation.

6.3 Safety Violation Escalation Matrix

6.3.1

Consequence of Safety Violation Observed (Not related to Incident/ Accident)		Violation				
S.No.	Safety Violation	1st	2nd	3rd	4th	Subsequent Violations
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	A	B	C	D	Will attract the same penality as applicable in the 4th violation.
2	Improper Working at Height	A	B	C	D	
3	Working without proper tools and tackles	A	B	C	D	
4	Poor condition of Crane/Hydra/ Vehicle/Incompetent driver/ Helper	A	B	C	D	
5	Violation of SOP/ WI	B	C	D	E	
6	Working without adherence to PTW process or authorization/ Safety Zone	C	D	E		

Legend	Action to be taken	Responsibility	Penality Amount (in Rs.)	
A	Warning letter	Engineer Incharge	Nil	The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.
B	Levy of Penalty	Engineer Incharge	2,000	
C	Memo to BA & Levy of Penalty	Head of Group	4,000	
D	Memo to BA & Levy of Penalty	Head of Department	10,000	
E	Memo to BA, Levy of Penalty and termination of Contract	Head of Department	1,00,000	

Figure 6.3 (1a)-Penality Matrix for Safety violation (Applicable for Minor Contracts)

Consequence of Safety Violation Observed (Not related to Incident/ Accident)		Violation				
S.No.	Safety Violation	1st	2nd	3rd	4th	Subsequent Violations
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	B	C	D	D	Will attract the same penality as applicable in the 4th violation.
2	Improper Working at Height	B	C	D	D	
3	Working without proper tools and tackles	A	B	C	D	
4	Poor condition of Crane/Hydra/ Vehicle/Incompetent driver/ Helper	B	C	D	E	
5	Violation of SOP/ WI	C	D	E		
6	Working without adherence to PTW process or authorization/ Safety Zone	C	D	E		

Legend	Action to be taken	Responsibility	Penality Amount (in Rs.)	
A	Levy of Penalty	Engineer Incharge	5,000	The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.
B	Memo to BA & Levy of Penalty	Engineer Incharge	10,000	
C	Memo to BA & Levy of Penalty	Head of Group	25,000	
D	Memo to BA & Levy of Penalty	Head of Department	50,000	
E	Memo to BA, Levy of Penalty and termination of Contract	Head of Department	1,00,000	

Figure 6.3 (1b)-Penality Matrix for Safety violation (Applicable for Major Contracts)

Once the BA reaches the "BLACK" (color – "5") category, i.e. highest level of safety violation, "Termination" notice to BA will be issued from the office of the Head of Department (equivalent to GM/ Sr. GM level) and further, *if required,* continuation / extension of contract will only be initiated by Functional Chief / Head of the department (equivalent to Sr. GM / Chief level) and approved by CEO & MD. Till the extension, the contract will remain suspended.

TPWODL encourages the reportage of the safety violation during the contract work by BA. Any TPWODL employee can register a safety violation against the BA in the "Safety Violation Form" *annexure 10*. Initially the observer has to fill the form and handover the counterfoil (lower portion) of the document to the supervisor of the BA, inform the site engineer of TPWODL and send the top portion of the Safety Violation Form to SAFETY group for the further necessary action against the BA. ***The cumulative nos. of Safety Violations pertaining to any particular BA shall be calculated on yearly basis.***

Safety violations resulting in incident / accident will be treated as per gravity of the injury / fatality and its impact as well as type i.e. minor or Major. Consequences of incident / accident are shown in the matrix (figure 6.3(2) for major and 6.3(3) for minor) below. In case of any accident, findings and recommendations of Accident Enquiry Committee will be final and binding and will supersede the arbitration clause of GCC.

Consequence Of an Incident / Accident (In case of MAJOR contract)		Incident / Accident				Action Required
Sl. No	Type of the injury	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	F (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less then 48 Hrs)	F	G	G	H	
3	Major injury (Bone injury or burn or Hospitalization more then 48 Hrs)	G	G	H	I	
4	Single fatality	J	K			Intolerable
5	Multiple fatalities (Two or more fatalities during one event)	K				

Legend	Action to be taken	Responsibility	Penalty (in Rs.)	
F	Memo to BA and levy of penalty	Engineer Incharge	5,000/-	*The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.*
G	Memo to BA and levy of penalty	Head of Group	20,000/-	
H	Memo to BA and levy of penalty	Head of Group	50,000/-	
I	Memo to BA and levy of penalty	Head of Department	2,00,000/-	
J	Memo to BA and levy of penalty	Head of Department	5,00,000/-.	
K	Memo to BA, levy of penalty, termination of contract and black listing of BA	Functional Head	10,00,000/-	

Figure 6.3 (2) - Penalty Matrix for Incident / Accident in Major Contracts

(*For example: In major contracts, if there is first incidence of major injury say bone injury (Cat. 3) where worker was hospitalized for more than 48 hrs then a penalty of amount Rs.20000/- will be deducted from the current bill produced for the payment. This penalty will be similar for first two incidents. However, it will increment to next higher category i.e. Rs. 50,000/- on subsequent incidents as per the above matrix)*

Consequence Of an Incident / Accident (In case of MINOR contract)		Incident / Accident				Action Required
Sl. No	Type of the injury	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	L (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less then 48 Hrs)	L	M	M	N	
3	Major injury (Bone injury or burn or Hospitalization more then 48 Hrs)	M	M	N	O	
4	Single fatality	P	Q			Intolerable
5	Multiple fatalities (Two or more fatalities during one event)	Q				

Legend	Action to be taken	Responsibility	Penalty (in Rs.)	
L	Memo to BA and levy of penalty	Engineer Incharge	5,000/-	*The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.*
M	Memo to BA and levy of penalty	Engineer Incharge	10,000/-	
N	Memo to BA and levy of penalty	Head of Group	25,000/-	
O	Memo to BA and levy of penalty	Head of Department	1,00,000/-	
P	Memo to BA and levy of penalty	Head of Department	3,00,000/-.	
Q	Memo to BA, levy of penalty, termination of contract and black listing of the BA	Functional Head	5,00,000/-	

Figure 6.3 (3) - Penalty Matrix for Incident / Accident in Minor Contracts

(*For example: In minor contracts, if a worker meets with a non-fatal accident say bone injury (Cat. 3) where he was hospitalized for more than 48 hrs then a penalty of amount Rs. 10,000/-, will be charged from the current bill produced for the payment. This penalty will be similar for first two incidents. However, it will increment to next higher category i.e. Rs. 25,000/- on subsequent incidents as per the above matrix.)*

In case of single or multiple fatalities described under legends J&K of 6.3(2) and P&Q of 6.3(3), the concerned BA may be debarred from extension of contract or participate in new contract. In such event the approval of Chief (O & S) will be necessary for extension or award of new contract to concerned BA.

6.3.2 COMPENSATION FOR BA PERSONNEL

In the event of any untoward incident/ accident, the Business Associate shall ensure prompt medical assistance such as treatment, sickness benefit, etc. is provided to the victim(s) as per the Employees' Compensation Act, 1923 or Employees' State Insurance Act, 1948, as applicable. Also, the BA will be required to take adequate measures for compensating the victim(s) or his/her/their kin as follows:

Group Personal Accident (GPA) policy coverage of ₹ 15 Lacs to be taken by the respective BAs.

i. It is mandatorily required to take the GPA policy coverage of ₹ 15 Lacs by the BA for his employees from a reputed insurance agency.

ii. TPWODL HR department will be the overall process owner and BA shall be required to coordinate with TPWODL HR department for policy implementation immediately post receipt of LOI / Work Order.

I. For Death or Permanent / Total Disablement

The BA shall take an insurance coverage of at least Rs. 15 lakhs for each engaged employee, to cover any incidence of Death or Permanent / Total Disablement (Permanent/Total Disability shall be considered as defined under Employees' Compensation Act, 1923). In the event of any such unfortunate incident, the BA would ensure that adequate compensation is paid immediately to the family of the victim(s) from his own resources. This compensation shall be covered under the insurance policy subscribed by the BA mentioned earlier and the arrangement should be such that it would get reimbursed to the BA by the insurance agency subsequently.

II. For Permanent Partial Disablement and Temporary Total Disablement

The compensation in this case will be as per provisions of the Employees' Compensation Act, 1923 or Employees' State Insurance Act, 1948, as applicable.

Accordingly, the BA shall obtain a suitable Insurance Policy on award of Contract and submit documentary evidence of the policy to the BA Cell before commencement of work. The BA shall ensure that the Insurance policy is active at all times and all employees are covered in all respects till the conclusion of contract period or till working with TPWODL. The BA shall submit a copy of the policy after periodic renewals to the BA Cell.

However, on occurrence of such unfortunate incident, if it is found that the victim(s) is/are not covered under any insurance policy, the BA shall be liable to pay the entire sum of Rs. 15 lakhs from his own resources.

Further, in case of an accident resulting in Death or Permanent / Total Disablement while on duty, the appointed BA Nodal Officer will ensure that the BA complies with all statutory provisions and benefits i.e. PF, Compensation, Gratuity etc., and that all these are made available to the employees' nominee(s) as per the stipulated timelines.

6.3.3 TPWODL rewards the BA with good track record of safety management. It is proposed that BA complying with Contractors Safety Management, Safety Manual and Safety process will be rewarded suitably as per the procedure, rule and regulations of the TPWODL. In any case major accident is reported during an assessment period BA will not be eligible for this reward scheme. Assessment of contracts will be once in year. Generally, the assessment cycle is calendar year and guidelines will be declared time to time.

Abbreviations Used in the Document

TPWODL	TP Western Odisha Distribution Limited
BA	Business Associate
HIRA	Hazard Identification & Risk Assessment
JSA	Job Safety Analysis
EHV	Extra High Voltage
SAFETY	Safety, Occupation Health, Environment & Disaster

	Management
MMG	Meter Management Group
EAG	Energy Audit Group
PPE	Personal Protective Equipment
SOP	Standard Operating Procedures
CSI/SI	Circle Safety In-charge / Safety In-charge
ASO	Area Safety Officer
NSO	Nodal Safety Officer
SC	Safety Coordinator
HoG / HoD	Head of Group / Head of Department
AGM / GM / VP	Assistant General Manager / General Manager / Vice President
CFO / Chief (O & S)/ CEO & MD	Chief Finance Officer / Chief (Operating & Safety) / Chief Executive Officer & Managing Director
COS	Corporate Operation Services
CAP	Centralized Account Payable System
PTW	Permit To Work
GCC	General Conditions of Contract.

- END -

Annexure 1 (Refer Para 3.1)

Business Associate Safety Management System Questionnaire

	Certification			
	The information provided in this questionnaire is a summary of the company's occupational health and safety management system.			
	Company Name:			
Turnover and experience:			Name of top officer:	
Date:			Position	
	Contract Details			
Contract Name			Contract Number:	

Business Associates Safety Management System Questionnaire	Marks	Yes	No	Score achieved
Safety Policy and Management				
- **Is there a written company Safety policy?** - If yes provide a copy of the policy, if No please refer Note 1.	1			
- **Does the company have an Safety Management system** - If yes provide details, if No please refer Note 1.	1			
- **Is there a company Safety Management System manual or plan?** - If yes provide a copy of the content page(s), if No please refer Note 1.	2			
- **Are Safety and occupational health responsibilities clearly identified for all levels of Management and staff?** - If yes provide details, if No please refer Note 1.	2			
Safe Work Practices and Procedures				
- **Has the company prepared safe operating procedures or specific safety instructions relevant to its operations and relevant work as per contract?** - If yes provide a summary listing of procedures or instructions, if No please refer Note 2.	1			

Certification				
- Comments				
- **Is there a register of injury or accident?** - If yes provide a copy (format)	1			
- **Is there a documented incident or accident investigation procedure?** - If yes provide a copy of a standard incident report form, if No please refer Note 2. - Comments	1			
Safety Training				
- **Describe how occupational health and safety training is conducted in your company** If No please refer Note 1.	2			
- **Is a record maintained of all training and induction programs undertaken for employees in your company?** - If yes provide examples of safety training records, if No please refer Note 2.	1			
- **Are regular safety inspections / audits are undertaken at worksites?** -If yes provide details (formats), if No please refer Note 3.	1			
- **Is there a procedure by which employees can report hazards at workplaces?** - If yes provide details if No please refer Note 1.	1			
Safety Monitoring				
- **Is there an officer / supervisor responsible for monitoring workplace / worksite safety?**	1			

Certification				
- If yes provide details				
Safety Performance Monitoring				
- **Are employees regularly provided with information on company health and safety performance?** - If yes provide details	1			
- **Has the company ever been convicted of an occupational health and safety offence?** - If yes provide details	NO Marks *(Negative mark ONE for each case)*			
- Has there been any major accident of employee at TPWODL site in past	NO Marks *(Negative mark ONE for each case*			
- Has there been any fatal accident of employee at TPWODL site in past. - (Note: Bid evaluation committee has to take cognizance of the incident and shall evaluate the bid only after formal approval of competent authority i.e. CTO. - In case of yes please refer Note 4.	NO Mark (Negative mark FIVE for each case)			
Minimum of 75% marks is required for qualification.		Total Marks achieved		
Company Reference				
1. Name of company *2. Name of company*				

Note

1: If company does not have formal procedure on Safety Management System than vendor may submit proposed Safety road map along with safety action plan and brief safety policy on his letter head signed by head of the organization.

2: The vendor may submit the same in the Safety Action Plan.

3: The vendor may utilize the same format of TPWODL or on request SAFETY group will assist the vendor in developing the audit system. For other points also vendor may take the assistance of SAFETY group for development of Safety management system.

4: The vendor may submit the Safety Improvement Plan and Safety Action Plan for his employees based on following points.

i. *Action plan for enhancing safety awareness*
ii. *Action plan for safety training of employee*
iii. *Action plan for increasing safety audit in field*
iv. *Action plan for provision and utilization of safety PPE.*
v. *Action plan for fatality reduction.*
vi. *Action plan for enhanced supervision at site*
vii. *Action plan for making employee more responsible and accountable for safety.*
viii. *Action plan for availability and utilization of all required tool and equipment.*
ix. *Safety Improvement done in last two years, specially highlighting those which have been taken after the fatal accident along with results.*
x. *Safety initiatives planed or started recently.*
xi. *Any other point.*

Based on above points and documentary evidences vendor will be required to submit a detailed report in support of his bid. The bid evaluation committee and competent authority will scrutinize the facts and the evidence submitted. If found satisfactory competent authority i.e. CTO may accord his approval for bid opening otherwise his tender shall be disqualified.

Annexure 2 (Refer Para 3.2 and 5.8)

Risk Assessment Form

Business Associate:
Scope of the work:
BA's Representative:
Telephone:
Signature: Date:

Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
Working at Height	Fall from height	2	1. Mandatory usage of JSA checklist prior to start of work 2. Use appropriate ladder 3. Use full body safety harness having double lanyard. 4. Use Electrical Safety Shoes if working on electrical network otherwise use safety shoes. 5. Use Safety helmet. 6. Use PPE as per the annexure 7 of this CSM document 7. Refer Work instruction related to Working at Height for other details 8. Use of metal scaffold to be ensured in height work (cup lock type) 9. Deploy competent workforce who are medically fit

Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
Working on electrical equipment / network	Electric flash / electrocution	3	1. Mandatory usage of JSA checklist prior to start of work 2. Use Electrical Safety Shoes while working on electrical network. 3. Use Electrical Safety gloves of appropriate voltage rating. 4. Use face shield / visor attached with helmet. 5. Use Safety helmet. 6. Use PPE as per the annexure 7 of this CSM document 7. Mandatory usage of Insulated tools & tackles on electrical system 8. Mandatory compliance for Lock Out & Tag out system. Refer Work instruction related to Working on electrical equipment / network for other details
Excavation / Civil work	Collapse of soil, fall in excavated pit leading to Injury	2	1. Use safety shoes. 2. Use Safety helmet. 3. Use PPE as per the annexure 7 of this CSM document 4. Hard Barricading of the worksite. 5. Refer Work instruction related to excavation / civil work for other details
Material lifting & Mechanical Erection work	Fall of material/object, Topple of crane,	2	1. Mandatory compliance of crane checklist 2. Visual condition check of lifting tools and tackles such as wire rope sling, belt sling, chain, pulley block, D-shackles, etc. shall be ensured. 3. The operator's physical fitness and alertness should be judged by sup. / EIC. 4. Use PPE as per the annexure 7 of this CSM document 5. Refer Work instruction related to Material lifting & Mechanical Erection work
Road Safety	Road Accidents	3	1. Mandatory compliance of TPWODL Road Safety policy

Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
Note: This information for the general indication purpose. The detailed risk assessment shall be conducted before start of the work by the authorized representative of the BA. The report of same shall be submitted to engineer in-charge along with annexure 4 of the CSM document.			

Guidelines for filling the Risk Assessment Form

- *Specific Task/Activity* - The documentation of each major task associated with the contract.
- *Potential Hazards* - The identification of hazards associated with each activity or task to be carried out.
- *Class of Risk* - Each hazard should be evaluated as a level of risk, described as Risk Class 1, 2 or 3 defined above.
- *Control Measure* - The identification and documentation of actions required to eliminate or reduce the hazards that could lead to accident or injury.

Hazard / Risks shall be classified according to the following schedule:

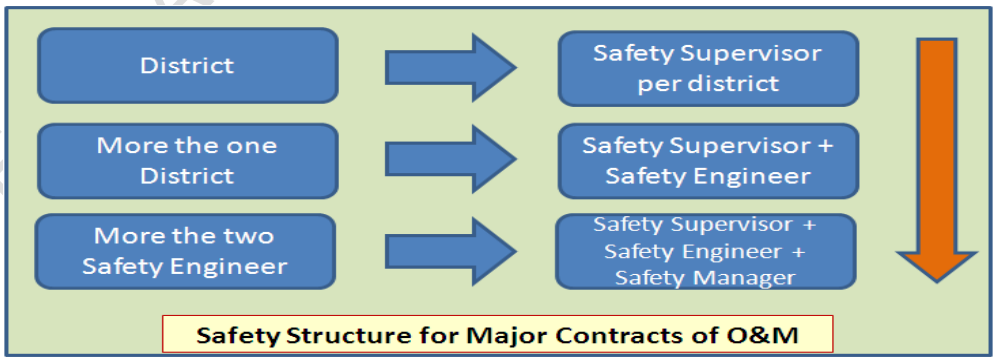
- Class 1: Potential to cause injury treatable with first aid
- Class 2: Potential to cause death or permanent injury
- Class 3: Potential to cause more than one or more lost time injuries.

Annexure 3.1 *(Refer Para 4.0)*

General Safety Conditions for the Maintenance of Distribution Network Contracts:

A BA awarded a contract (O&M) work of maintenance of distribution network will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPWODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPWODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPWODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPWODL approved list in *annexure 7.*
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPWODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPWODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPWODL.
- BA shall provide safety performance and Safety MIS (*annexure 9)* to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system in a district. In case the BA has been awarded work in more than one district, then the following safety structure will be adopted.

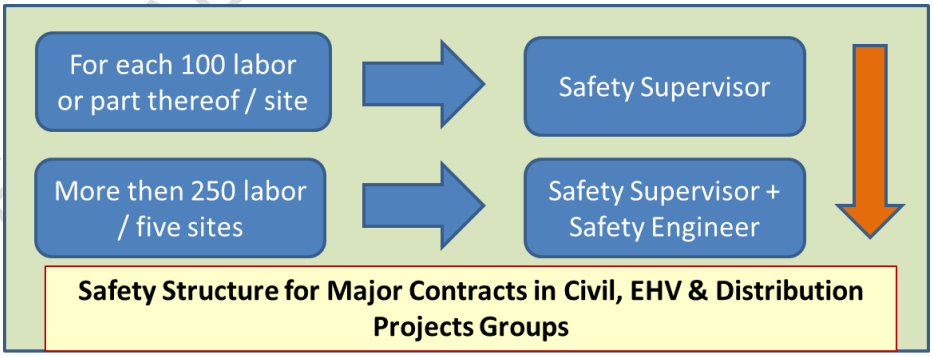


Annexure 3.2 *(Refer Para 4.0)*

General Safety Conditions for the Distribution Projects Major Contracts:

A BA awarded a major contract work of TS&P in area of a circle will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1.
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPWODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPWODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPWODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPWODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPWODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPWODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPWODL.
- BA shall provide safety performance and Safety MIS (*annexure 9)* to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system in the area. In case the BA has been awarded work in more than one circle, then the following safety structure will be adopted.

