

Open Tender Notification

For

**Engineering, Supply, Erection & Commissioning of Multiple Infra
Projects under CMPDP on “Turnkey Contract Basis” in all over
TPCODL Area.**

Tender Enquiry No.: TPCODL/P&S/ 1000000364/2023-24

Due Date for Bid Submission: 08.05.2023 [22:00 Hrs.]

TP Central Odisha Distribution Limited

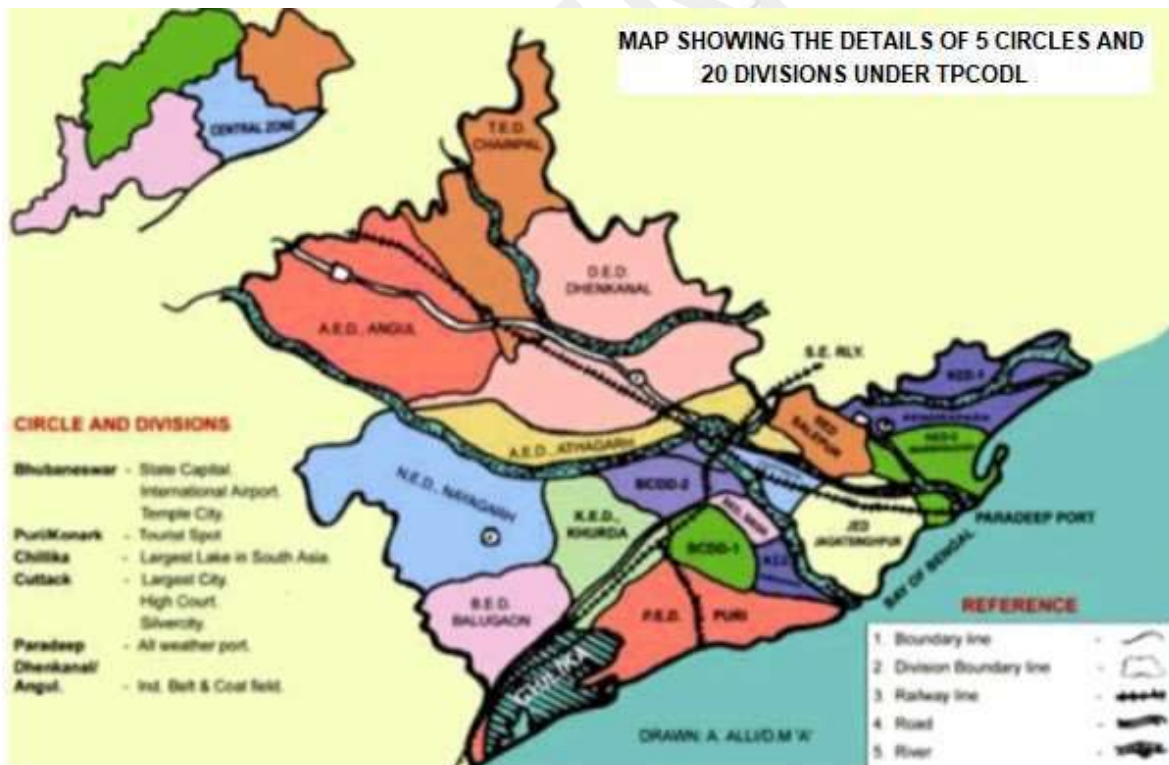
(A Tata Power & Odisha Government joint venture)

Purchase department

2nd Floor, IDCO Towers, Janpath, Bhubaneswar-751022

PREAMBLE

TP Central Odisha Distribution Limited (TPCODL) is a joint venture between Tata Power and the Government of Odisha with the majority stake being held by Tata Power Company (51%). TPCODL is a state electricity distribution utility with sole rights to distribution of electricity in the Central Zone in Odisha covering the distribution circles of Bhubaneswar, Cuttack, Paradeep and Dhenkanal in accordance with the Electricity Act. Tata Power Company has successfully won the bid to own the license for the distribution and retail supply of electricity in Odisha's five circles constituting Central Electricity Supply Utility of Odisha (CESU). It came into operation with effect from 01.06.2020. TPCODL serves a population of 1.36 Crore with Customer Base of 26 Lakh and a vast Distribution Area of 29, 354 Sq. Km. The primary business activity includes purchase of power from GRIDCO Ltd at BSP rate and distribute to consumers. The field structure has been presented below:



Name of 20 Electrical Distribution Divisions are as follows:

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1. Bhubaneswar City Distribution Division-I (BCDD-I)
2. Bhubaneswar City Distribution Division-II (BCDD-II)
3. Bhubaneswar Electrical Division (BED)
4. Nimapada Electrical Division, Nimapada (NED)
5. Khurda Electrical Division, Khurda (KED)
6. Balugaon Electrical Division, Balugaon(BEDB)
7. Nayagarh Electrical Division, Nayagarh (NYED)
8. Puri Electrical Division, Puri (PED)
9. City Distribution Division-I, Cuttack (CDD-I)
10. City Distribution Division-II, Cuttack (CDD-II)
11. Cuttack Electrical Division, Cuttack (CED)
12. Athagarh Electrical Division, Athagarh (AED)
13. Salipur Electrical Division, Salipur (SED)
14. Dhenkanal Electrical Division, Dhenkanal (DED)
15. Talcher Electrical Division, Chainpal (TED)
16. Angul Electrical Division, Angul (ANED)
17. Kendrapara Electrical Division, Kendrapara (KED-I)
18. Kendrapara Electrical Division, Marshaghai (KED-II)
19. Jagatsinghpur Electrical Division, Jagatsinghpur(JED)
20. Paradeep Electrical Division, Paradeep (PDP)

INFORMATION TO THE BIDDERS TO PARTICIPATE IN E-TENDER SYSTEM OF TPCODL

-: Steps for E-tender submission:-

Bids are to be submitted only through online e-procurement platform, ARIBA. Any other form of bid submission will not be accepted. Online Link for submission of bid through ARIBA will be sent only after confirmation of payment of tender fee from bidder.

Step 1:

The bidder can get primary information about the tender from the Newspaper advertisement / TPCODL website <www.tpcentralodisha.com> and can download the tender document from the above website.

Step 2:

Non-Refundable Tender Participation Fee, as indicated in tender document, to be submitted before last date of tender fee payment, in the form of direct deposit/NEFT/RTGS in the following bank account.

Account Name: TP Central Odisha Distribution Limited

Bank Name: State Bank of India,

IDCO Towers, Bhubaneswar

Bank Account No. : 10835304915

IFSC Code : SBIN0007891

Step 3:

Eligible and Interested bidder to send an email to TPCODL attaching duly signed and stamped letter on Bidder's letterhead, with following details, expressing their intend to bid against above tender:

Sl No	Description	Bidder's Response
i)	Tender Enquiry No.	
ii)	Description of materials / Works Tendered	
iii)	Package to be Participated for all scope	
iv)	Name and address of the bidding company	
v)	Name of the authorized contact person	
vi)	Contact No. authorized person	
vii)	E-mail Id of the where online ARIBA link to be mailed.	
viii)	Tender Fee details (Amount / NEFT-RTGS UTR No / Date), Ref	
ix)	GST No. of bidder	

E-mail has to be sent to package owner Malaya Ranjan Roul <Malaya.Roul@tpcentralodisha.com> with copy to <sudhakar.behera@tpcentralodisha.com> before "Last date and time for payment of Tender Participation Fee".

Step 4:

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On receipt of the document as mentioned in Step 3 above and after due verification of the same, ARIBA link for participation in the tender will be sent to bidder's mail address from ARIBA system.

Step 5:

In this mail there will be an online link as [Click Here](#) to participate in the tender.

Step 6: Click "[Click Here](#)" to access this event.

Step 7:

If bidder is bidding first time for TPCODL through ARIBA site then please "Sign UP" by creating User Name and password as mentioned in Sign Up page. Please follow the process, as mentioned in the Sign Up page, during creation of User Name and password. Also a simple one-page registration screen will open for first time user. All * mark mandatory field to be filled in.

Those who are already having User Name and password for accessing TPCODL events, they can LOGIN using same User Name and password.

If bidder has got User name and password for their other customer, same will not be applicable for TPCODL.

Step 8: You will be able to see the RFQ

Step 9: After review and downloading of all documents click on "[Review Pre-requisites](#)"

Step 10: Review and accept "[Bidder Agreement](#)".

Step 11: You can see attached pdf tender document against clause no 1.1.1 (Introduction).

Step 12: Vendor has to attach pdf version of technical bid in clause no. 2.1 and 2.2. In this field do not attach any price document.

Price schedule is attached in clause no.3.2. Same has to be downloaded and price and tax details to be filled in as per the format given, print to be taken in vendor's letter head and signature and seal to be made by authorised person. PDF version of this price bid to be attached in clause 3.2 For Price Bid put all the unit price and taxes and duties in provided field. Put "0" (ZERO) in not applicable field.