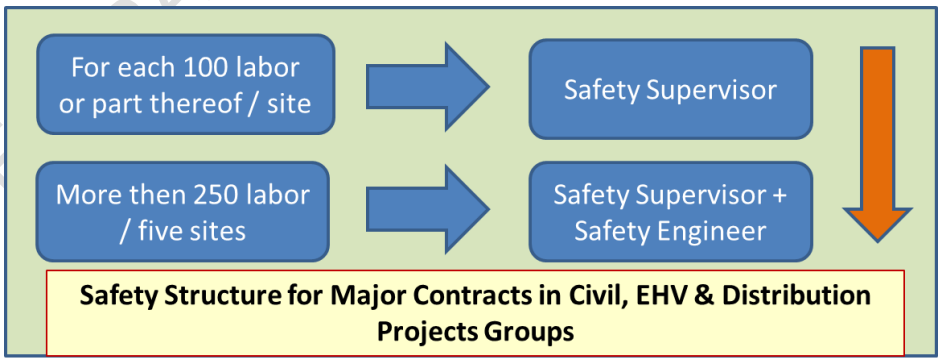


Annexure 3.3 ***(Refer Para 4.0)***

General Safety Conditions for the major EHV Projects Contracts:

A BA awarded a major contract work of EHV projects will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPWODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPWODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPWODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPWODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPWODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPWODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPWODL.
- BA shall provide safety performance and Safety MIS (*annexure 9)* to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system in the area. In case the BA has been awarded work in more than one circle, then the following safety structure will be adopted.
- BA shall refer Construction Safety Manual in TPWODL Safety Manual for details.

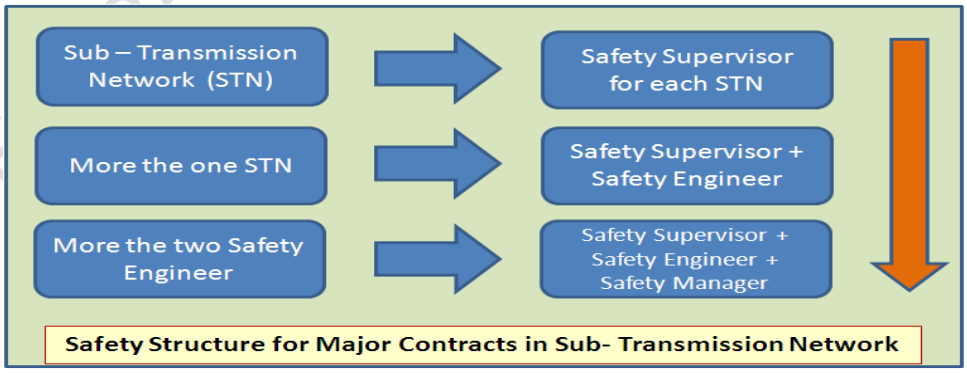


Annexure 3.4 ***(Refer Para 4.0)***

General Safety Conditions for the Maintenance of Sub – Transmission Network Contracts:

A BA awarded a major contract work of maintenance of sub – transmission network in area of a power system will be required to fulfil the following conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPWODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPWODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPWODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPWODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPWODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPWODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPWODL.
- BA shall provide safety performance and Safety MIS (*annexure 9)* to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Coordinator for managing a complete safety management system in the area. In case the BA has been awarded work in more than one area power system, then the following safety structure will be adopted.



Annexure 3.5 ***(Refer Para 4.0)***

General Safety Conditions for the major contract work in Civil / Generation Projects:

A BA awarded a major contract work of / in civil or Generation project will be required to fulfil the following safety conditions:

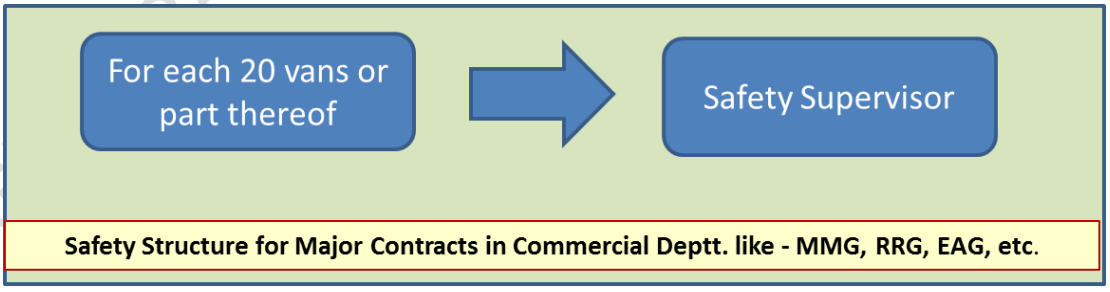
- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like: applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPWODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPWODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPWODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPWODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPWODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPWODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPWODL.
- BA shall provide safety performance and Safety MIS (*annexure 9)* to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor (for workforce up to 100 at site) / a safety engineer (for workforce up to 250 at site) / safety manager (for more than two safety engineers) for managing a complete safety management system at the project site. In case the BA has been awarded more than one major contracts, then the following safety structure will be adopted.
- BA shall refer Construction Safety Manual in TPWODL Safety Manual for details.

Annexure 3.6 ***(Refer Para 4.0)***

General Safety Conditions for the major contract work in Commercial Department like - MMG, RRG, EAG, etc.:

A BA awarded a major contract work in meter management group & energy auditing group will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPWODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPWODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPWODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPWODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPWODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPWODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPWODL.
- BA shall provide safety performance and Safety MIS (*annexure 9)* to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor for managing a complete safety management system for the work as per the following safety structure.
- The BA for the RRG work shall depute one Safety supervisor.



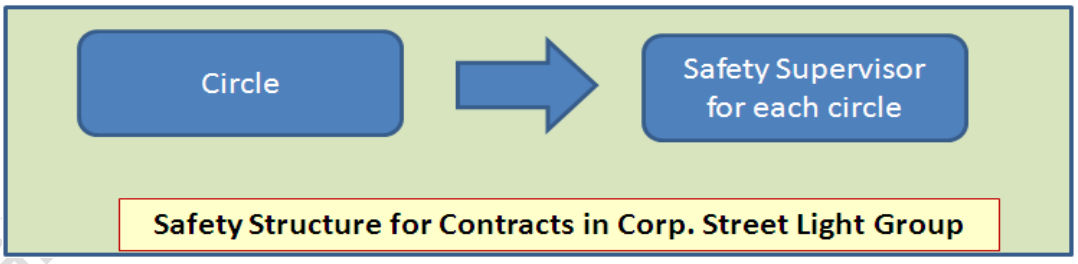
Safety Structure for Major Contracts in Commercial Deptt. like - MMG, RRG, EAG, etc.

Annexure 3.7 ***(Refer Para 4.0)***

General Safety Conditions for the major contract work in O&M of street light group:

A BA awarded a major contract work in operation and maintenance of street light group will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy and safety objectives of their company.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, etc.
- BA shall provide the filled safety management questionnaire as per Annexure 1
- BA shall conduct a job risk assessment and provide information as per Annexure 2
- BA shall abide by Safety manuals, guidelines of TPWODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPWODL.
- BA shall document the work practices and procedures in terms of Safety Management.
- BA shall ensure safety training and induction program for the employees
- BA shall conduct safety audits & inspections as per TPWODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment PPE as per the TPWODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPWODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPWODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPWODL.
- BA shall provide safety performance and Safety MIS (*annexure 9)* to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- Each BA shall ensure to depute a Safety Supervisor for managing a complete safety management system for the work awarded as per the below structure.



Annexure 4 *(Refer Para 3.3)*

Safety Undertaking by way of Affidavit

I_____ s/o_____R/o_____ (AUTHORIZED REPRESENTATIVE/PARTNER/DIRECTOR/PROPRIETOR) of M/S _____(name of company/firm)__ having its office at (Complete address of Company), authorized vide power of attorney dated ------/Board resolution dated----/letter of authority dated----, hereinafter referred to as **Contractor [or Business Associate (BA)]** which expression shall, unless it be repugnant to or inconsistent with the meaning or context thereof, be deemed to include its heirs, executors, administrators, and assigns do hereby affirm and undertake as under :

1. The present undertaking shall remain in force from the date of execution of contract awarded by TPWODL and shall be valid till the date of termination of the said contract by either parties. The undertaking is binding on me (contractor) as well as my sub-contractor and its employees, representatives etc.
2. That I(the contractor) will be responsible and liable to comply and abide by all the safety rules, instructions and regulations as may be specified and laid down by The TP Western Odisha Distribution Limited (TPWODL) so as enable TPWODL to achieve its goal of Zero On site incidences.
3. That the Contractor shall be fully responsible for ensuring occupational health and safety of its employees, representatives, agents as well as of its subcontractor's employees, at all times during the discharge of their respective obligations under the contract including any methods adopted for performance of their tasks / work.
4. That Contractor shall ensure ,at its own expense to arrange for and procure, implement all requisite accident prevention tools, first aid boxes, personal protective equipment, fire extinguisher, safety training, Material Safety Data Sheet, pre-employment medical test, etc. for operations & activities including as & when so specified by TPWODL specifically. , failing which TPWODL shall be entitled, but not obliged, to provide the same and recover the actual cost thereof from the Contractor's payments.
5. That the Contractor shall engage adequate and competent Safety – Supervisor / Engineer / Manager / Skilled persons at site as per the Para 5 (Qualification and experience of safety personnel) and Annexure 3 of Contract Safety Management.
6. That the Contractor shall engage the competent Site – Supervisor with each group of workers for safe and correct workmanship, proper co-ordination of material and site work as per contract.

7. That the Contractor shall immediately replace supervisor in case it is found to be not up to the level of skill and experience required as in skill and experience required in *annexure 5* of this document, but any such replacement shall be only with the prior concurrence of TPWODL .
8. That the Contractor and its subcontractors shall abide by all the safety guidelines as per Safety Manual, Contract Safety Management and other guidelines issued from time to time by TPWODL during the contract period.
9. That in case the Contractor and/or any of its Subcontractor fail to ensure the compliance as required in terms of this undertaking the Contractor shall keep and hold TPWODL / its directors / officers / employees indemnified against any / all losses / damage / expense / liability / fines / compensation / claims / action / prosecutions or the like which might be suffered by TPWODL or to which TPWODL might get exposed to as a result of any breach /wilful negligence /deliberate default on the part of the Contractor /Subcontractor in complying with the same. Contractor shall also furnish any press release, clarification etc. if sought by TPWODL for any near miss or safety violations, accidents, which are attributable to fault of Contractor.

DEPONENT VERIFICATION

Verified at Sambalpur on this _Day of _____20__ that the contents of the above affidavit are true and correct and nothing material has been concealed therefrom

DEPONENT

Annexure 5 *(Refer Para 5.4)*

SKILL / QUALIFICATION REQUIRED FOR ELECTRICIAN AND ELECTRICAL SUPERVISOR

Skill / Qualifications Required for Electrician *(Certificate of Competency Class-II)*:

1. Formal education in ITI – Wireman/ Electrician trade.

   OR

2. Working experience of minimum three years of practical wiring.

   OR

3. Have completed three years apprenticeship course through Apprenticeship Advisor, Govt. of Odisha / other state Govt. in the trade of Lineman / Wireman / Electrician.
4. A candidate must have attained the age of Eighteen years.

Skill / Qualifications Required for Electrical Supervisor (*Certificate of Competency Class-I)*:

1. Have at least five years' experience of practical wiring after passing the certificate of competency class-II i.e. electrician.

   OR

2. Recognized Degree or Diploma or equivalent qualification in Electrical Engineering from any Technical institute / College or University recognized by the Board.

   AND

   Must have completed the training/job in rectifying the common defects in electrical line and power installation for a period of one and three years after passing Degree or Diploma respectively

   OR

3. Possessing the valid certificate of certificate of competency class – 1 (Electrical Supervisor)

Annexure 6 (*Refer Para 5.6)*

Training Module for BAs Worker & Supervisor

Training for BA Supervisor **Duration – 02 Hrs / Month**

Methodology: **Lecture and Practical Demonstration of Safety Zone Creation**

Session: 1

Topic: **Electrical Safety Aspects**

Sub Topics:

1. Learning specifics of HT & LT Network of zone
2. Major type of HT / LT / service lines / street light maintenance works
3. Understanding the need of Safety
4. Understanding the safe process of maintenance:
    - Planning of the maintenance job
    - Availability of men, material & machine, PPEs, Safety gear and approved PTW
    - Briefing of the job by the supervisor of the TPWODL
    - Identification of Risks associated with the maintenance work and planning for controlling measures by TPWODL supervisor
    - Creation of safety zone by TPWODL supervisor and satisfying that the network is dead – Use of Neon Tester, Shorting Chain and Safety Tagging
    - Start of the work – Right person for the right job
    - Alert supervision
    - Completion of the job – Check points
    - Energization of network
    - Actions to be taken in case of some accident

Session: 2

Topic: **Use of Electrical Testing Equipment**

Methodology: **Lecture and Practical Demonstration**

Sub Topics:

1. Meggar, Hi Pot, Clamp On Meter, Neon Tester, Discharge Rod, Line tester etc.

Session: 3

Topic: **Awareness of Electrical Safety Aspects**

A. Understanding the need of this Training and Safety
B. Learning specifics of HT & LT Network
C. Major type of work to be carried out in zones
D. Switching Operations (Do's & Don'ts) including Street Light Switching
E. Working on Height *(practical demo also)*
F. Understanding the Safe Process of Maintenance / Working:
    - Planning of the job
    - Availability of men, material & machine, PPEs, Safety gear and approved PTW
    - Briefing of the job by the supervisor
    - Permit to Work
    - Safety Tagging and Lock Out Tag out

- Identification of Risks associated with the work to be carried out and planning for controlling measures by proper supervision
- Concept of "***Safety Zone***"
- Identification and use of Neon Tester, Shorting Chain, Clamp on Meter, Hi Pot, Meggar etc.
- Completion of the job – Check points
- Accident Theory & Incident Reporting
- Actions to be taken in case of some accident

Session: 4

Topic: Identification, Demonstration and Usages of Tools, PPEs and other Safety Gears and demonstration of working on HT pole

Session: 5

Topic: Practical demonstration of Safety Zone creation

FREQUENCY

Regular Safety Training Program

- It will be conducted for all field & supervisor staff of BA in such a manner that all BA Personnel attend at least two hours safety training during every month.

One Day Induction Safety Training Programs:

- This training will be for the new BA's personnel, who have been cleared by the Cross Functional Panel to undergo Safety training and who are likely to be deployed at various work sites of TPWODL by the BA, as a part of AMC / Work Contract.

Duration / Periodicity:

- Duration and periodicity has been defined above. However, this is subject to change at the discretion of TPWODL.

Annexure 7 *(Refer Para 5.7)*

LIST OF PERSONAL PROTECTIVE EQUIPMENT AND TESTING FREQUENCY

Sl. No.	Name of PPE	IS / EN Standard	Testing Frequency	Remarks	Ref Brand & Model
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298 (Part-2)	Monthly and visual check every day for any crack or damage in the leather or sole.		BATA (Model No.- Endura L/C) Liberty (Model No. – 7198-01 HT Barton Black – Warrior)
02	HDPE Safety helmet with chin strap and ratchet type for adjustment.	IS:2925-1984	Monthly and visual check every day for any crack in shell.		Karam (PN Safetech) Joseph Leslie Accent Industries Honeywell
03	Full body harness (Safety belt)	EN 361	Monthly and visual check every day of the bends and the harness.		Karam (PN Safetech) Joseph Leslie Accent Industries
04	Electrical Safety Gloves	EN: 60903 CE marked	Weekly and visual check for any crack and blow test before every work.	Manufactured not beyond 12 months.	Make Sparian / Sumitech / CATU supplied with inner cotton glove with over glove of split leather.
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	Monthly and visual check every day for any crack in shell.	Clear acrylic visor attached with safety helmet.	Karam (PN Safetech) Joseph Leslie Accent Industries Honeywell
06	Fireproof jacket for chest protection		Monthly and visual check every day.		
07	Safety Chain for shorting cum earthing.	As per TPWODL standard	Weekly and visual check before every work.	Made of brass, Total length – 5.5 meters and made of 12 SWG.	

Note:

1. *Any other Personal Protection Equipment required beyond above list will be according to BIS or EN Standards.*
2. *All Personal Protection Equipment will be checked by the engineer in-charge or SAFETY group of TPWODL.*
3. *Safety Representative of the BA has to maintain the record of the availability, condition and checking of the PPEs.*
4. *All tools required as per the contract must be according to respective IS / EN standards.*
5. *TPWODL may revise or add the above list of PPE and their specifications as and when feel necessary. The information about new specifications /models will be circulated by the Engineer In-charge (EIC), which shall adhere by the business associated in the shortest possible time. The EIC shall issue a memo / instruction to BA with timeline for implementation. Any delay will be treated as non- compliance / safety violations. Refer picture of each PPE given in next page.*

Pictures of PPE for reference purpose.

Sl. No.	Name of PPE	IS / EN Standard	Picture
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298(Part-2) and with test report of electrical resistance.	
02	HDPE Safety helmet with chin strap and ratchet type for adjustment.	IS:2925-1984	
03	Full body harness (Safety belt) The straps at shoulder and thigh shall have full pad for comfort. The back shall be so designed that harness straps do not tangle with each other.	EN 361:2002 EN 358: 2000 IS: 3521:1991/2002	

04	Electrical Safety Gloves – Composite type Soft electrical gloves as per size of individual.	EN: 60903 CE marked	
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	
06	Fireproof jacket for chest protection		
07	Safety Chain for shorting cum earthing.	As per TPWODL standard	  
08	Reflective jacket to each workman	As per TPWODL standard	

Note: Picture shown are for indicative purpose only. Actual product may differ.

Annexure 8 *(Refer Para 5.8)* LIST OF AUDITS TO BE CONDUCTED

Audits	Responsibility	Freq.	Ref. Doc.
Permit to Work & Field Audit	BA Safety Representative	Weekly	F04 (COR P - 12)
Tool Bag & PPE's Audit		Weekly	F06 (COR P - 12)
First Aid Box Maintenance Record		Fortnightly	F08 (COR P - 12)
Fire Extinguisher Record ***(Applicable for the BA involved in major construction works and have storage of flammable material at worksite)***		Monthly	F09 (COR P - 12)
Safety Talk Register		Weekly	F18 (COR P - 12)
Site Safety Audit		Daily	F29A (COR P - 12)

Note:

1. *(BA Safety Representative has to use the formats as per Safety process COR – P – 12 of TPWODL)*

Annexure 9 (*Refer Para 5.9)*

PERFORMANCE REPORT – SAFETY

FOR THE MONTH OF……

Name of BA: ……..

Name of the Project and Purchase order No: ……

Date of commencement of work: ……

Man Hour Worked in this month (No. of employees X 8 Hrs + Overtime): ……

Cumulative Man Hour worked: ……

Total Number of Minor Injury (this month): …… Minor Injury (Total)…….

Major Injury (this month): …….. Major Injury (Total): ……

Detail of the Incident / Sub Standard Acts and Condition

Activity	This Month	Cumulative (Total)	Day Lost (this month)	Days Lost (Cumulative)
No. of the Incident				
No. of lost time injuries				
No. of dangerous occurrences				
No. of near miss reported				
Substandard Act/Conditions observed			Attach details of observation of this month	
Safety Violation Notice received (from TPWODL) (both in numbers and in Rs.)	No.	No.	No. of violation letter received and compliance report for the TPWODL.	
	Rs.	Rs.		

Note: Cumulative means total from date of commencement of work according to the contract.