Step 13: After successfully putting Techno commercial offer and price part then click on "[Submit Entire Response](#)"

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1.0 Event Information

1.1 Scope of work

Open Tenders are invited through the e-tender bidding process from interested Bidders for entering into a *Contract* for construction & augmentation of 33kV & 11kV Lines and Construction of Independent 11KV,33kV lines , Bay extension, UG cabling work ON TURNKEY CONTRACT BASIS all over TPCODL Area as defined below:

Tender Enquiry No	Name of Districts	Package	Work Description	EMD * cost (Rs.)	Tender Participation Fee (Rs.)	Last Date and Time for payment of Tender Participation Fee
TPCODL/P&S/ 1000000364/ 2023-24	Angul, Dhenkanal, Cuttack, Puri, Khurda, Nayagarh, Jagatsingpur , Kendrapara, Jajpur	Scope-I	PSS 33KV Bay Extension work including VCB Installation.	25 Lakhs.	5,000/-	17.04.2023, 17.00 Hrs
		Scope-II	SITC 33 KV OH Line ,RMUs, UG cabling work , Augmentation work			
		Scope-III	SITC of 11kv OH Line,RMUs, UG Cabling work & 11KV OH DT Linking Line			
		Scope-IV	SITC of 11/0.4 KV New & Augmentation DTR (63,100,250,500 KVA)			
		Scope-V	Supply & Installation of LT ABC (4C×95 mm ² ,4C×70 mm ² & 4C×35 mm ² ABC using 9 Mtr PSC Poles along augmentation work,			

* EMD is exempted for MSMEs registered in the State of Odisha.

** MSMEs registered in the State of Odisha shall pay tender fee of Rs. 1,000/- including GST.

For details of MSME norms, pls refer "Annexure VII-a".

Bidders must participate in all scope of work.

Note: Tender Fee is inclusive of GST.

1.2 Availability of Tender Documents

Please Refer "Procedure to participate in the e-Tender".

1.3 Calendar of Events

(a)	Date of availability of tender documents from TPCODL Website	From 06.04.2023
(b)	Date by which Interested and Eligible Bidder to pay	17.04.2023, 17:00 Hrs

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	Tender Fee and confirm participation as mentioned in "Procedure to Participate in Tender"	
(c)	Last Date of receipt of pre-bid queries, if any	24.04.2023
(d)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	01.05.2023
(e)	Last date and time of submission of Bids through AIBA E-Tender Portal	08.05.2023 up to 22.00 Hrs

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

For further details of Tenders, please visit Vendor Zone on TPCODL website <https://www.tpcentralodisha.com>. Future communication/corrigendum to tender documents, if any, shall be available on website. The authority reserves the right to accept or reject any or whole of the offers without assigning any reason thereof.

1.4 Mandatory documents required along with the Bid

- 1.4.1 EMD of requisite value and validity. In case of BG, original required to submit.
- 1.4.2 Tender Fee of requisite value.
- 1.4.3 Price Bid as per the Price Schedule mentioned in Annexure-I (BOQ).
- 1.4.4 Necessary documents against compliance to Qualification Requirements mentioned at Clause 1.7 of this Tender Document.
- 1.4.5 Duly filled, signed and stamped all required Annexure.
- 1.4.6 Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.
- 1.4.7 Bank certificate towards Liquid Assets.
- 1.4.8. Notary Affidavits of Bidders as per qualifying requirement in hard copy.

Please note that in 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:-

As mention above

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

1.7 Qualification Criteria

1.7.1 TECHNICAL REQUIREMENT :

This bid is open to any EPC / Turnkey Contractor domicile in India independently, who meets the following Technical qualifying requirement;

The bidder must have executed multiply projects having similar scope of job as envisaged in this tender including Engineering, Supply, Erection , Testing & Commissioning on Turnkey basis in any utility/companies for a total value of **Rs. 40.00 cr. in last five years** and also meet the following criteria:

- a. Have executed One single order of Rs. 20 Cr. during last 5 financial years.**
- or**
- b. Have executed Two orders of Rs. 10 Cr. (each) during last 5 financial years.**
- or**
- c. Have executed four orders of Rs. 5 Cr. (each) during last 5 financial years.**

The Bidder must upload copies of the relevant Work Orders along with Handing Over and Taking Over Certificate or Client certified copies of Completion Certificate in proof of successful execution of Works and Performance Certificates duly signed by the competent authority of the Client in proof of successful operation of the above quantum of works from any Discoms/utility/reputed companies in India. The works experience schedule shall be as per proforma given here under.