Detail of the Accident / Near Miss Incidents:

Date and Time	Type of the incident	Name of Employee	Brief Description	Corrective and Preventive actions recommended

Details of the Safety Violations:

Date and Location	Brief Description	Name of employee involved	Action Taken

Detail of the Safety Talk / Toolbox Talk / Safety Training

Date and Location	Topic (s)	Total Number of employees (Worker / Supervisor)	Number of participants (Worker / Supervisor)

Detail of the Safety Meeting

Date and Location	Number of participants	Topics discussed	Major Observations / Innovation

Detail of the Safety Inspection /Audit: (as per TPWODL site audit checklist F29A(COR-P-12)

Date	Area / Location	Major Observations	Recommendations	Action Taken

Any other Safety, Occupational Health, Environment & Disaster Management Promotional Activity (During this month):

Date	Location	Activity	Level of Participation	Number of participations

Signature of the BA Safety Representative Signature of ZM / HoG

Name, E. No. and Date Name, E. No. Date.

Note: The original form to be deposited with Engineer in-charge and a copy to SAFETY group on or before 5th of every month along with bill. List of training of the current month and status of PPE to be also mentioned individual wise.

BA may include additional lines if required. The TPWODL may revise the format as and when deemed required.

ANNEXURE-M

VENDOR APPRAISAL FORM

TO BE SUBMITTED BY VENDOR (To be filled as applicable)			
VENDOR:			
1.0	**DETAILS OF THE FIRM**		
	1.1	NAME (IN CAPITAL LETTERS)	:
	1.2	TYPE OF CONCERN (PROPRIETORY) Partnership, Pvt. Ltd., Public Ltd. etc.	:
	1.3	YEAR OF ESTABLISHMENT	:
	1.4	LOCATION OF OFFICE POSTAL ADRESS TELEGRAPHIC ADDRESSES, TELEX NO. FAX NO.	:
	1.5	LOCATION OF MANUFACTURING UNITS	:
		i) UNITS 1	:
		ii) OTHER UNITS	:
2.0	**PRODUCTS MANUFACTURED**		:
3.0	**TURNOVER DURING THE LAST 3 YEARS (TO BE VERIFIED WITH THE LATEST PROFIT & LOSS STATEMENT).**		:
4.0	**VALUE OF FIXED ASSETS**		:
5.0	**NAME & ADDRESS OF THE BANKERS**		:
6.0	**BANK GUARANTEE LIMIT**		:
7.0	**CREDIT LIMIT**		:
8.0	**TECHNICAL**		
	8.1	NO. OF DESIGN ENGINEERS (INDICATE NO. OF YEARS EXPERIENCE IN RELATED FIELDS)	:
	8.2	NO. OF DRAUGHTSMEN	:
	8.3	COLLABORATION DETAILS (IF ANY)	:
		8.3.1 DATE OF COLLABORATION	:
		8.3.2 NAME OF COLLABORATOR	:
		8.3.3 RBI APPROVAL DETAILS	:

		8.3.4 EXPERIENCE LIST OF COLLABORATORS	:
		8.3.5 DURATION OF AGREEMENT	:
	8.4	AVAILABILITY OF STANDARDS / DESIGN PROCEDURES / COLLABORA-TOR'S / DOCUMENTS (CHECK WHETHER THESE ARE LATEST/CURRENT	:
	8.5	TECHNICAL SUPPORT, BACK-UP GUARANTEE, SUPERVISION, QUALITY CONTROL BY COLLABORATOR (WHEREVER ESSENTIAL). (THIS CLAUSE IS RELEVANT WHEN VENDOR'S EXPERIENCE IS INADEQUATE)	:
	8.6	QUALITY OF DRAWINGS	:
9.0	**MANUFACTURE**		
	9.1	SHOP SPACE, LAYOUT LIGHTING, VENTILATION, ETC.	:
	9.2	POWER (KVA)	:
		MAINS INSTALLED	:
		UTILISED	:
		STANDBY POWER SOURCE	:
	9.3	MANUFACTURING FACILITIES (ATTACH LIST OF EQUIPMENT AS APPLICABLE)	:
		9.3.1 MATERIAL HANDLING	:
		9.3.2 MACHINING	:
		9.3.3 FABRICATION	:
		9.3.4 HEAT TREATMENT	:
		9.3.5 BALANCING FACILITY	:
		9.3.6 SURFACE TREATMENT PRIOR TO PAINTING/ COATING, POLISHING, PICKLING, PASSIVATION, PAINTING, ETC.	:
	9.4	SUPERVISORY STAFF	:
	9.5	ADEQUACY OF SKILLED LABOURS (MACHINISTS, WELDERS, ETC.)	:
	9.6	NO. OF SHIFTS	:
	9.7	TYPE OF MATERIAL HANDLED (SUCH AS CS, SS, ETC.)	
	9.8	WORKMANSHIP	:

	9.9	MATERIAL IN STOCK AND VALUE	:
	9.10	TRANSPORT FACILITIES	:
	9.11	CARE IN HANDLING	:
10.0	**INSPECTION / QC / QA / TESTING**		
	10.1	NUMBER OF PERSONNEL (INDICATE NO. OF YEARS OF EXPERIENCE)	:
	10.2	INDEPENDENCE FROM PRODUCTION	:
	10.3	AVAILABILITY OF PROCEDURAL WRITE UP/QUALITY PLAN	:
	10.4	INCOMING MATERIAL CONTROL AND DOCUMENTATION	:
	10.5	RELIABILITY/REPUTATION OF SUPPLY SOURCES	:
	10.6	STAGE INSPECTION AND DOCUMENTATION	:
	10.7	SUB-ASSEMBLY & DOCUMENTATION	:
	10.8	FINAL INSPECTION AND DOCUMENTATION	:
	10.9	PREPARATION OF FINAL DOCUMENTATION PACKAGE	:
	10.10	TYPE TEST FACILITIES	:
	10.11	ACCEPTANCE TEST FACILITIES	:
	10.12	CALIBRATION OF INSTRUMENTS AND GAUGES (WITH TRACEABILITY TO NATIONAL STANDARDS) (ATTACH LIST)	:
	10.13	STATUTORY APPROVALS LIKE BIS, IBR, ETC. (AS APPLICABLE)	:
	10.14	SUB-VENDOR APPROVAL SYSTEM AND QUALITY CONTROL	:
	10.15	DETAILS OF TESTS CARRIED OUT AT INDEPENDENT RECOGNISED LABORATORIES	:
		i) FURNISH LIST OF TESTS CARRIED OUT AND THE NAME OF THE LABORATORY WHERE THE TESTS WERE CONDUCTED	:
		ii) CHECK AVAILABILITY OF CERTIFICATES AND REVIEW THESE WHEREVER POSSIBLE	:
11.0	**EXPERIENCE (INCLUDING CONSTRUCTION / ERECTION / COMMISSIONING) TO BE FURNISHED IN THE FORMAT INDICATED IN APPENDIX)**		:
12.0	**SALES, SERVICE AND SITE ORANISATIONAL DETAILS**		:
13.0	**CERTIFICATE FROM CUSTOMERS (ATTACH COPIES OF DOCUMENTS)**		:

14.0	**POWER SITUATION**	:
15.0	**LABOUR SITUATION**	:
16.0 *	**APPLICABILITY OF SC/ST RELAXATION (Y/N)** **IF YES, SUPPORTING DOCUMENTS TO BE ATTACHED**	
17.0	**ORGANIZATIONAL DETAILS** 1. PF NO 2. ESI NO 3. INSURANCE FOR WORK MAN COMPENSATION ACT NO 4. ELECTRICAL CONTRACT LIC NO 5. ITCC / PAN NO 6. SALES TAX NO 7. WC TAX REG. NO	:
18.0	**DOCUMENTS TO BE ENCLOSED:** 1. FACTORY LICENSE 2. ANNUAL REPORT FOR LAST THREE YEARS 3. TYPE TEST REPORT FOR THE ITEM 4. PAST EXPERIENCE REPORTS 5. ISO CERTIFICATE –QMS, EMS, OHAS, SA 6. REGISTRATION OF SALES TAX 7. COPY OF TIN NO. 8. COPY OF SERVICE TAX NO. 9. REGISTRATION OF CENTRAL EXCISE 10. COPY OF INCOME TAX CLEARANCE. 11. COPY OF PF REGISTRATION 12. COPY OF ESI REGISTRATION 13. COPY OF INSURANCE FOR WORK MAN COMPENSATION ACT NO 14. COPY OF ELECTRICAL CONTRACT LIC NO 15. COPY OF PAN NO 16. COPY OF WC TAX REGISTRATION 17. DOCUMENTS IN SUPPORT OF SC/ST RELAXATION AT S.NO.16.0 18. GST Registration No	

*** Classification of BA s under SC/ST shall be governed under following guidelines:**

- **Proprietorship/ Single Ownership Firm:** Proprietor of the firm should be from SC/ST community. Governing document shall be Proprietorship Deed.
- **Partnership Firm:** Only such firms shall qualify which have SC/ST partners holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Partnership Deed.
- **Private Limited Company:** Only such firms shall qualify which have SC/ST directors holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Memorandum of Understanding (MoU) and/or Article of Association (AoA).

NOTE: Certification from SC/ST Commission shall be required for deciding upon SC/ST status of a person.

ANNEXURE-N

MANUFACTURER AUTHORIZATION FORM

(To be submitted on OEM's Letter Head)

Date: …….

Tender Enquiry No.: ……..

To,

Chief (Procurement & Stores)

TP Western Odisha Distribution Limited,
Burla,Sambalpur

Sir,

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

……..

and to subsequently negotiate and sign the Contract.

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

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

Yours Sincerely,

For ……..

Authorized Signatory

Contractor's Safety Code of Conduct

Reason for Change	Date of Last Revision	Prepared By	Reviewed By	Approved by
Inclusion of Odisha Discom and periodic Revision	*11-May-2015-R1* *15 August-2021-R6*	All Discom and CFT members from all cluster	Debi Prasad Acharya (Head-Safety-Odisha Discom	Suresh H Khetwani (*Chief safety and Environment*)

CONTENTS

1.0 Objective

- The Tata Power engages contractor workforce to execute, run and maintain various operating sites and facilities across locations for various business verticals including Generation, Transmission, Distribution and Renewable. The activities range from project execution, operation, maintenance to facilities management.
- The management of contractor safety represents a significant challenge for management. Tata Power has a responsibility to ensure that contractors are provided with enough information and support to enable them to conduct their roles safely and without endangering health and safety of their own workforce or that of our staff.

2.0 **Scope:**

- This procedure applies to all operating and project sites of The Tata Power Company Ltd and Group companies including new businesses like Electric Vehicle charging, Home Automation, Microgrid, Roof top solar etc. *This Code of Conduct also applies to all operating and project sites of four Odisha Discoms and New business based on mutually agreed timeline for implementation. R7*
- *This document is applicable to Odisha Discoms also. Odisha Discoms are a joint venture between Tata Power and the Government of Odisha with the majority stake being held by Tata Power Company (51%). ODISHA DISCOMS is a state electricity distribution utility with sole rights to distribution of electricity in the Odisha covering the distribution companies such as TPNODL, TPCODL, TPSODL and TPWODL. In accordance with the Electricity Act. ODISHA DISCOMS engages contractor workforce to execute, run and maintain various operating sites and facilities across locations The activities range from project execution, operation & maintenance of facilities. (R7)*

3.0 Definitions

3.1. **Order Manager/Engineer in charge:** Order Manager/Engineer in charge is the Tata Power-Division /DISCOM representative, who has the ownership of the given job.

3.2. **Site Safety Management Plan**: It is the safety plan agreed between Contractor and Tata Power-Division/DISCOM. It will contain the entire job specific safety requirement and will be signed by the contractor.

3.3. **Contractor/Business Associate/Vendor (BA)**: An individual or a company that provides services to Tata Power-Division/DISCOM under a signed contract.

3.4. **Emergency:** It is a serious, unexpected, or dangerous situation requiring immediate action, which may result in *loss of life,* loss of revenue/property, business discontinuity. In case of Emergency, services may be procured by selecting the qualified vendor based on the vendor category without the safety bid evaluation and approved by adequate authority of MB level or above.

3.5. **Expert Service jobs:** Jobs which needs expert services of contractor which does not involve direct exposure to the potential risk or work which involves only

supervisory work such as expert for AI-ML, expert for transmission and distribution network, expert for civil works, expert on transformers, expert for PSCC, expert for equipment overhaul etc.

3.6. **CEO/Chief/Head of division/Unit/Utility**: Business in charge who is overall custodian of the Tata Power-Division/DISCOM.

3.7. **Category A Vendor:** Vendor eligible to carry out Very High & High risk (as per Tata Power-Division Hazard Identification and Risk Analysis Procedure) and /or Long-Term Contract related to operation and maintenance (O&M) of plant. Vendors must fulfil the requirement specified for Category A in Appendix 4-CSMF-4 of this document.

3.8. **Category B Vendor:** Vendors eligible to carry out technical jobs, that are classified under Medium / low risk. Vendors must fulfil the requirement specified for Category B in Appendix 4-CSMF-4 of this document.

3.9. **Category C Vendor:** Vendors eligible for to carry out low or very low risk administrative and office jobs. For this he must fulfil the requirement specified for Category C in Appendix 4-CSMF-4 of this document.

3.10. **Category D Vendor:** All Consultants, Medical Practitioners or vendors taking job from Tata Power and working from their own premises (e.g., motor rewinding at vendor's shop floor, equipment sent for repair to vendor's works etc.) are classified as Category D Vendor.

3.11. **High Risk Jobs**: A Job or its activities are considered as Very High or High Risk when Order manager apply the "Tata Power Hazard Identification and Risk Analysis" procedure and found safety risk associated with are under Very High or High category. Indicative lists of jobs are given in appendix 14 of this document.

3.12. **Medium Risk Jobs:** Jobs or its activities are considered as medium risk when Order manager apply "Tata Power Hazard Identification and Risk Analysis" procedure and found the same as Medium Risk.

3.13. **Low Risk Jobs:** Any job or its activities are considered as Low or Very low risk while Order manager calculated it by applying "Tata Power Hazard Identification and Risk Analysis" procedure and found it under Low or Very Low category.

3.14. ***Long Duration Jobs:*** *When the duration of job is more than 12 months, it is considered as long duration job.* ***R7***

3.15. **High Value Jobs:** When the value of the job contract is Rs. One Crore or more, it is considered as High value job.

3.16. ***Strategic Business Unit-SBU/Division/Discom:*** *A strategic business unit is a fully functional, independently operational setup of a particular business and an important part of the Tata power company*. R7

4.0 Responsibilities

4.1 Order Manager/Engineer in Charge: Order Manager is Tata Power-Division /DISCOM representative, who is responsible for:

4.1.1 Finalizing the Site Safety Management Plan along with Contractor, Safety Concurrences Group, Divisional Safety Head and Expert (External or Internal) if required.

4.1.2 Ensure 100% safety capability building L1, L2, L3 for contractor work force and supervisor before start of Job

4.1.3 Ensure Contractor safety revalidation test for all work force quarterly *or Half yearly for new business such as Odisha Discom (R7)*.

4.1.4 *Conduct competency assessment of all critical work force working on High-Risk Jobs based on Experience, Technical skill and Safety capability through contractor representative along with division/Discom safety representative. R7*

4.1.5 Supervise and ensure work is carried out as per the Site Safety Management Plan including agreed Risk Assessment (HIRA/JSA) and Method Statement.

4.1.6 Conduct audit and evaluate Safety Performance of contractor.

4.1.7 Ensure contractors adhere to all statutory provisions.

4.1.8 In case any Exception needed in agreed safety management plan or in CSCC process for execution of job, *document control procedure-* ***TPSMS/GSP/DC/014*** *Clouse 6.3* will be applicable, and approval may be obtained by the Order Manager from adequate authority of *Chief of Division/CEO of Discom. (R7)*

4.2 Contractor/Business Associate/Vendor (BA): The person, entity or organisation who is executing the job for Tata Power-Division /Odisha Discoms under a contractual agreement and will be responsible for the following

4.2.1 To follow all Tata Power-Division /DISCOM Critical Safety Procedure, Rules and guidelines given in **CSM F3 Safety Terms and Conditions.**

4.2.2 Undertake job as per **CSM F9 Site Safety Management Plan** and method statements agreed with the Tata Power-Division /DISCOM.

4.2.3 Ensure 100% safety capability building L1, L2, L3 for contractor work force and supervisor before start of Job

4.2.4 Ensure Contractor safety revalidation test for all workforce quarterly *or Half yearly for new business such as Odisha Discom up to three years. R7*.

4.2.5 *Ensure competency assessment of all critical work force working on High-Risk Jobs based on Experience, Technical skill and Safety capability through Order manager or Engineer in charge representative along with division/Discom safety representative. R7*

4.2.6 Raise any concerns about their work and its safety with the Order Manager.

4.2.7 Report all injuries, near misses, unsafe acts/conditions, and occurrences to the Order Manager immediately.

4.2.8 Ensure that all sub-contractors follow the Tata Power Safety Procedure and agreed **CSM F9 Site Safety Management Plan.** *If subcontractor detail is not available at stage of Bid evaluation, then this can be agreed with Order manager or Engineer in charge before deployment. Ensure that all sub-contractors follow the Tata Power Safety Procedure and agreed CSM F9 Site Safety Management Plan*.**R7**

4.2.9 To follow all statutory requirements as per the laws of the land.

4.2.10 All vendors applying for category "A "jobs or submitting quote for high-risk jobs shall obtain certificates of ISO:9001, ISO:14001 and ISO:45001 before submitting quote for high-risk Jobs *or otherwise mention plan to get the certification.* R7

4.3 Safety Concurrence Group (SCG): It is Cross Functional Team constituted by Contract department with active support from Safety Team of the Tata Power Division/Discom safety team having representatives from Execution Department, Operation Department, Contract Department, and any other department as deemed fit. SCG will be responsible for the following:

4.3.1 Assessment of Safety Potential of new vendor before registration using **CSM F1 Process Flowchart for Vendor Registration** and **CSM F2 Safety Category Qualification Form.**

4.3.2 Safety Evaluation of the bids as per evaluation format **CSM F7 Safety Bid Evaluation Criteria**

4.3.3 Finalization of the **CSM F9 Site Safety Management Plan** submitted by the contractor.

4.3.4 During Safety Bid Evaluation for following types of jobs are evaluated: R7

4.3.4.1 High-Risk jobs, Medium Risk job, Major Shutdowns and Outages.

4.3.4.2 Capex jobs of High-Risk Category

5.0 Procedure

5.1 Registration of Business Associates (Vendors)

For Vendor Registration, Contract Department will issue following documents for evaluation of contractor's safety capability

1) **CSM F2 Safety Category Qualification Form**
2) **CSM F3 Safety Terms and Conditions**

The document **CSM F3 Safety Terms and Conditions** provides the information about Tata Power-Division /Odisha Discom safety System to the contractor. Contractor will submit the **CSM F2 Safety Category Qualification Form** with all relevant details and documents to Vendor Registration Initiator, which will in turn forward it to Safety Concurrence Group (SCG) for evaluation. The SCG will evaluate the details submitted by the contractor based

on a predetermined criteria **CSM F4 Safety Potential Evaluation Criteria** for Vendor Registration and will determine the category (Category A/B/C/D) for which the contractor will be registered. As mentioned in the above criteria, a site visit may also be organized by SCG prior to registration under Category A and B. In case, the contractor does not qualify the safety criteria, the contractor will not be registered. However, he may apply afresh for registration after 6 months. Please refer **Appendix 1: CSM F1 Process Flow Chart for Vendor Registration.**

5.2 Bid evaluation

At the time of placing the Purchase Requisition (PR), Order Manager is required to declare the risk involved in the of the job (i.e., High Risk / Medium Risk / Low Risk jobs, based on the RPN in HIRA). If the Job is "High /Medium Risk" then RFQ will be attached with following documents:

1) **CSM F3 Safety Terms and Conditions**
2) **CSM F6 Safety Competency Assessment Form**
3) **CSM F8 PPE requirements**
4) **CSM F9 Site Safety Management Plan Job Specific Safety Requirement (Educational and Professional Qualification, Skill & Experience Manpower, Tools, and Tackles, e.g., man lifter, use of drone, use & availability of rescue kit, Work Methodology etc.)**

Otherwise the RFQ will be attached only with **CSM F3 Safety Terms and Conditions.**
Contracts department will collect duly filled **CSM F6 Safety Competency Form** along with the bid. All other stakeholders will also put their efforts to get all relevant safety data during meeting / discussions with the vendor. SCG will evaluate the document as per the **CSM F7 Safety bid evaluation criteria**. If any specific condition related to Contract is required to be conveyed to the contractor, Site safety team will attach the same as Annexure for specific conditions of job and submit it to contract team along with safety bid evaluation form. Commercial bid of contractor will be considered for evaluation by contract team only if contractor is qualified in safety bid. Site Safety Management Plan, defining the complete procedure of executing the job at site will be signed by the contractor and SCG after mutual agreement. Contract will attach a copy of Site Safety Management Plan along with PO to the successful bidder. Please refer **CSM F5 Process Flow Chart for issuing RFQ and PO significant health and safety risk associated with it.**

5.3 Capability Building:

Before issuing gate pass:

For Odisha Discom: All Tata Power contractor and subcontractor workforce is required to

attend Site Safety Orientation Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry. This Safety Orientation Course will be for duration of minimum half day. The information provided during the orientation will include, but is not limited to Job rules, personal safety, and conduct, Hazard's reporting, reporting of injuries, Emergency procedures, Safety Activities and Program including disciplinary measure and incentives, Critical safety procedure relevant to the job

For Tata Power Divisions: All Tata Power contractor and subcontractor workforce is required to attend L1 Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry.

For TataPower and Discom: Appropriate practical training such as SHE L1, L2& L3 is given to ensure that a jobholder, either supervisor or worker, is competent to do his/her job safely. The skill training is provided through TPSDI, and other agencies authorized by Tata Power on the list of 15 critical Safety procedures mentioned under safety procedures. Duration of course is as specified by Division/Discom. Contractor shall ensure that concerned workmen are provided with adequate training before he/she is allowed to execute the work. An evaluation test will be conducted after the completion of the training. Those BA employees, who meet the minimum required competency, will be provided with Certificate or Training /Competency Card, which is valid for 3 years, post which the employee must reappear for the assessment. If the workman is not able to qualify the assessment, he/she will be given 3 additional attempts to clear in 3-month time frame failing which he/she will not be allowed to work on Division/Discom any jobs. *After expiry of Certificate or Training /Competency Card again one day recertification of L1, L2 and L3 skill training will be provided. R7.*

The Contactor shall bear the conveyance and food expenses of his staff for attending training sessions and capability building sessions in new business-like Odisha Discom.
The Contactor shall bear the entire cost of L1/L2/L3, the costs towards training, salaries/wages, boarding and lodging of his staff for attending training sessions and capability building sessions These trainings are offered on nominal chargeable basis payable by Contractor and rates shall be decided by TPSDI from time to time in case of training trough TPSDI. Generally, L0 is of one day, L1 is for 2 days for each critical procedure and L3 is for one day. Around Rs 700+GST is approx. cost /Day/Candidate. - R7

All contractors' workmen and Business Associate must attend Safety foundation course Training, all workmen engaged in critical jobs must clear and get certified for critical procedures applicable on his work like Work at Height and Electrical safety-LT & HT/LOTO&LC separately and all supervisors must complete supervisor certification in safety.

Competency assessment of all critical workforce to be carried out for all who has taken L2 training. R7

5.4 Recognition to the Prior Learning in Safety-R7

If "Order Manager" recommends and "Head of the Safety Department of Discom" is satisfied with the safety knowledge and competency of the employee of contractor, a test may be conducted by Tata power Skill development Institute/ other recognized institute to assess the prior learning in safety. If employees of the contractors pass in such test, he will be exempted from appearing in SHE L1 training. *This assessment is on nominal chargeable basis and rates are decided by TPSDI from time to time.*

5.5 Safety performance retention(R7): A certain percentage of the bill value will be retained against every running bill as safety performance retention. The amount will be released with the last invoice or every six-month based on Safety Performance Score of contractors. The retention amount will be calculated based on contract value as below. (R7)

Risk Category-(R7)	Contract Value	Retention Amount (%)
Very high/High risk job/ Medium Risk jobs	Up to 10 Lakhs	2.5
Very high/High risk job/ Medium Risk jobs	10 – 50 Lakhs	2
Low/Very Low Risk jobs	10 – 50 Lakhs	1
Very high/High risk job	0.5 to 10 Cr	2
Medium Risk jobs	0.5 to 10 Cr	1.5
Low/Very Low Risk jobs	0.5 to 10 Cr	1
Very high/High risk job	>10 Cr	1.5
Medium Risk jobs	>10 Cr	1

1. *The safety retention amount will not be applicable if there is clause of Contract Performance Bank Guarantee (CPBG) and safety performance of contractor is as per desired criteria.*
2. *If safety performance of contractor is not as per desired criteria (as per Appendix 10 – CSM F10 – Process Flow Chart for Safety Performance Evaluation and Appendix 11: CSM F11 - Safety Performance Evaluation Criteria- R7.) then safety retention percentage as mentioned in table above will be deducted from running bill.*
3. *Bidder to give understanding that if there are any deductions required to be made for safety non-performance as per the Safety Performance Score, then Tata Power shall recover any such deductions against safety non-performance directly from the monthly bills / final settlement or it shall be within its right to recover such sum from accounts payable or the CPBG or the retention of the Contractor available with Tata Power for the said contract between the Contractor and Tata Power. R7*

For all other contracts retention amount is applicable as per table given above.

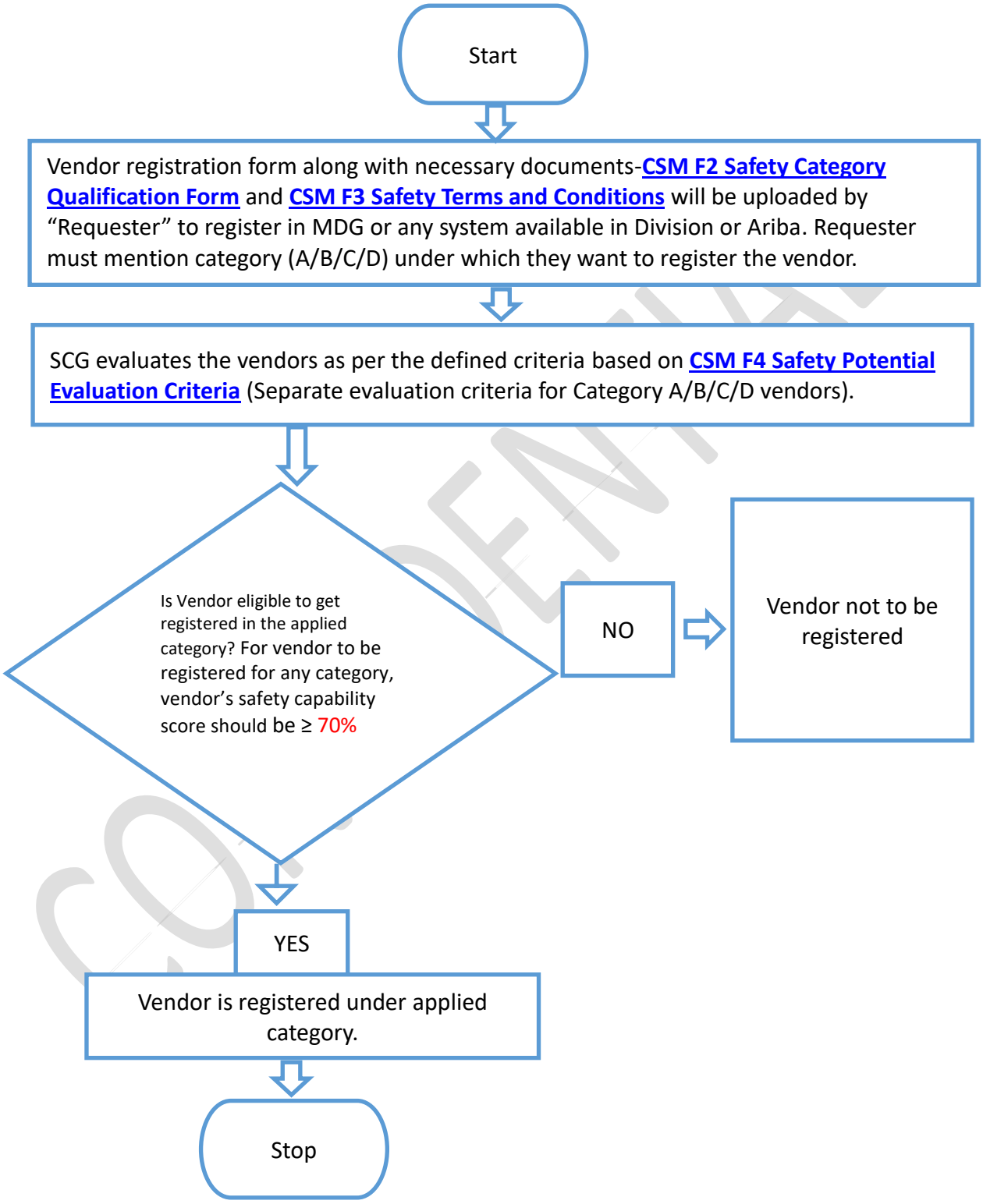
4. *The retention amount against non-safety performance saved and Penalty will go to a separate Safety Improvement Fund.R7*
5. For the contract value of more than Rs 1 Cr or contract duration more than 12 months, the retention amount shall be released half yearly based on safety performance. For all remaining contracts, the retention amount will be released with the final bill.
6. Safety performance bonus 1% (limiting to 50 lakhs) of the invoice value will be considered at the end of the job if the contractual safety performance score is 100%.

5.6 Safety Performance Evaluation:

During the time of job execution, regular site inspection will be carried out by the Tata Power-Division /DISCOM officials to evaluate monthly safety performance of the contractor as per **CSM F11 Safety Performance Evaluation Report** and monthly score will be maintained by the Order Manager. Violations will be dealt as per **CSM F12 Safety Violation Penalty Criteria**. Please refer **CSM F10 Process Flow Chart for Safety Performance Evaluation**. Percentage of retention amount is usually mentioned in safety terms and conditions.

1. During the progress of the work, concerned site Supervisor/Engineer/Safety representative will visit and inspect the work site regularly and evaluate the safety performance of the contractor based on matrix **Appendix 13** and apply the Consequence management policy/Penalty criteria as applicable.
2. The evaluation criteria include Lead Indicators such as percentage of workers trained in TPSDI, inspection of critical equipment. Lag indicators such as Fatalities, LWDC and man-days lost.
3. In case of job stoppage due to safety violations / unsafe observations at the site, no time extension from PO completion date shall be given to the contractor, if such delays are attributable to contractor.
4. In case of fatality, limb loss or loss of property, vendor must pay for liability, legal, statutory, and additional mutually agreed settlement charges imposed by the appointed committee by Division Chief/CEO. This charge is over and above the retention amount. The committee will finalize penalty amount based on factors such as advice by statutory authorities, contract value and impact of accident etc.
5. Order Manager, Head of Business and functional Chief have the authority to terminate the contract as per **CSM F12 Safety Violation Penalty Criteria** Through contract department.

Appendix 1: CSM F1 - Process Flow Chart for Vendor Registration



Appendix 2: CSM F2 - Safety Category Qualification form

1. "**Safety Category Qualification Form**" is part of vendor registration form. It needs to be filled by the contractor at the time of Registration and should be submitted to Requester / Order Manager with all relevant documents.
2. The same will be evaluated by Safety Concurrence Group of the Division (SCG).
3. Information provided by contractor will be verified during site visit.

Safety Category Qualification Form

Please consider my application for

Category A Vendor: Vendor eligible to carry out Very High- and High-risk O&M/Project jobs

Category B Vendor: Vendors eligible to carry out technical jobs, classified as Medium / low risk

Category C Vendor: Vendors eligible for to carry out low or very low risk administrative and office job

Category D vendor: All Consultants, Medical Practitioners or vendors taking job from Tata Power and working from their own premises.

<table>
<tr><td colspan="4">Name of the Vendor:</td></tr>
<tr><td>Sr. No</td><td>Safety Information</td><td>Yes / No</td><td>Remarks</td></tr>
<tr><td>1</td><td>Certified for
i. ISO 45001,
ii. ISO: 14001
iii. ISO: 9001
(ISO certificates to be issued from reputed accreditation agencies specified by Tata Power)</td><td>i. Y/ N
ii. Y/ N
iii. Y/ N</td><td>If Yes, Attach copy of the certification.

If No, mention plan to get the certification.</td></tr>
<tr><td>2</td><td>Safety Statistics for current and Last Three (3) Years

- LTIFR

- LTISR</td><td>Yes/No</td><td>
<table>
<tr><td></td><td>Current Year</td><td>Year 1(Last FY)</td><td>Year 2</td><td>Year 3</td></tr>
<tr><td>LTIFR</td><td></td><td></td><td></td><td></td></tr>
<tr><td>LTISR</td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
</table>

Name of the Vendor:

3	Any Compensation paid due to accidents during current and last three years?	Yes/No	<table><tr><th></th><th>Amount (INR)</th><th>Manhour</th></tr><tr><td>Current Year</td><td></td><td></td></tr><tr><td>Y1 (Last FY)</td><td></td><td></td></tr><tr><td>Y2</td><td></td><td></td></tr><tr><td>Y3</td><td></td><td></td></tr></table>
4	Any prosecution against you by statutory bodies/clients during last three years due to statutory violations, criminal negligence towards safety and dereliction of duty of care towards your employees? Is any case still pending against you?	Yes/No	If yes, give details. If no, give an undertaking that no case is pending against you and you have not been prosecuted by statutory bodies or clients.
5	Do you have Safety Policy? Safety Principles? And Lifesaving Rules?	Yes/No	If yes, attach copy of the documents available.
6	Do you have Safety training process?	Yes/No	If yes, attach safety training process and average training manhour of your employees for the last three years.
7	Do you have a system for recording, reporting, and investigating all incidents or near misses?	Yes / No	If yes, show the incident statistics of last three years and implementation of CAPA.
8	Do you have a disciplinary action program against your employees for violation towards safety rules and procedures?	Yes/No	If yes, show the records of disciplinary action taken the last three years.

Name of the Vendor:			
9	Do you have a reward and recognition scheme for your employees who show exemplary safe behavior and contribute to overall safety improvement at site?	Yes/No	If yes, show the records of Reward and Recognition given during. the last three years.
10	Do you engage in safety promotional activities?	Yes/No	If Yes, Show the proof of engagement in safety promotional activities.
11	Have you been recognized or awarded or rewarded by government bodies of clients for showing excellence in safety management in your jobs during last three years?	Yes / No	If Yes, Show proof.
12	Do you provide adequate quality of PPEs to your workmen?	Yes/No	If yes, please provide details of PPE Matrix and if required, samples for inspection.
13	Do you have Safety organization structure e.g., Safety Officers and Safety Committees?	Yes/No	If yes, attach copy of the safety organization structure, details of safety committees and safety professionals.
14	Name and address of sites where work is in progress or worked earlier	Yes/No	Site details to be attached for inspection by Tata Power-Division /DISCOM Officials.

Note: If you respond NO to any of the above questions, you can mention your plan to get the required documents.

I hereby confirm that the information provided above are true. I give my consent to be penalized as deemed fit in case any information given above are found to be false.

I will abide the general safety guidelines mentioned in the purchase order / work order and will ensure to prepare and follow site specific safe operating practices in consultation with the site-in-charge and safety professional. I will abide by penalty scheme in case of non-compliance.

Signature :

Name and Designation:

Stamp of Organization :

Appendix 3: CSM F3 - Safety Terms and Conditions

(Attached as a separate document under the title CSM F3 – Safety Terms and Conditions)

Appendix 4: CSM F4 - Safety Potential Evaluation Criteria for Vendor Registration

At the time of vendor registration, vendor will be registered under 4 categories

1) **Category A**- Vendors eligible to carry out High risk Jobs
2) **Category B**- Vendors eligible to carry out technical jobs that are Medium/low risk
3) **Category C**- Vendors eligible to carry out administrative and office jobs
4) **Category D**- Outsourced Jobs / Consultants /Medical Practitioners / Suppliers etc

For vendors to be registered under **Category A/B**, a safety potential evaluation will be carried out based on following parameters. (Actual **score is safety capability score)**

Sr No	Description	Weightage (%)	Actual Score
1	Does the service provider have a valid 45001 Certification?	10	
2	During site visit check for safety adequacy at site	20	
3	Check the Safety statistics of Service provider (If available than 10 otherwise Zero)	10	
4	Check the trend LTIFR/LTISR for last 3 years (If less than 0.2 than give 10 Marks if between 0.2 to 0.3 than give 5 marks and otherwise Zero	10	
5	Has there been any prosecution / conviction for any Contravention regarding safety and Health provision under the factories Act/Electricity Act / BOCW Act and Rules framed there under? If yes Give Zero otherwise 10 Marks.	10	
6	Check the Safety orientation & training process of Service provider- Records of Safety training provided to safety officer/supervisor /workmen during last 1 year as percentage (%) of total employed by service provider ✓ **Safety Officer:** >80% of employees: 5 Marks, 50 to 79% of employee: 2.5 Marks and <50%: Zero. ✓ **Safety supervisor**: >80% of employees: 5 Marks, 50 to 79% of employee: 2.5 Marks and <50%: Zero. ✓ **Workmen:** >80% of employees: 10 Marks, 50 to 79% of employee: 5 Marks and <50%: Zero	20	
7	Check the organizational structure for safety professionals & engineers / supervisors. ✓ Check Availability of number of Safety Officers from government recognized institute as per workforce strength. 1 in 50 employees than 10 Marks, if 1 in 100 than 5 Marks otherwise Zero.	15	

	✓ Check Availability of Qualified workforce from government recognised institute/TPSDI. 100% of safety officers qualified than 5 Marks, 50% TO 99% Than 2.5 Marks and if less than 50% than Zero Marks.		
8	Certified/skilled workers as a percentage of overall workforce	5	
	Total	100	

Evaluation Criteria for Category C

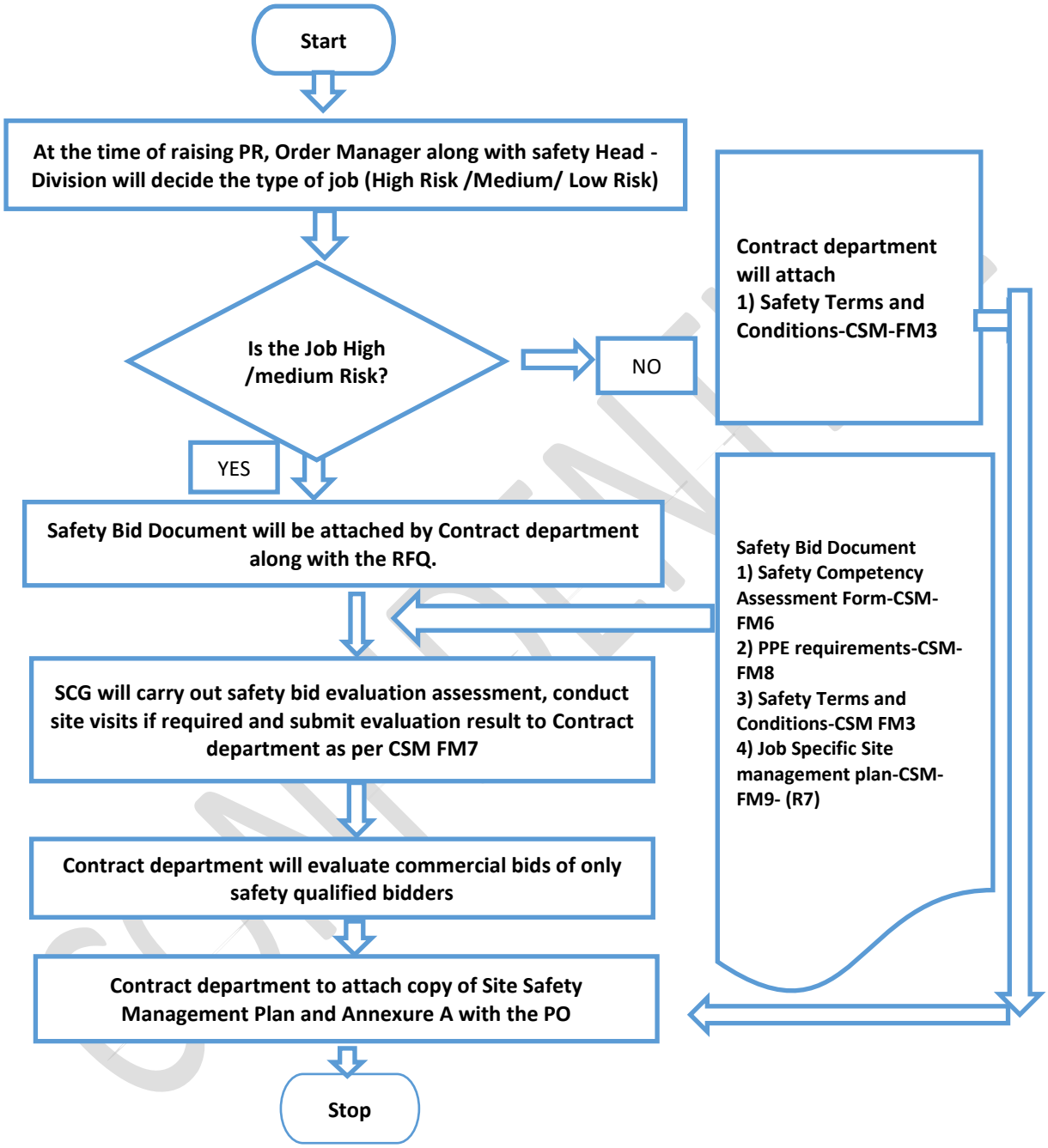
Sr no	Description	Weightage (%)	Actual Score
1	Does the contractor have a valid ISO 9001 certification?	40	
2	Check the Safety statistics of Service provider (If available than 10 otherwise Zero)	10	
3	Check the trend LTIFR/LTISR for last 3 years (If less than 0.2 than give 20 Marks if between 0.2 to 0.3 than give 10 marks and otherwise Zero	20	
4	Has there been any prosecution / conviction for any Contravention regarding safety and Health provision under the factories Act/Electricity Act / BOCW Act and Rules framed there under? If yes Give Zero otherwise 10 Marks.	10	
5	Check the Safety orientation & training process of Service provider- Records of Safety training provided to safety officer/supervisor /workmen during last 1 year as percentage (%) of total employed by service provider ✓ **Safety Officer:** >80% of employees: 5 Marks, 50 to 79% of employee: 2.5 Marks and <50%: Zero. ✓ **Safety supervisor**: >80% of employees: 5 Marks, 50 to 79% of employee: 2.5 Marks and <50%: Zero. **Workmen:** >80% of employees: 10 Marks, 50 to 79% of employee: 5 Marks and <50%: Zero	20	
	Total	100	

Evaluation Criteria for Category D

Category D does not require any evaluation as it is for outsourced job outside the Tata Power company premise.