Work Experience Schedule

Work Order Ref.				Sub-Station/Lines Installed, Erected & Commissioned		
Sl. No.	FY	Name of the Client	Work Order Ref (No. & Date)	Qty (No. of Sub Stations/ Kms. of Lines) Installed/ Erected	Date of Completion of Commissioning	Documents provided in proof of having completed the works and/or of successful operation as the case may be. (As Attachment)

Supporting documents in favour of the above mentioned requirement shall have to be submitted/ uploaded by the Bidder as an attachment to the e-tender folder. Failure to furnish/upload any or all information as required as a part of Bid document in all respect will be at the Bidder’s risk and may result in rejection of the Bid.

1.7.2 BIDDER’S FINANCIAL QUALIFICATION:

1. MINIMUM AVERAGE ANNUAL TURNOVER:

The bidder should have average annual turnover of **Rs. 40.00 Crores** in the three financial years i.e. (FY 19-20, FY 20-21 & FY 21-22). Audited balance sheet, profit and loss account and auditors report from the statutory auditors of the company are required.

For MAAT, the bidder has to furnish the certificate from the Chartered Accountant (CA) certifying the Annual Turnover of the company only based on audited accounts of the last Three Financial Years.

2. LIQUID ASSETS AND ACCESS TO CREDIT FACILITY:

Bidder shall be financially sound and stable. The **liquid assets (Cash at Bank & Fixed Deposit) and Unutilized credit facility (both Fund & Non Fund based)** available from bank(s) duly certified by the Bank(s) within one Month prior to the date of Tender opening, should **not be less than Rs. 2 Crores**.

1.7.3 BIDDER'S PERFORMANCE QUALIFICATION:

1. The bidders or Holding / Associate / Subsidiary Companies or its any group company who have earlier failed to execute even any order of the TPCODL / Odisha Discom/ Govt. Of Odisha /Govt. funded Project or who stand currently debarred / blacklisted by TPCODL / Govt. Of Odisha/any other Distribution / Transmission / Generation Utility in India shall not be eligible to participate in this tender.
2. The bidder should not have any pending litigation with TPCODL with regard to any project or related activity. The Bid furnished by the bidder shall not be eligible for consideration if it is not accompanied by the Affidavit. Further, the Bid/LOA/LOI shall be liable for outright rejection/ cancellation at any stage if any information contrary to the affidavit is detected.
3. The bidder must not been declared Insolvent or referred to National Company Law Tribunal (NCLT) under the Insolvency and Bankruptcy Code (IBC), 2016. In such case the bid shall also be rejected. In this respect one undertaking from the bidder that they are not declared as Insolvent or referred to NCLT under IBC shall be submitted along with the bid. Non-disclosure of this fact by the bidder will lead to rejection of the bid or termination of the contract with forfeiture of EMD/CPBG.

Note:

The bidder should certify/ declare the same in unequivocal terms by way of an affidavit duly sworn before a Notary. Failure to furnish/upload any or all information as required as a part of Bid document in all respect will be at the Bidder's risk and may result in rejection of the Bid.

1.7.4. OTHERS:

3. Bidder should have a **valid HT/ EHT Electrical license** issued by Govt. of Odisha for carrying out electrical works in Odisha Copy of license required. In case bidder is not having HT Electrical license issued by Govt. of Odisha should have HT Electrical license issued by Electrical licensing department other state government / Union territory, they shall submit an undertaking that, in case they are successful bidder, license shall be obtained within 1 months after award of contract. They shall submit a copy of such application with copy of challans for payment of required fees to appropriate authority in Odisha **within 15 days after award of contracts**. This is a statutory requirement for any Electrical Contractor to work in Odisha.
4. Bidder must have all statutory compliance like valid PAN, ESI registration, EPF registration and GSTN registration, Certificate Of Incorporation .

Note :

- ❖ **The evaluation of contractor's safety capability with evaluation of safety bid is part of qualifying requirement for this work.**
- ❖ **Evaluation of Bidder capacity is part of part-I evaluation. TPCODL have right to reject any bid, at any time with or without assigning notice or reasons thereof.**
- ❖ **Joint venture/ consortium is not accepted in the tender.**

TPCODL reserves the right to relax qualification criteria without assigning any reason thereof. TPCODL reserves the right to accept or reject any bid at any time without assigning reason what so ever may be.

1.8 Marketing Integrity

We have a fair and competitive marketplace. The rules for bidders are outlined in the General Condition of Contracts. Bidders must agree to these rules prior to participating. In addition to other remedies available, TPCODL 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 market place 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 TPCODL. This includes all bidding information submitted to TPCODL. All tender documents remain the property of TPCODL and all suppliers are required to return these documents to TPCODL 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 safety ground on the compliance to tender terms and conditions.
- The bids will be evaluated commercially on **overall all-inclusive price of tender BOQ of whole package/scope** as calculated in Schedule of Items [Annexure I]. TPCODL reserves the right to split the order line item wise and / or quantity wise or/ scope wise or / Location wise, among more than one Bidder. Hence, all bidders are advised to quote their most competitive rates.
- Bidder has to mandatorily quote as per schedule of item [Annexure-I]. Failing to do so TPCODL may reject the bid.