For vendor to be registered for any category, vendor's safety capability score should be ≥ 70%.

Appendix 5: CSM F5 - Flow Chart for Issuing RFQ and PO



Appendix 6: CSM F6 - Safety Competency Assessment Form (Template)

Name of the Vendor/Bidder:
Name of the Sub Vendor (If job is given to Sub Vendor):
Description of the Job:
Request for Quotation (RFQ) No.:

Vendor/Bidder to mandatorily provide the below safety competency related information:

1. Proposed Manpower Deployment Schedule : -

Type of manpower	Qualification	Experience	Month 1	Month 2	Month 3	.....
Project /*AMC Manager(R7)*						
Site In Charge						
Safety Manager						
Safety Officer						
Supervisors						
Technicians						
High Skilled workmen						
Skilled workmen						
Semiskilled workmen						
Lineman						
Helpers						
Drivers						
Unskilled						
Others(R7)						

Instruction to Bidders:

i. Indicate the overall site manpower deployment schedule as above
ii. Indicate direct or subcontracted employees by using color code given below:
Direct Bidder Employee – Green
Partly Direct / partly Subcontracted – Yellow
4.3.5 **Subcontracted – Red** *If subcontractor detail is not available at stage of Bid evaluation, then this can be agreed with Order manager or Engineer in charge before deployment Ensure that all sub-contractors follow the Tata Power Safety Procedure and agreed CSM F9 Site Safety Management Plan*.**R7**

iii. Against each category, indicate minimum educational qualification and work experience

iv. Add rows to include other specialized manpower, if any.
v. Extend columns to cover the entire duration of the proposed contract.
vi. If the operation is in shifts, then indicate shift in charge and / or safety officers required for each shift operation.

2. List of Tools, Tackles, Machines and Equipment: -

Bidder/ Vendor to provide the list of tools, tackles, equipment **to be used during the job / project execution**. Bidder/Vendor to ensure that all the lifting tools and tackles, pressure vessels are duly certified by the competent person authorised by the Chief Inspector of Factories of the respective state prior to start of the job

Sr. No	Description of Tools / Tackles	Capacity / Rating	Quantity	Make	Year of manufacture	Remarks
1						
2						
3						
4						
5						
……						

3. Safety Records:

Bidder to provide the details of fatalities and lost workday cases (LWDC), occurred in last three years (data to be provided for the last completed FY and preceding 2 years).

Description	Safety Data for current and Last 3 Years			
	Current Year	Year 1 (Last FY)	Year 2	Year 3
		20__ - __	20__ - __	20__ - __
Fatalities (Nos.)				
Lost Workday Cases (Nos.)				

In case of no fatalities, LWDC during any year, the form may be filled stating NIL against the respective year. Bidders are encouraged to also submit the RCA / incident investigation reports and the learning's implemented out of the above reported incidents

4. Job Safety Plan/ Method Statement:

Bidder to provide / enclose a detailed Site/Job Safety Plan along with a Method statement detailing the execution philosophy (how the bidder intends to execute the Job/Project), identifying all key activities which are required to be performed by the contractor at Site.

Bidder to also list down all high-risk activities and provide the Hazard Identification and Risk Assessment (HIRA) for all such high-risk activities involved in the site work.

(Use Method Statement template attached as Appendix 9)

5. PPE Requirement -R7

Division/DISCOM Requirement	Bidders Response
The Bidder/Vendor shall ensure that all PPE of Approved standards as per CSM F8 – PPE Requirements shall be always available and shall be used by his employees with no exception whatsoever. Bidders to also ensure Standard PPE matrix of Tata Power to be followed for all activities.	
10% Buffer stock of PPEs to be provided by bidders at each circle to meet any contingency	
Bidder will ensure that sample PPEs to be submitted/approved by Safety Department along with EIC at the time of submission of Safety bids for evaluation In case bidder manpower found using substandard or any PPEs which are not approved by the Tata Power-Division /DISCOM representative, then Tata Power-Division /DISCOM will provide the same to manpower deployed at the cost of bidders.	

6. ***Vehicle Deployment*:** Bidders to provide details of all vehicles deployed during execution of work-(R7)

S. No.	Vehicle No.	Vehicle Type	Location	EV/CNG/Diesel/Petrol	Year	Whether CNG endorsed on RC

7. ***Crane Deployment***-(R7)**:** Bidders to provide details of crane to be deployed during the execution of work as and when required. Bidders to provide approved new gen crane ACE Model SX150, ACE FX150 and Escorts Model TRX 1550.

Sl No	Crane No	Location	Year

8. ***Training Records***-(R7)**:** Bidders to provide training records of employees deployed for the execution of work during last one year. These training includes OHS (Occupational Health and Safety) Training, Training on SOP/Work Procedures and Medical Emergency trainings imparted at their own facility, cost, and expenses. Bidders to provide the following details:

Tata Power-Division /DISCOM **Requirement**	**Bidders Response**
Training records of employees at their own facility, cost, and expenses for last one year	
Training facility available with Bidders	
Future road map for enhancing the competency of workforce	

9. ***Rewards and Recognition***-(R7)**:** Bidders to provide the details of process deployed in their organization for sharing and resolution of safety concerns raised by their employees. Also, bidders to provide the details of Rewards and Recognition process in their organization for safety to encourage the morale of their workforce.

10. **Management System Certification: -**

Sr.No	**Certification**	**Yes / No**	**If Yes, Year of Certification**	**If No, Target date for Certification**
1	ISO 9001			
2	ISO 14001			
3	ISO 45001			
4	Any other (Specify….)			
Note: Please attach certificates to support above. In case not accredited for above but applied for, application letters may be attached.				

Appendix 7: CSM F7 - Safety Bid Evaluation Criteria

The User must select whether the job is high /Medium Risk and long duration at time of raising the PR.

1) The decision whether job is "is high /Medium Risk "or not has to be made by order manager based on Risk involved (Risk Priority Number in HIRA) of the Jobs. An indicative list of high-risk jobs is attached as Appendix 14. *The risk assessment will be done along with Division safety Head. R7*
2) *If a technical job is of low risk with estimated duration of the contract more than one year, the job should be treated as "**long duration**". R7*
3) All Safety bids will be evaluated by Safety Concurrence Group. Structure of SCG will be declared by contract department with the assistance of Division / Discom safety. Safety team will audit bid evaluation process of a few selected jobs and Quality of evaluated safety Bids.
4) Records of jobs sent by for Safety Bid evaluation shall be maintained by Contract team in existing tracing sheet along with other jobs.
5) *Safety bid evolution will be done by SCG within one working week. R7*
6) *Contracts / Division shall provide a list of regular Contractors participating in multiple tenders during the year for a one-time umbrella Safety Evaluation of Bidder (as against the specific Bid evaluation) by indicating the nature of the type of jobs / works which the BA usually participates in bidding. SCG shall evaluate such bidders for the requested works and on satisfying the evaluation criteria may be granted a Safety Pre-Approved status for the specific types of work (e.g., O&M of Boiler, Turbine, CHP, AHP, Turnkey EPC, Switchyard, Distribution Electrical Contract etc.) which shall be initially valid for a period of 1-year and shall thereon be extended further against revalidation / re-evaluation as required. R7*
7) *Business Associates having such Safety Pre-Approved status for the type / category of jobs shall be exempted from submission of Safety Evaluation Bid against each tender provided that their Safety Pre-Approved status is valid for the subject work / tender. R7*
8) *A suitable system shall be developed by Contracts to track the validity of such Safety Pre-Approved status of Bidder for timely renewal failing which the Safety Pre-Approved status shall cease and Bidder will thereon have to provide Safety Bids with each tender until such one-time approval is renewed. R7*

Safety Bid Evaluation will be based on following parameters.

Evaluation Criteria-(R7)

S. No.	Description	Max Marks	Criteria for evaluation
1.	Qualification and Experience of manpower	15	As per Clause No. 1
2.	Tools and Tackles to be provided by bidder	15	To be evaluated as per approved tool list of concerned departments.
3	PPE Requirements	5	To be evaluated as per approved PPEs standard and PPE Matrix specified in CSM
4	Job Safety Plan/ Method	15	To be evaluated as per as per SOP/WI/HIRA
5	Vehicle Deployment	5	Weightage will be given for CNG Vehicles with endorsement of CNG kit on RC/Electrical Vehicle
6	Crane and Mechanized heavy equipment Deployment	15	Date of manufacturing or running hours
7	Training Records	5	Training records to be evaluated with evidence and scoring to be done as per availability of records
8	Certificate Accreditation	5	ISO 9001-2.5 Marks ISO 45001- 2.5 Marks ISO14001- 2.5 Marks. Total Max 5 Marks for all Three
9	Safety Initiative for learnings implemented in accidents in organization and work force (Fatal / Non-Fatal)	15	Maximum 15 marks will be awarded for visible evidence in terms of safety initiative deployed based on learning of accident in organization and workforce in case of accident
10	Rewards and Recognition Process	5	Maximum 5 marks will be awarded for R&R process evidence
Total		**100**	
Safety Records (Lag Parameter)- -(R7)			
1.	Fatal Accident	(-) 10 Marks for each case with max of 15 marks	For any fatality in Tata power /Other company in Current and last three years 10 marks will be deducted with maximum up to 15 marks. For new entrant BA, these marks will be deducted for Past safety records. If and BA found hiding such facts, then contract will be terminated immediately during the execution stage.

2	LWDC (Non-fatal)	(-) 5 Marks for each case with max of 10 marks	For each LWDC (Non-Fatal) case in Tata power /Other company in Current and last years, 5 marks will be deducted with maximum up to 10 marks. For new entrant BA, these marks will be deducted for past safety records. If and BA found hiding such facts, then contract will be terminated immediately during the execution stage.

Final Qualifying Criteria

S. No.	Description	Max Marks	Criteria for evaluation
1.	Qualified Bidders	More than 70 marks	Marks Obtained. 60 Marks for New business-like Odisha Discom for one year from CSCC implementation date.

		Minimum Requirement	Weig ht age (%)	Score Obtained
Manpower	**Safety Officer (1 per 500 workers) or as per requirement**	**Qualification** - Safety Officer shall possess recognized degree in any branch of engineering with practical experience in similar industries of Min 2 years and Advance Diploma In Industrial Safety by State technical board. (Each state government prescribes the qualification of safety officer.). Require knowledge of Local language. **Experience**- Minimum 2-year experience in relevant field as mentioned in the job in PR.	5	
	Safety Supervisor (1 per work site up to max. 50 workers)	**Qualification-** Supervisor shall possess ITI/ Diploma in relevant field. PDIS is desirable, but not mandatory. Require knowledge of Local language. **Experience**- Minimum 5-year experience in relevant field as mentioned in the job in PR.	5	

		Training – Trained and certified by Tata power Skill development Institute or equivalent institute in relevant safety procedures. **Note:** On request of the contractor/Users - TPDSI should vet & certify the skilled & experienced Technician if Technical Qualification is not adequate.		
	Qualified Technician (Skilled workers as electrician, rigger, fitter, welder, cable jointer, line men etc.)	**Experience**- Minimum 2-year experience (or experience prescribed by state government) in relevant field as mentioned in the job in PR. **Training** – Trained and certified by TPSDI or equivalent institute in relevant safety procedures.	5	
Tools & Tackles	Equipment / Machines/ Tools & Tackles (lifting and shifting tools)	The list of Equipment /Machines / Tools and tackles to be used for job to be submitted by the contractor. Evaluation of the list will be carried out based on 1) Suitability as per the relevant job 2) Make and age of the tools from authorized agencies defined by the user. 3) Certification by the competent authority of respective state.	15	

Appendix 8: CSM F8 - PPE requirements-(R7)

The Contractor shall ensure that the following PPE of Approved standards shall be always available and shall be used by his employees with no exception whatsoever. • PPE shall be conforming to BIS/DGMS/DIN specifications, in good condition and shall be comfortable to his employees, when used. This is indicative. For better clarification refer PPE procedure-***TPSMS/GSP/PPE/023.*** as per safety terms and condition Appendix 3 CFM 3 in detail. R7

PPE Requirement

1	All contractor's employees at site	Safety Florescent Jacket (orange color), Safety helmet & safety shoes with composite or steel toe cap
2	Workers mixing asphalt, cement, lime / concrete	Safety goggle & protective Hand gloves and footwear, Nose mask.
3	Welders / Grinders/Gas cutters	Welding screen/goggles, safety shoes, leather hand gloves, aprons, leg guard
4	Stone breaker	Protective goggle, hearing protection, anti-vibration hand gloves and Protective clothing.
5	Electricians / Linemen	Rubber hand gloves *with correct voltage rating and expiry date normally one year from Manufacturing date-(R7)* & Electrical resistant shoes, Safety helmet with induction strip to alert about presence of voltage for those linemen who climb the poles or work on electrical equipment
6	Workers working at a height of 1.8 Meter or above.	Double lanyard full body harness, fall arrestor and safety net made of reinforced nylon fiber ropes firmly supported with steel structures, Work positioning attachment

PPE Type and Testing Frequency

Sl. No.	Name of PPE	IS / EN Standard	Testing Frequency	Remarks
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298 (Part-2)	Monthly and visual check every day for any crack or damage in the leather or sole.	

02	HDPE Safety helmet with chin strap and ratchet type for adjustment for non-Electrical work	IS:2925-1984	Monthly and visual check every day for any crack in shell.	
03	Full body harness (Safety belt)	EN 361	Monthly and visual check every day of the bends and the harness.	
04	Electrical Safety Gloves	EN: 60903 CE marked	Weekly and visual check for any crack and blow test before every work.	Manufactured not beyond 12 months.
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	Monthly and visual check every day for any crack in shell.	Clear acrylic visor attached with safety helmet.
06	Fireproof jacket for chest protection		Monthly and visual check every day.	
07	Safety helmet with induction Strip for linemen and working for electrical work-Class E	EN 397/2012	Monthly and visual check everyday	Induction Strip alerts presence of voltage
08	Shorting clamps, crocodile clamps, Discharge Rod and Neon tester		Monthly and visual check everyday	For discharging the residual voltage and test before touch

Pictorial View of PPEs for reference purpose

Sl. No.	Name of PPE	IS / EN Standard	Picture
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298(Part-2) and with test report of electrical resistance.	

02	HDPE Safety helmet with chin strap and ratchet type for adjustment for Nonelectrical work and electrical work	IS:2925-1984/ EN 397/2012	
03	Full body harness (Safety belt) The straps at shoulder and thigh shall have full pad for comfort. The back shall be so designed that harness straps do not tangle with each other.	EN 361:2002 EN 358 : 2000 IS: 3521:1991/2002	
04	Electrical Safety Gloves – Composite type Soft electrical gloves as per size of individual.	EN: 60903 CE marked	
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	
06	Fireproof jacket for chest protection		
08	Reflective jacket to each workman	As per Tata Power standard	

These pictures are indicative. Actual product may vary.

Note:

1. Any other Personal Protection Equipment required beyond above list will be according to BIS or EN Standards.
2. All Personal Protection Equipment will be checked by the engineer in-charge or SAFETY group of company.
3. Safety Representative of the BA must maintain the record of the availability, condition and checking of the PPEs.
4. All tools required as per the contract must be according to respective IS / EN standards.
5. Company may revise or add the above list of PPE and their specifications as and when feel necessary. The information about new specifications /models will be circulated by the Engineer In-charge (EIC), which shall adhere by the business associated in the shortest possible time. The EIC shall issue a memo / instruction to BA with timeline for implementation. Any delay will be treated as non- compliance / safety violations.

Appendix 9: CSM F9 - Site Safety Management Plan / Method Statement

Site Safety Plan / Method Statement (Template)

This Method Statement describes the specific safe working methods which will be used to carry out the described work. It gives details of work procedure with control measures to counter health and safety issues related to this work. The listed content of this Method Statement can be changed/modified subjected to job scope / specifications, but task specific method statement once finalized & approved, that should not be modified during work execution without permission from the approving authority.

Project/Job Name		
Scope of work: -		
Drawing References: -		
Detail of Sub contractors involved: -		
Method Statement Prepared By: - Designation: - (e.g., Site Manager)	Signature	Date

1.0 Introduction (*Describe purpose of the work, give details of type and scope of work being carried out)*

2.0 Location of Work (*Give site address and precise location on site where work is to be carried out)*

3.0 Safety Document /Specific Approval Required (Details of any safety documents or specific approval i.e., Client specific approval required to undertake the work)

5.0 Role & Responsibilities of Personnel/Parties Involved in activities: Clearly define roles and responsibilities of all personnel involved in activity i.e., Site management staff including subcontractors' staff, Project Manager/Site Manager of principal contractor, Sub Contractor Site Manager, Project Engineer, Safety officer, Competent Supervisory Staff etc.)

6.0 Working/Activity Description: - *It is important that all operatives should have clear idea of those operational sequences and responsible supervisor must verify their competency prior to their engagement in operation.*

6.1 Pre-Working Checks

6.2 Resources (Equipment, tools including manpower) Details *i.e., Equipment and Tools, specific operational equipment, test kits, lifting resources, Details of materials to be used in operation, including any reference to COSHH assessments in case of use of any chemicals, Details of the manpower allocated to the task, e.g., titles, qualifications, competences, direct manpower, contractors. Details of plant, tools, and equipment to be used for the work, including the availability of relevant statutory documents, checks or inspections etc. Details of fencing, barriers, cones, chains, dangers notices, warning signs etc.*

Tools required for work:

Sr.No	Tools /Equipment /Machine	UOM	Required Qty.	Remark
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

6.4 Operational Sequence of work*: - Full description of the work, setting out the methodology in a sequential manner, including any reference to any identified operational restraints. Also refer here sec. 5.0 responsibilities part for every step of work sequence).*

S. No	Activity	Details of job sequence	Risk Involved	Control Checks
1.				
2.				
3				
4				
5.				

6.7 Final Checks & restoration of work area after completion of work: *Those checks to be carried out by responsible supervisor in witness of his line hierarchy by use of specific checklist of certain operational checks and once those completed satisfactory, PTW (if applicable) to be closed and isolation arrangements to be restored by removing barricades/cautionary tags.*

7.0 Task Specific Hazards: - *Refer to Task Specific Risk Assessment and attach in appendix*

Attachment: - Specific Risk Assessment

In addition, please provide below control measures in risk assessment *(as applicable).*

Fall Protection Measures: (Where Work at height cannot be avoided)	
Control Measures for Electrical Hazards	
Others Hazard if any (please provide details)	

Hazardous Substances to be used in job: (Attach MSDS if required)							
	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N

7.0 Emergency Provisions: *Relevant operational possibility of a programme in the case of emergency situation i.e. electrical supply restoration. In addition, emergency response provisions i.e., first aiders, firefighting, and first aid arrangements, nearest onsite/offsite emergency response also to be considered during emergency planning.*

8.0 "5S issues" / Waste Disposal/ Housekeeping and Environmental issues: *Details waste disposal processes and or housekeeping activities, Details of environmental impacts and control measures.*

9.0 Personal Protective Equipment (PPE): *Tick on PPE requirements for the task/Job*

Safety Helmet / Hard Hats		*Safety Shoe / Safety Boots*	
Gum Boot		*Double Lanyard Safety Harness with work positioning attachment*	
Electrical Hand gloves		*Other hand gloves*	
Eye protection		*Respiratory protection*	
Ear Protection		*Electrical Arc flash suit*	
Chemical resistant suit		*Reflective Jackets*	
Any Other		*Any Other*	

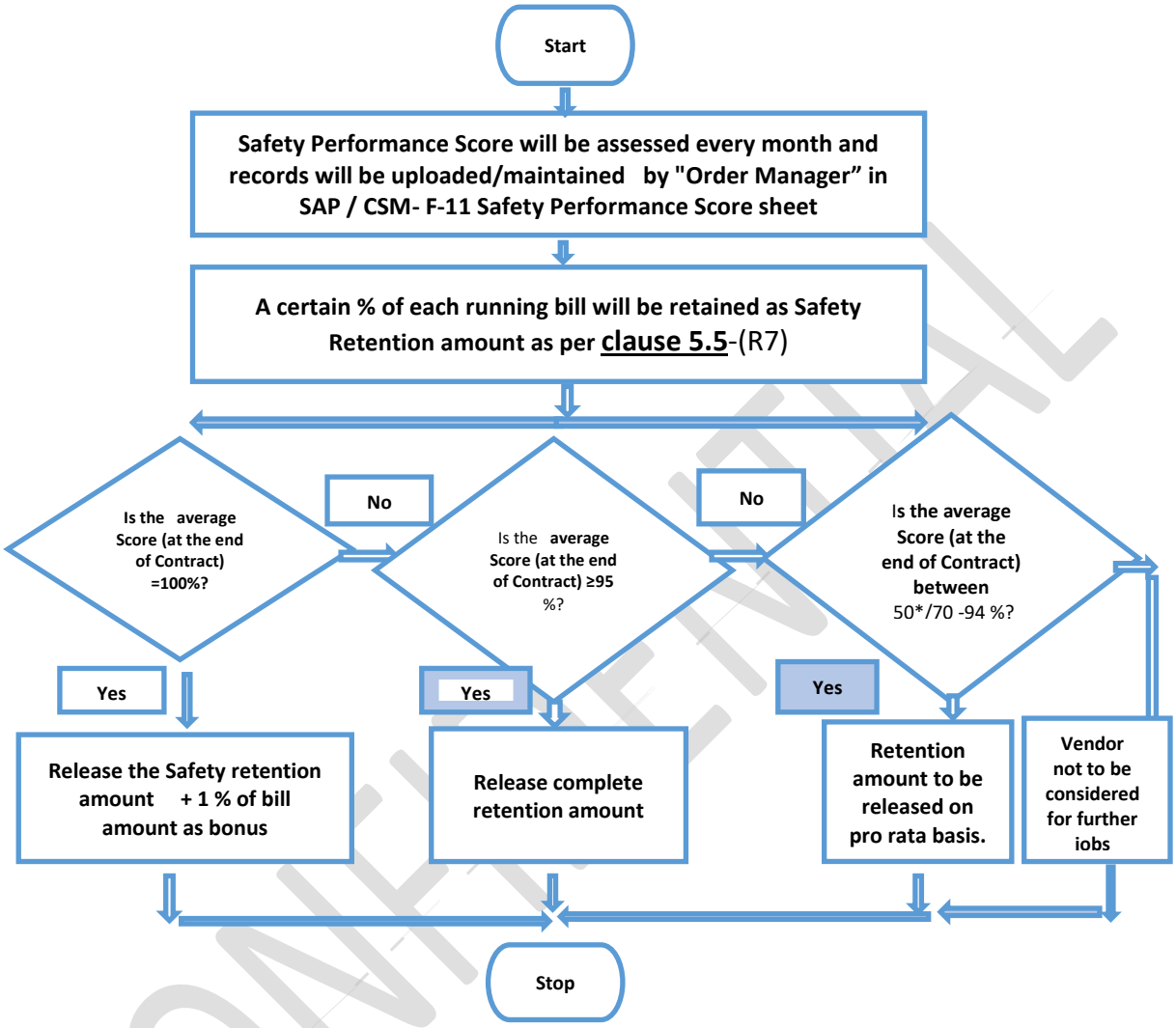
10.0 First Aid facilities and Nearby Hospitals Details

- Name of On Site First Aider
- First Aid Box Location
- Location of nearest hospital

11.0 Occupational Health, Fitness and COVID-19 related Preparedness:

• Please give a brief writeup / methodology of your organization's plan to avoid impact of the COVID-19 pandemic at Tata Power working site. • Please give brief details of occupational health and hygiene related interventions planned by your organisation to ensure good health and fitness of workforce at Tata Power site.

Appendix 10 – CSM F10 – Process Flow Chart for Safety Performance Evaluation



*** For New Business such as Odisha Discoms**-(R7)

Appendix 11: CSM F11 - Safety Performance Evaluation Criteria

Safety Performance Evaluation Report- CSM F11

Sr. No	Parameter	Unit of Measurement	Target	Weightage	Actual Performance	Actual Score
Lead Indicator						
1	% of Employee certified in TPSDI/Authorized agency	%	100%	20		
2	Monthly inspection and replacement of damaged Personal Protective equipment -PPE by contractor	%	100	10		
2	Monthly inspection and replacement of damaged Critical Equipment, lifting Tools & Tackles and hand tools used at site by contractor	%	100%	15		
3	Condition of critical tools, tackles, and equipment to be checked by order manager or Engineer in Charge.	%	100%	10		
4	Safe Disposal of Waste generated (Designated way) Records of Waste generation (Hazardous waste, oily cotton waste, E Waste) No effluent to drain or discharge to ground	Yes / No	Yes	10		
Lag Indicator						
1	Number of Fatalities	No	0	15 / 20*		
2	Number of Lost workday case (LWDC) (reportable)	No	0	10 / 15*		
3	No of Recordable Cases (Exclude Fatalities and LWDC)	No	0	5 / 0*		
4	Man-days Lost	Man-days	0	5 / 0*		
					Final Score	
					Invoice Value	
					Amount to be released	

Safety Performance Evaluation Criteria

Lead Indicators

		Target			
1	% of employees certified in TPSDI/Authorized agency	100%	51% to 99%	50%	<50%
	Score	**20**	**Pro-rata**	**10**	**0**
2	Monthly inspection and replacement of damaged Personal Protective equipment - PPE by contractor	100%	99% to 50%	<50%	
		10	**5**	**0**	
2	Monthly inspection and replacement of damaged Critical Equipment, lifting Tools & Tackles and hand tools used at site by contractor	100%	99% to 50%	<50%	
	Score	**15**	**7**	**0**	
3	Condition of critical tools, tackles and equipment *to be checked by order manager*	100%	<100%		
	Score	**10**	**0**		
4	Safe (designated way) Disposal of Waste generated, Records of waste (Hazardous Waste – Oily cotton waste – E- waste etc.) generation No effluents to drain/discharges to ground	YES	NO		
	Score	**10**	**0**		

Lag Indicators

		Target		
1	Number of Fatalities	0	>0	
Score	**Score**	15 / 20*	0	
2	No of LWDC - Reportable	0	>0	
Score	**Score**	10 / 15*	0	
3	No of Recordable Cases (Exclude Fatalities and LWDC)	0	1	>1
Score	**Score**	5 / 0*	5	0
4	Man-days Lost	0	1-5	>5
Score	**Score**	5 / 0*	5	0

* *For New Business such as Odisha Discoms*-(R7)

Appendix 12: CSM F12 - Safety Violation Penalty Criteria

Major Violations and Escalation matrix-(R7)

Consequence of safety violation observed not related to incidents or accidents		Violations				
Sl. No.	**Safety Violation**	**1st**	**2nd**	**3rd**	**4th**	**Subsequent violation**
1	Working without required PPE such as Helmet/gloves/safety shoes/Safety harness etc.	A	B	C	D	Will Attract the same penalty as 4th violation
2	Working without proper tools and tackles	A	B	C	D	
3	Poor or bad condition of Crane/Hydra/Vehicle and/or Incompetent driver and/or helper).	B	C	D	E	Termination of Contract and blacklisting after repetition of violations (3 to 4 times as the case may be)
4	Improper Working at Height	B	C	D	E	
5	Untrained /unauthorized workman engaged in high-risk jobs	B	C	D	E	
6	Violation of SOP or WI or LOTO	C	D	E		
7	Working without PTW or LC / Without authorization / Without creating Safe Zone	C	D	E		

Legend	Action to be Taken	Responsibility	Penalty (INR)	Repeat Violations
A	Levy of Penalty	Order manager / EIC	5000	The no. of repeat violations shall be calculated cumulative during the contract period, not on a monthly basis
B	Memo to BA and Levy of Penalty	Order manager / EIC	10000	
C	Memo to BA and Levy of Penalty	Order manager / EIC	25000	
D	Memo to BA and Levy of Penalty	Order Manager / EIC	50000	
E	Memo to BA, Levy of Penalty, Termination of Contract, Blacklist	Order Manager / EIC	100000	

Other Violations and Penalty

Penalty shall be imposed on the contractors under the following circumstances for breaching the contractual agreements. The list is not exhaustive, but indicative.

Sl. No.	Description of Violation	Severity	Penalty (INR)
1.	Unhygienic/Bad condition of PPE	2	500
2.	Unsafe Act/Condition of Severity 4	4	4000
3.	Unsafe Act/Condition of Severity 5	5	5000
4.	No Earthling of Electrical equipment	5	5000
5.	Working without efficient supervision	4	4000
6.	Non-reporting of incidents	3	3000
7.	Starting the job without Toolbox Talk	4	4000
8.	Electric cable tied with metal wire / Use of damaged electrical cable / Use of two core cable	3	3000
9.	Rubber mat not available in front of electrical panels.	3	3000
10.	Inserting naked wire into the socket instead of a plug	5	5000
11	Inflammable materials stored inside PSS/FCC/Distribution Room	5	5000
12	Water accumulation found near electrical panels / equipment	5	5000
13	Grinding wheel/ Coupling/ Piling winch/other rotating parts without guard	4	4000
14	Inadequate illumination of working area	3	3000
15	Bringing inside PSS/FCC or any other work area any chemicals without approval.	5	5000
16	Loose materials in work area which can fall down or fly during a storm	5	5000
17	Misusing emergency facilities like fire hydrant line/ hose box/ spray system/ eye wash etc.	3	3000
18	Entering restricted areas like switch yard, hazardous material storage room etc. without authorization	3	3000
19	Not using 24 V lamp inside confined spaces	3	3000
20	Bypassing/overriding safety interlocks	5	5000
21	Working besides road without proper barricading and monitoring of traffic	5	5000

22	Smoking in prohibited area (Closed Go-downs, Storage of flammable material, Storage of Gas cylinders, PSS , Offices etc.)	3	3000
23	Improper stacking of materials in Storage Yard	4	4000
24	Sleeping at workplace	3	3000
25	First aid box not available / in locked condition	2	2000
26	Appointment of subcontractor without his Safety Bid Evaluation and/or without the permission of engineer in charge or Order manager.	5	5% of order value
27	Bad Housekeeping with respect to ***TPSMS/GSP/GHK/022*** • 1st Instant • 2nd instant • 3rd instant • 4th instant • Subsequent instants	2	• 1000 • 2000 • 5000 • 10000 • 10000
28	Violations related to vehicles with respect to ***TPSMS/CSP/RSP/015.*** • Parking without wheel choke • Parking in undesignated area • Heavy vehicle without helper or co-driver • Seat belt not available / not used • Driver without license • Heavy vehicles without reverse horn • Using mobile phone while driving • Lights/mirrors not working /broken	3	1000 per each violation
28	Violation in Gas cutting and Gas cylinder handling • Cylinder valve without guard • No flashback arrester • Leaky DA/Oxygen hose • Cylinders not kept in secured manner • Cylinder trolley not available • Cylinders are transported by manual rolling	5	2000 per each violation
29	Violations in Lifting Operations w.r.t. to *TPSMS/CSP/HEMS/005* • Hook latch missing • Load raised or swung over people or occupied areas of building • Persons standing within the swing area of the crane • No barricading of crane working area • Use of damaged lifting tools and tackles	5	2000 per each violation

	• Lifting tools and tackles not tested / Test certificate expired • Crane operator without proper license • Angular loading • Lifting / shifting heavy material without guide rope • Using mobile phone during loading and unloading jobs		
30	Violation in Scaffolding work w.r.t. to TPSMS/CSP/SCAF/007 • Unstable scaffolding/nonstandard Scaffolding in use • Handrails/mid rails/toe guards missing • Safety harness not anchored on fixed structure • Opening found in working platform	5	2000 per violation
31	Violation in Excavation Work w.r.t. to TPSMS/CSP/EXS/002 • Loose material falling into excavated pit • Water logging in excavated pits / trenches • Inadequate or no barricading • Undercut / cave in found on sides of excavated pits	4	2000 per violation
32	Caution boards, danger signs (luminescent /red) along with emergency contact number are not found displayed.	3	3000
34	Spillage of hazardous material/chemicals during transportation	4	4000

Penalty for Incidents / Accidents-(R7)

Consequence of incident / Accident		Incident / Accident				
Sr.No.	**Type of Injury**	**1st**	**2nd**	**3rd**	**4th**	**Action Required**
1	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-fatal	**F**	**F**	**G**	G	
2	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-Fatal (Two or more non-Fatal in one event)	**G**	**G**	**H**		**Intolerable**
3	Single fatality	**G**	**H**			
4	Multiple fatalities (Two or more fatalities in one event). Anywhere in Tata power.	**H**				

Legend	Action to be taken	Responsibility	Penalty (INR)	
F	Memo to BA and Levy of Penalty	Order Manager/Engineer in charge	200000	The no. of violations shall be calculated cumulative during the contract period for all contracts in SBU, not on a monthly basis
G	Memo to BA and Levy of Penalty	Order Manager/Engineer in charge	500000	
H	Memo to BA, Levy of Penalty, Termination of Contract and Blacklisting the BA	Order Manager/Engineer in charge	1000000	

Appendix -13: CHECKLIST TO BE USED DURING SITE VISIT

Checklist to be used: During site visit to check the adequacy Safety systems.			
		Observation	Score* (1-5)
1	Check the adequacy of safety policy and Safety Management system of the contractor.		
2	Does the contractor have written down safety procedures?		
3	Check the records of Near miss, unsafe act, unsafe conditions, and incidents.		
4	Check the organization setup to implement the safety systems at site (safety officer, safety supervisor)		
5	Check whether safety meeting and toolbox talk carried out regularly and records maintained or not.		
6	Is the process of incident investigation adequate or not?		
7	Verify incident reporting and recording system		
8	Check the usage of equipment/tools and tackles.		
9	Check for housekeeping at site		
10	Check the use of PPEs and general behavior of workforce towards safety		
	Total Score		
	Site Visit Score		

Score*- rating on the scale of 1-5 to be given based on the observations on site. Score of 1 is the lowest and core of 5 is the highest.

Appendix 14: Indicative List of High-Risk Jobs

Indicative high-risk jobs are given below. This is not an exhaustive list. This is only indicative.

Sl. No.	Jobs
1	Transmission Line Tower Erection on columns, near live lines, In congested areas, In creeks, In the Sea.
2	Conductor Stringing on Tower Using Tensioner & Puller in the area such as Line Crossing, Near Live lines, Congested Areas, Road Crossing, Bridge Crossing, Railway line Crossing, In creeks, In the Sea
3	Cable Pulling by Using winch Machine in City and Rural Areas
4	Hot Washing of HT and Extra HT lines, Towers and switchyards equipment
5	Maintenance / Testing and Replacement of High Voltage (33 KV etc.) Switchyard equipment
6	Installation of Lifts
7	Installation of EOT Cranes
8	Tower Dismantling
9	Working on H Frame /Pole mounted Transformers
10	Excavation in operational Area having power cables in receiving station
11	Identification and spiking of cable / disconnection of cables from poles
12	Working on Electrical Panels
13	Working on live electrical switch yard, Material handling and equipment repair/installation.
`14	All activities that require climbing on a pole/structures/Towers/Transformers
15	Cable laying and termination jobs
16	Excavation beyond 5 feet near existing building and structures
17	Working in confined Spaces
18	Stringing of new conductors over poles

TPWODL

Tender Ref No. TPWODL/MK/O/SITC/056

ARIBA SUPPLIER MANUAL

SUPPLIER MANUAL ANSWERING

TO

E-BIDDING

	Version 1.2
Company Confidential	DEC - 2020

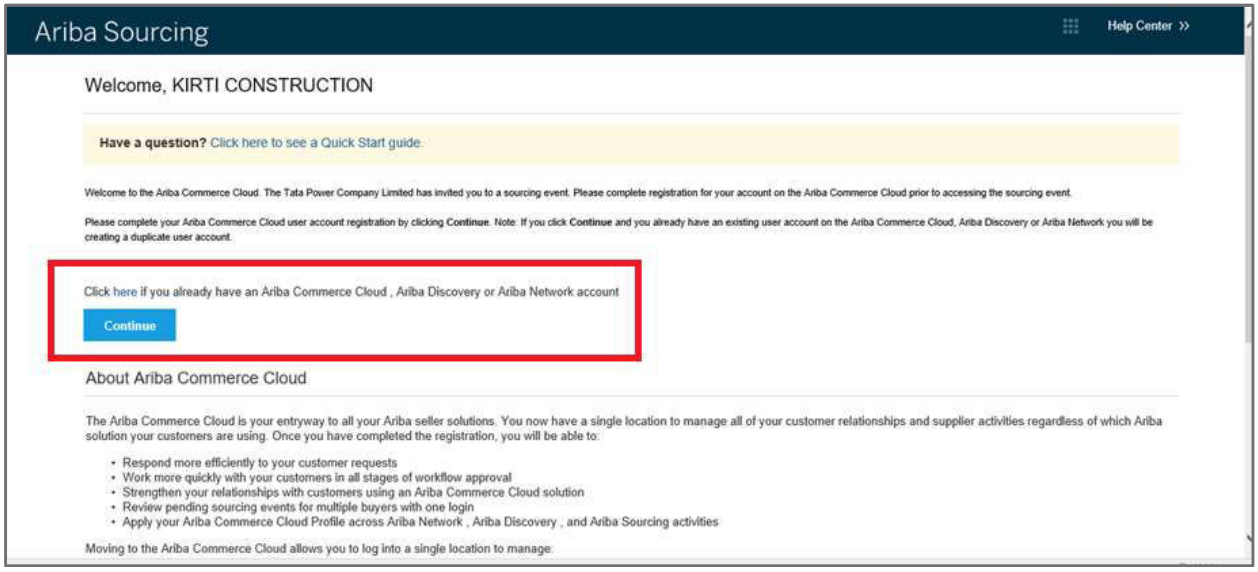
INDEX

1- Accessing Ariba Sourcing

Step 1: You will get an invitation to your email from Ariba System. Keep this email, it contains your login Information and a direct link to Ariba.

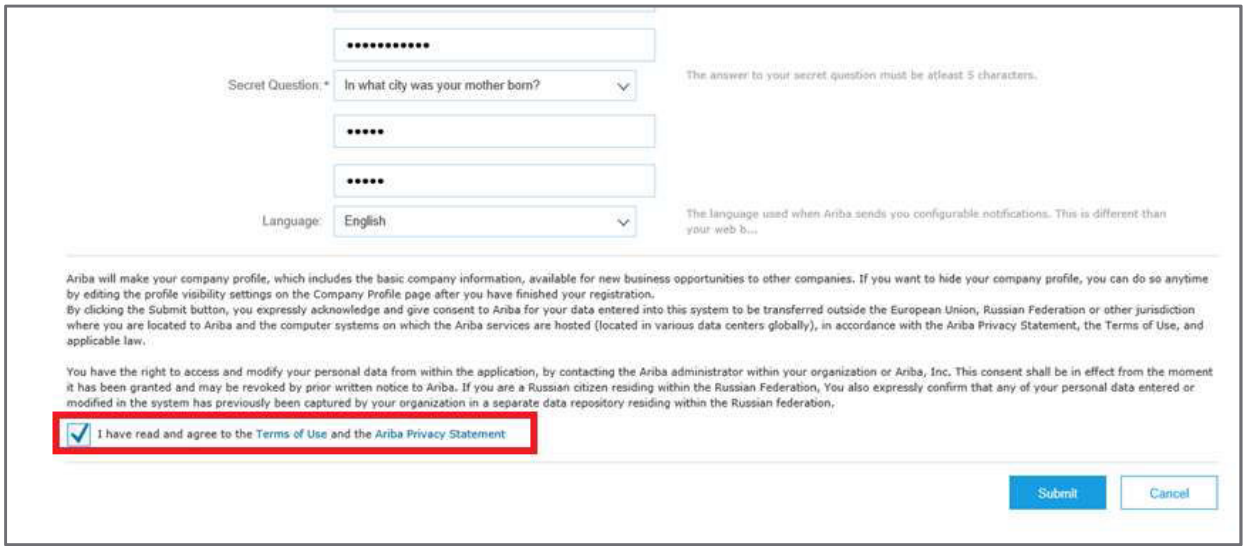
Step 2: Click “Click Here” to access the Ariba Web Site.

Step 3: Supplier has to click on "Continue"



Step 4: The registration process only takes a few moments, with a simple one-page registration Define your password and secret question. Click “OK”

Step 5: If it's the first time you are invited to use UPM Ariba, you'll need to accept the "Participant Terms". Select "I accept the terms of this agreement". Click "Submit".

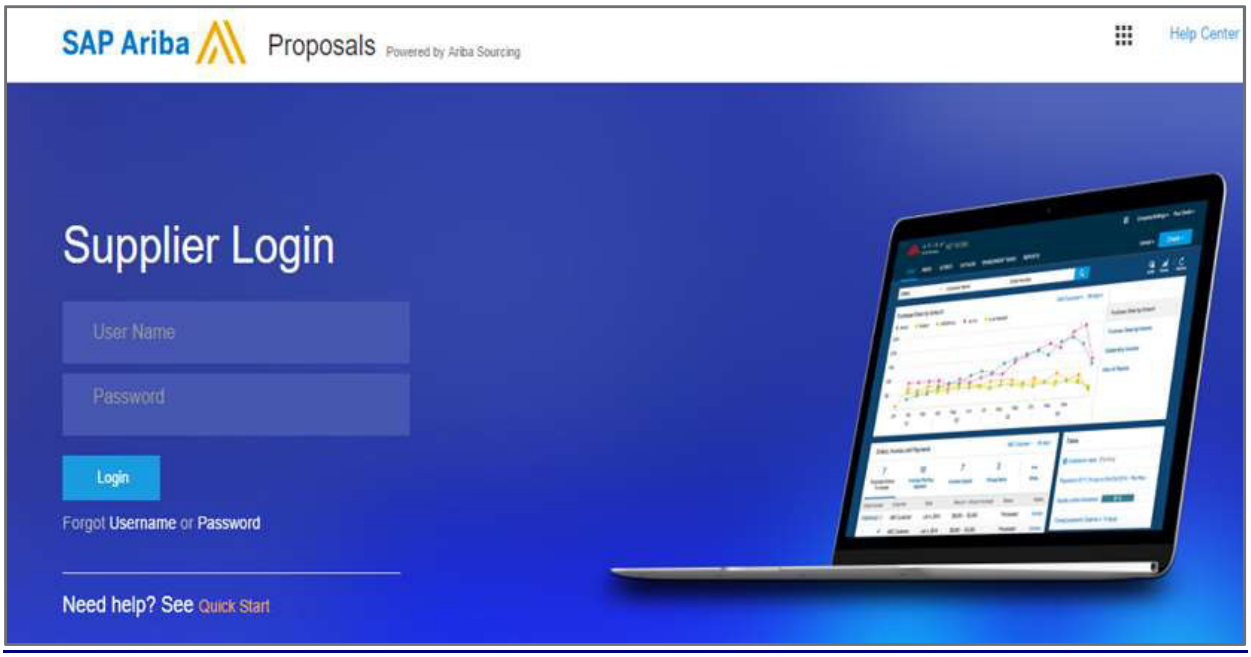


2 Vendor Screen - Submitting Your Answers / Proposal

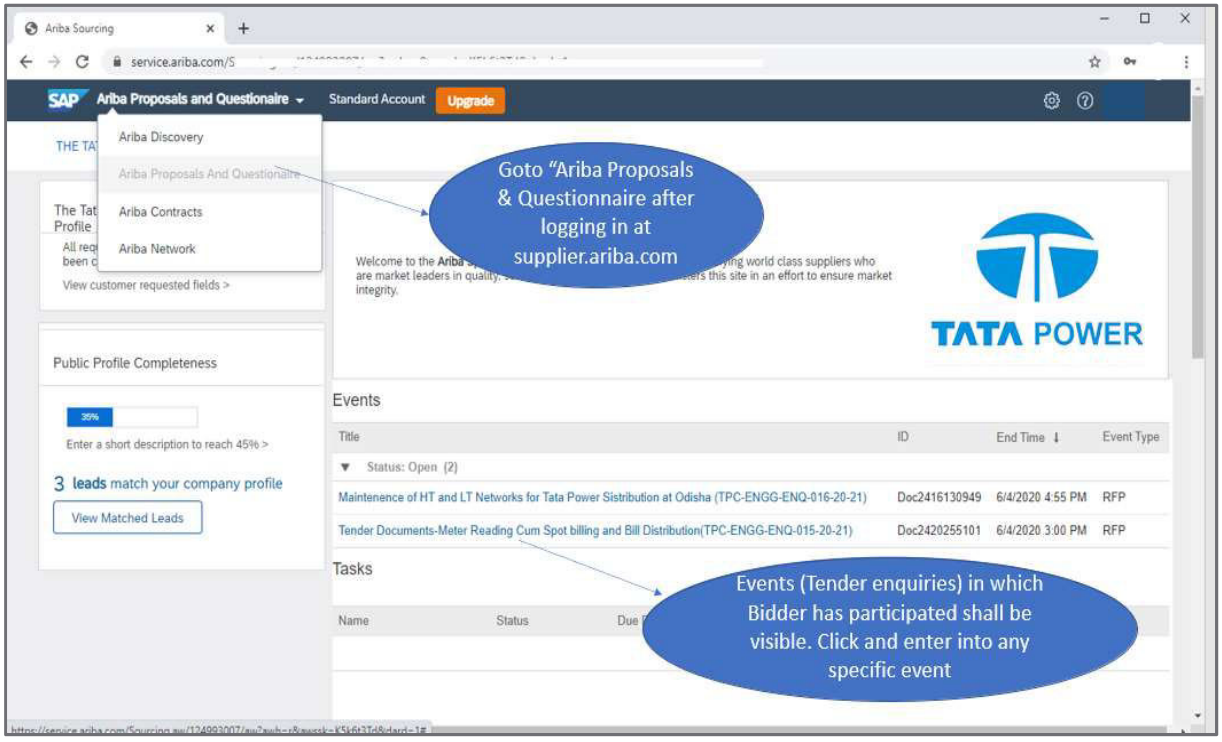
2.1.1 If vendor goes through mail invitation then directly Screen 3.1.1 will appear, but if If you have used Ariba before and have already accessed an event for the buyer-specific account with your current log in ID, click the **Login** button to continue. Log in with your Ariba username and password in order to participate in the event OR you have to follow the following steps.

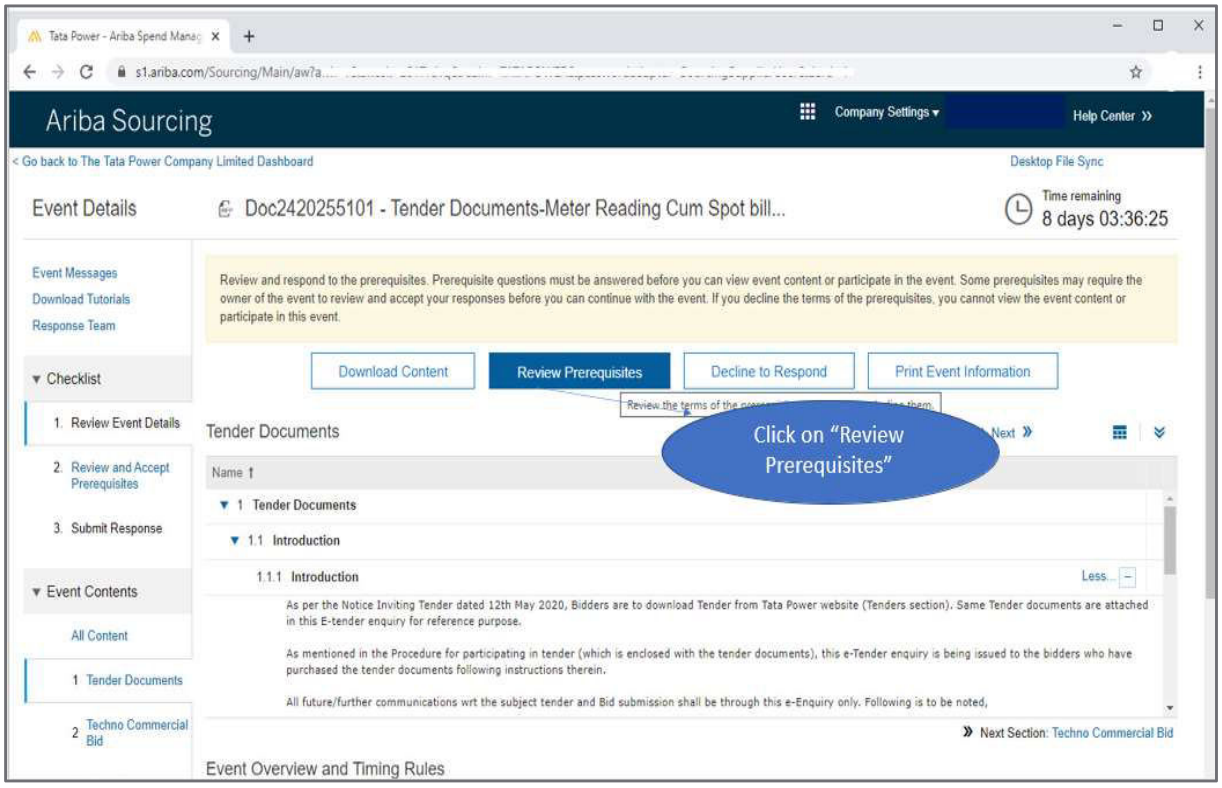
Step 1 - Log on **supplier.ariba.com**

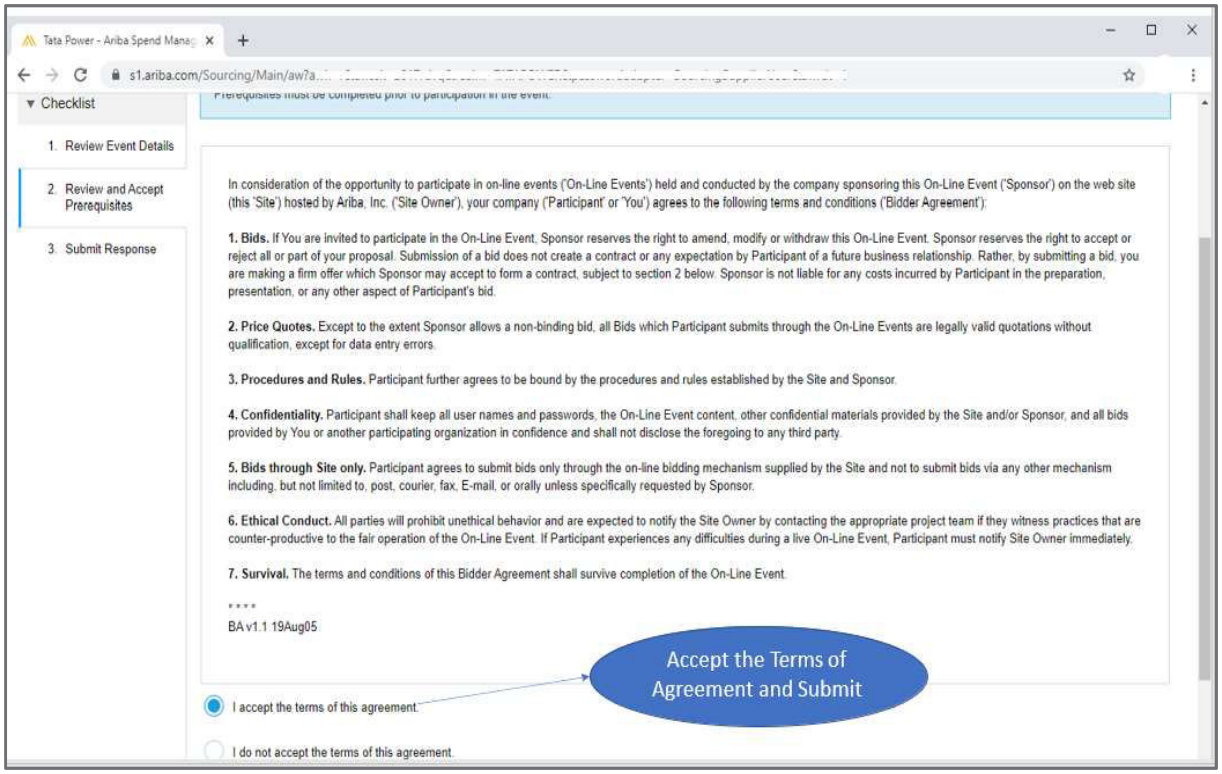
Step 2 - Put your USER ID and Password in following screen

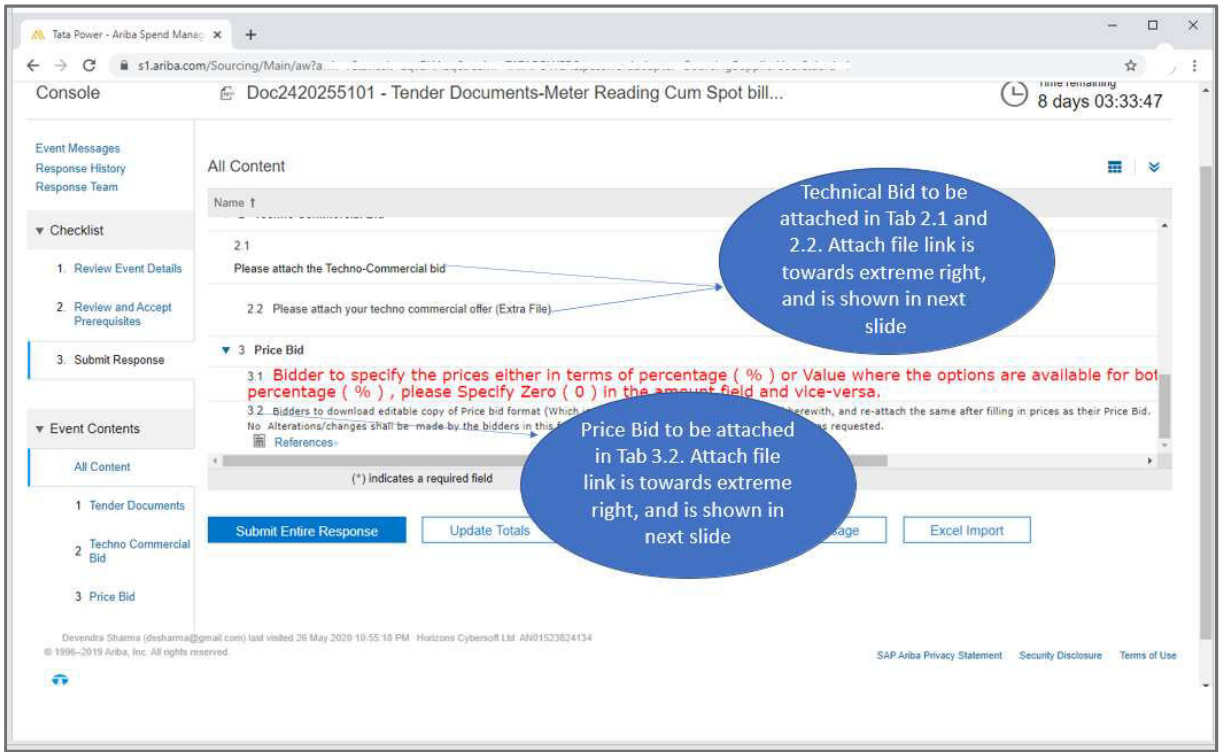


Step 3 - Go to “Ariba Proposals & Questionnaire”.






Tata Power - Ariba Spend Manag
s1.ariba.com/Sourcing/Main/aw?a...
Checklist
1. Review Event Details
2. Review and Accept Prerequisites
3. Submit Response
In consideration of the opportunity to participate in on-line events ('On-Line Events') held and conducted by the company sponsoring this On-Line Event ('Sponsor') on the web site (this 'Site') hosted by Ariba, Inc. ('Site Owner'), your company ('Participant' or 'You') agrees to the following terms and conditions ('Bidder Agreement'):
1. Bids. If You are invited to participate in the On-Line Event, Sponsor reserves the right to amend, modify or withdraw this On-Line Event. Sponsor reserves the right to accept or reject all or part of your proposal. Submission of a bid does not create a contract or any expectation by Participant of a future business relationship. Rather, by submitting a bid, you are making a firm offer which Sponsor may accept to form a contract, subject to section 2 below. Sponsor is not liable for any costs incurred by Participant in the preparation, presentation, or any other aspect of Participant's bid.
2. Price Quotes. Except to the extent Sponsor allows a non-binding bid, all Bids which Participant submits through the On-Line Events are legally valid quotations without qualification, except for data entry errors.
3. Procedures and Rules. Participant further agrees to be bound by the procedures and rules established by the Site and Sponsor.
4. Confidentiality. Participant shall keep all user names and passwords, the On-Line Event content, other confidential materials provided by the Site and/or Sponsor, and all bids provided by You or another participating organization in confidence and shall not disclose the foregoing to any third party.
5. Bids through Site only. Participant agrees to submit bids only through the on-line bidding mechanism supplied by the Site and not to submit bids via any other mechanism including, but not limited to, post, courier, fax, E-mail, or orally unless specifically requested by Sponsor.
6. Ethical Conduct. All parties will prohibit unethical behavior and are expected to notify the Site Owner by contacting the appropriate project team if they witness practices that are counter-productive to the fair operation of the On-Line Event. If Participant experiences any difficulties during a live On-Line Event, Participant must notify Site Owner immediately.
7. Survival. The terms and conditions of this Bidder Agreement shall survive completion of the On-Line Event.
****
BA v1.1 19Aug05
Accept the Terms of Agreement and Submit
I accept the terms of this agreement.
I do not accept the terms of this agreement.


Tata Power - Ariba Spend Manag
s1.ariba.com/Sourcing/Main/aw?a...
Console
Doc2420255101 - Tender Documents-Meter Reading Cum Spot bill...
8 days 03:33:47
Event Messages
Response History
Response Team
Checklist
1. Review Event Details
2. Review and Accept Prerequisites
3. Submit Response
Event Contents
All Content
1 Tender Documents
2 Techno Commercial Bid
3 Price Bid
All Content
Name
2.1
Please attach the Techno-Commercial bid
2.2 Please attach your techno commercial offer (Extra File)
Technical Bid to be attached in Tab 2.1 and 2.2. Attach file link is towards extreme right, and is shown in next slide
3 Price Bid
3.1 Bidder to specify the prices either in terms of percentage (%) or Value where the options are available for bot
percentage (%) , please Specify Zero (0) in the amount field and vice-versa.
3.2 Bidders to download editable copy of Price bid format (Which
herewith, and re-attach the same after filling in prices as their Price Bid.
No Alterations/changes shall be made by the bidders in this f
as requested.
References
(*) indicates a required field
Price Bid to be attached in Tab 3.2. Attach file link is towards extreme right, and is shown in next slide
Submit Entire Response
Update Totals
Excel Import
Devendra Sharma (desharma@gmail.com) last visited 26 May 2020 10:55:18 PM Horizons Cybersoft Ltd AN01523824134
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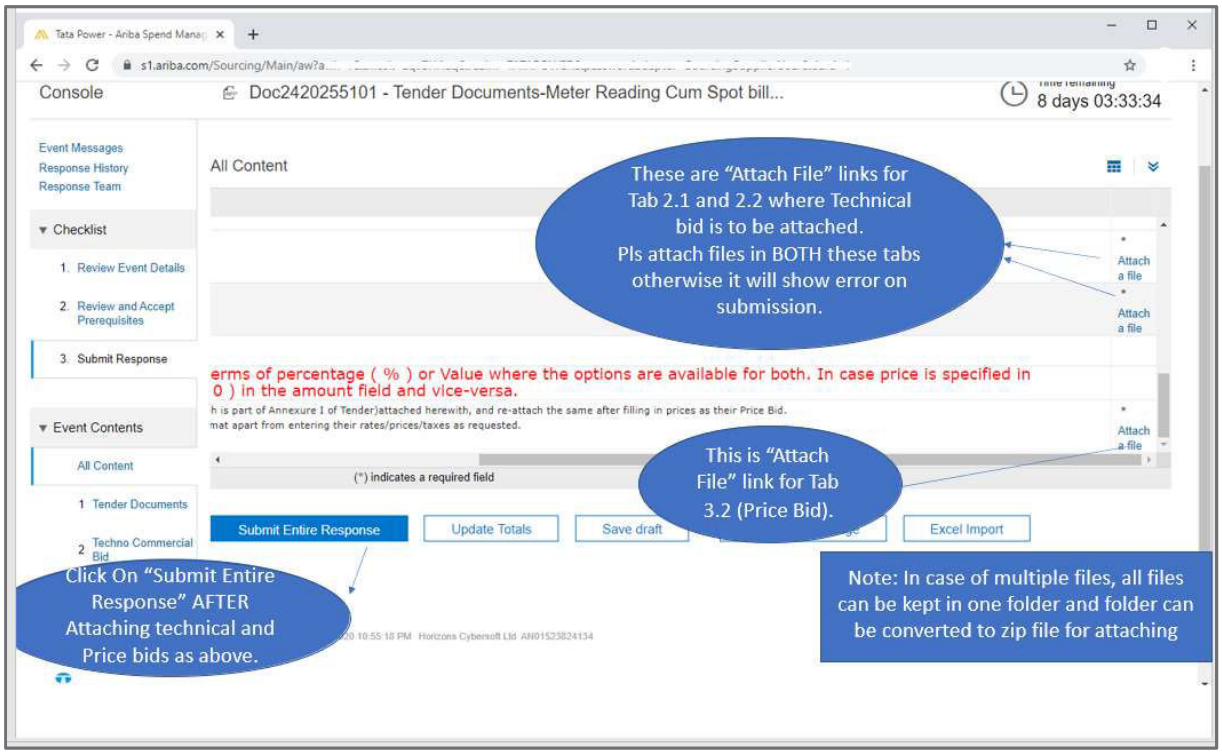
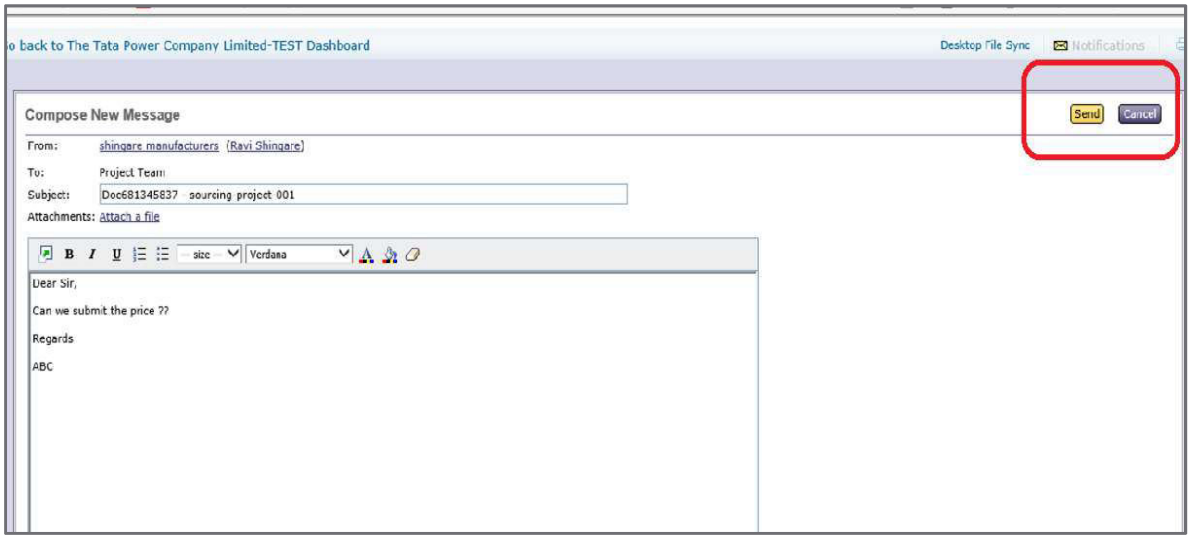
SAP Ariba Privacy Statement
Security Disclosure
Terms of Use



3 Communicating with Tata Power Buyer during e- bidding

Step 1: Click "Compose Message".

Step 2: Compose Your Message and click "Send".



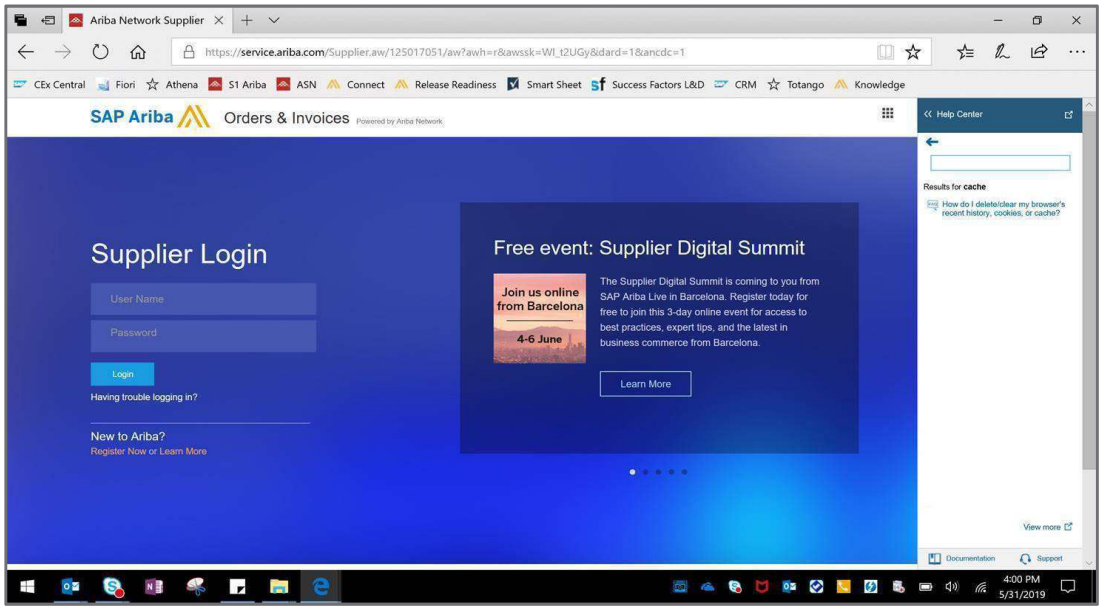
ARIBA TRAINING VIDEOS

Participating in a RFI or RFP on Ariba Network - https://www.youtube.com/watch?v=9_XXUaVyI7o

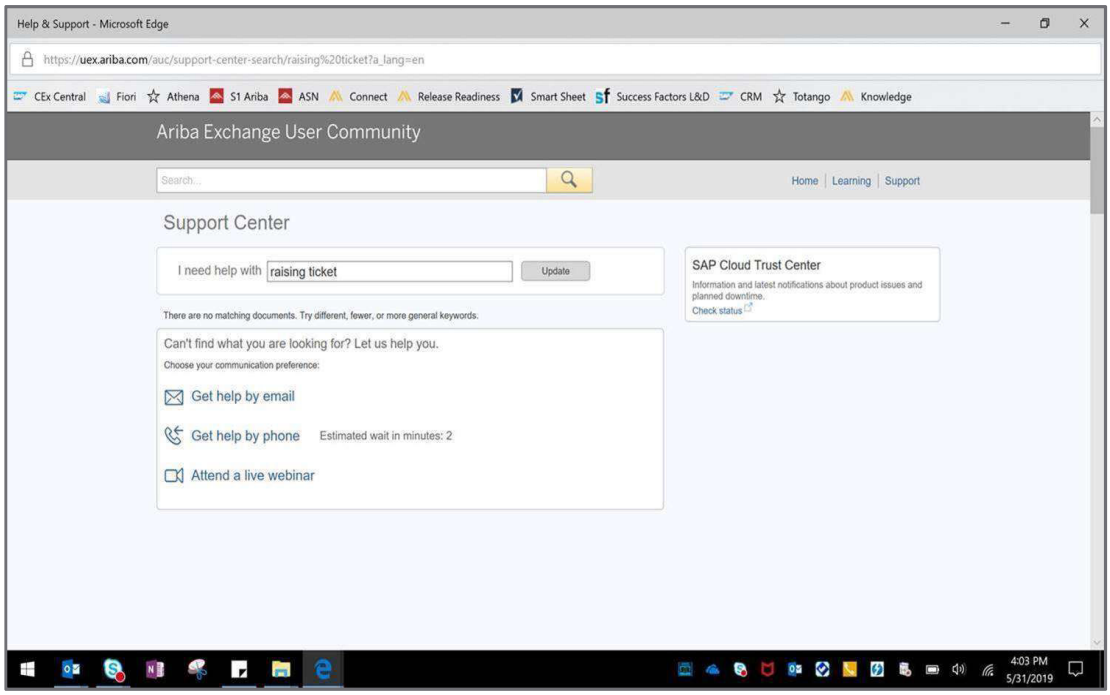
Support from Ariba - Supplier can raise the Ticket for "Support"

Here are the steps that Suppliers can follow for raising a ticket or requesting a call back from Support team. They can do so without logging in – pls follow the brief instructions given below.

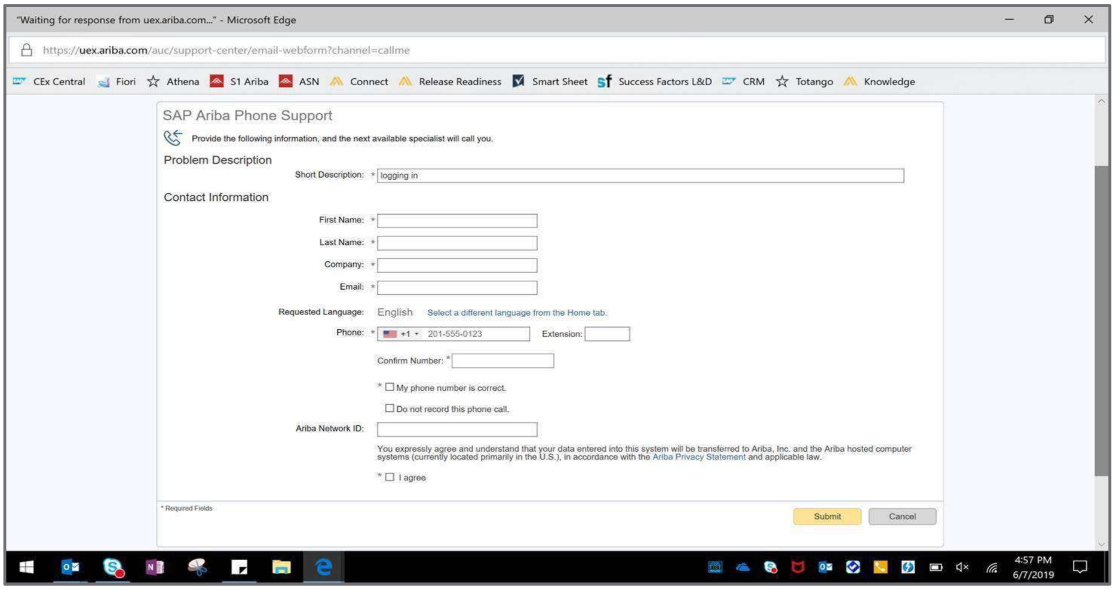
1. Go to login page>Choose "Support" on the bottom right corner



2. Add query and press "Start" – After that, following screen will pop up where you can choose either Get Help by Email or Get Help by Phone.



3. Choose phone and add following basic details and you will get call back



If not by phone, they can ask for a response/support by email.

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

SUPPLIER FREQUENTLY ASKED QUESTIONS

- **If I registered on my buyer's Ariba Sourcing site in the past, do I need to register again?**

Answer- Yes. Although you have registered on your buyer's Ariba Sourcing site in the past, registering on the Ariba Commerce Cloud is required. The registration process only takes a few moments, with a simple one-page registration. Registering on the Ariba Commerce Cloud gives you access to all your buyer relationships with one username and password.

- **What is the Ariba Commerce Cloud?**

Answer: - The Ariba Commerce Cloud is your entry point to all of your seller solutions. Rather than managing log in information for multiple buyers' sites, you will have one log in and one account. This means fewer passwords to remember, easier user maintenance for your company, and a unified profile for your organization.

- **Do I need to add Product and Service Categories during registration?**

Answer:-Yes; this is a required field. Product and Service Categories classify what your company sells, and the system uses this information to match potential business opportunities with your products and services.

Click **Add Product and Service Categories** to select one or more categories from the list of options. During registration, you only need to choose one category, preferably related to the event you are joining. You can add, refine, or remove categories any time after the registration process.

- **Do I need to add ship-to or service locations during registration?**

Answer: - Yes; this is a required field. Ship-to or Service locations inform buyers where your company sells its products or provides its services, and the system uses this information to match potential business opportunities with your products and services.

Click **Add Ship-to or Service Locations** to select one or more sales territories from a list. You can add, refine, or remove ship-to or service locations any time after the registration process.

Additional Information: - D-U-N-S is a registered trademark of Dun & Bradstreet or its subsidiaries in the United States and other countries.

- **What is the difference between the Email and Username fields in my profile?**

Answer: - The Email field represents the email address where you wish to receive email notifications. The Username field is the identifier that you use to access your account. The Username field must be in email format, but you do not have to use a valid email address.

Note: Leave the **This is my username** box checked if you want your email address to be the same as your username.

- **How do I participate in my buyer's event using an email invitation?**

Answer: - Use the **Click here** link in the email notification to access the sourcing event.

While buyers might customize the email content you receive, all email invitations contain a link to access the event.

Depending on your previous experience with Ariba solutions, do one of the following to access the event after you click the link:

- If you are new user, click **Continue** on the welcome page. You continue to register an Ariba account to link with your buyer and participate in the event.
- If you have used Ariba before and have already accessed an event for the buyer-specific account with your current log in ID, click the **Login** button to continue. Log in with your Ariba username and password in order to participate in the event.
- If you already have an existing Ariba Network, Ariba Discovery, or Ariba Sourcing supplier account, but you have not accessed any events for the inviting buyer's site, use the **Click here if you already have an Ariba Commerce Cloud, Ariba Discovery or Ariba Network account** link. After clicking the link, log in with your existing account to move your information to your buyer's site.

Additional Information:- Registering an Ariba account provides you with a consolidated view of all your customer relationships. With this one profile, you can view business opportunities, participate in sourcing events, participate in contract negotiations, and manage orders, catalogs, and invoices.

- **Why doesn't the link in the email invitation to participate in a sourcing event work?**

Answer:-If you cannot click the link, or the link does not open the log in page, highlight and copy the Uniform Resource Locator (URL), and then paste the URL into your web browser.

- **Can my company have multiple accounts?**

Answer:-Your Company can have multiple Ariba accounts, depending on your business needs. For example, if your company has several locations around the world, you might want a separate account for each region.

Most companies choose to have one account with multiple customer relationships, which provides a centralized location to maintain their company profile information and all of their customer relationships.

- **How do I complete registration if my username already exists?**

Answer: - This message means that you already have an Ariba Network, Ariba Discovery, or Ariba Sourcing supplier account registered under username you entered. You can either register ua new account by creating a new username, or access one of the following sites to request a password reset for the registered username:

- Ariba Network (This login page is used for all Ariba Network, Ariba Sourcing, or Ariba Contracts suppliers).
- Ariba Discovery login page

To reset your password, click the **Having trouble logging in?** Link on the Login page.

- **Nothing happens when I click Forgot Username and enter my email address**

Issue: - Nothing happens when I click the **Forgot Username** link and enter my email address.

Cause: - After you submit your request to retrieve your username, the Ariba Network sends an email notification with usernames that match the email address you submitted.

Some possible reasons why you may not receive this username retrieval email notification:

- The email address on your account does not match the email address you entered when submitting the request.
- Your buyer-specific account was deactivated before you could move it to the Ariba Commerce Cloud. Generally, that means you probably have not participated in an event with that buyer for a while.

Solution: -

- To ensure you receive this email notification:
- Make sure you type the email address configured within your account.

If your buyer-specific account has been deactivated, contact your buyer to determine how to proceed.

- **Where is my password reset email?**

Answer: - After you submit your request for a password reset, Ariba sends instructions to the email address associated with your account. If you didn't receive a password reset email, check the following scenarios to troubleshoot.

The username you entered is in the wrong format, or it isn't associated with the email address you are checking.

- Keep in mind, your username is in the format of a full email address, but it can be associated with any email address you entered previously.
- Your username is also case-sensitive.
- To confirm that you are using the correct username and format, return to the Ariba login page, and click the **Having trouble logging in?** link (**Forgot Username** if you're working in Ariba Discovery).
    - Choose **I forgot my username**, and click **Continue**.
    - Enter the email address associated with your account, and click **Submit**.

- You will receive an email that lists the exact format of the username associated with the email you entered.

You entered the correct username, but you still didn't receive the password reset email notification.

- This can occur if the configured email address is different from the account you are checking.
- You might have multiple accounts for your company, so make sure you are attempting to access the correct account.

Your email configuration or company's security settings might also prevent you from receiving the password reset email. To find out, check your junk mail folder or email filter settings to verify that automated emails from Ariba are not blocked from your email account.

Why do I get this message on the SAP Ariba Login page: "The username and password pair you entered was not found"?

Answer: - You entered an incorrect **Username** or **Password**. You might receive this message if you entered a previous **Username** or **Password**. Remember that your **Username** has the format of an email address, and both the **Username** and **Password** are case sensitive.

Click the **Having trouble logging in?** Link on the Login page if you don't remember your log in information.