NOTE: In case of a new bidder not registered, inspection of their any other site and evaluation shall be carried out to ascertain bidder's capability and quality procedures. However, TPCODL reserves the right to carry out

site inspection and evaluation for any bidders prior to qualify technically. In case a bidder is found as Disqualified in the factory evaluation, their bid shall not be evaluated any further and shall be summarily rejected. The decision of TPCODL shall be final and binding on the bidder in this regard.

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

2.2 Quantity variation Clause: There will not be any guarantee on quantity of job. Job has to be carried out on as and when required basis order from TPCODL on the quantity to be specified in the order.

3.0 Submission of Bid Documents

3.1 Bid Submission

Bidders are requested to submit their offer in line with this Tender document through e-tendering process.

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

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

Bids shall be submitted in 3 (Three) parts:

FIRST PART: “EMD” as applicable shall be submitted. The EMD shall be valid for 210 days from the due date of bid submission in the form of NEFT/ RTGS / Bank Guarantee / Bank Draft / Bankers Pay Order (issued from a Scheduled Bank) in favoring ‘TP Central Odisha Distribution Limited’ payable at Bhubaneswar. The EMD (BG) has to be strictly in the format as mentioned in General Condition of Contract, failing which it shall not be accepted and the bid as submitted shall be liable for rejection. A separate non-refundable tender fee of stipulated amount also needs to be transferred online through in case the tender document is downloaded from our website.

TPCODL/ TPCODL Bank Details for transferring Tender Fee and EMD is as below:

Account Name: TP Central Odisha Distribution Limited

Bank Name: SBI, IDCO Towers, Bhubaneswar

Bank Account No. : 10835304915

IFSC Code : SBIN0007891

EMD Original Hard Copy shall be delivered at the following address in Envelope clearly indicating Tender Reference/ Enquiry Number, Name of Tender and Bidder Name

Chief (Procurement & Stores)

TP CENTRAL ODISHA DISTRIBUTION LIMITED

2ND FLOOR, IDCO TOWERS, JANAPATH, BHUBANESWAR- 751022

SECOND PART: “TECHNICAL BID” shall contain the following documents:

- a) Documentary evidence in support of qualifying criteria mentioned as clause 1.7 of this tender documents
- b) No Deviation Certificate as per the Annexure III – Schedule of Deviations
- c) Acceptance to Commercial Terms and Conditions viz Delivery schedule/period, payment terms etc. as per the Annexure V – Schedule of Commercial Specifications.
- d) Acceptance Form for participation in Reverse Auction as per the Annexure VII
- e) Quality Assurance Plan (*where applicable*)

The technical bid shall be properly indexed and is to be submitted through TPCODL E-tender System (Ariba) only. Hard Copy of Technical Bids need not be submitted.

THIRD PART: "PRICE BID" shall contain only the price details and strictly in format as mentioned in Annexure I 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 TPCODL E-Tendering system (Ariba) only. **Hard copy of Price Bid not be submitted.**

SIGNING OF BID DOCUMENTS:

The bid must contain the name, residence and place of business of the person or persons 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 TPCODL E-Tender system (Ariba).

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

Communication Details:

Package Owner

Name: Mr. Malaya Roul, DM, Elect.- Procurement

Contact No: 8763216613

E-Mail ID: Malaya.roul@tpcentralodisha.com

Escalation Matrix

Name: Mr. Sudhakar Behera, Sr. GM-Procurement

Contact No: 9437282663

E-Mail ID: sudhakar.behera@tpcentralodisha.com

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

3.3 Bid Prices

Bidders need to quote for all packages as per the Price schedule attached in Annexure I. Also bidder need to quote for all the items mentioned in each Package with a break up of prices for supply and erection of individual items and Taxes & duties as per the price schedule format. 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 TPCODL. 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 break up 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 TPCODL 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 TPCODL against the risk of bidder's conduct which would warrant forfeiture.

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

- Banker's Cheque/ Demand Draft/ Pay order drawn in favor of TP Central Odisha Distribution Limited payable at Bhubaneswar.
- Online transfer of requisite amount through NEFT/ RTGS.
- Bank Guarantee as per the format (Annexure-A) provided in GCC valid for 210 days after due date of submission.

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

The type tests report of the approved make specified in TPCODL 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 TPCODL.

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 TPCODL'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 TPCODL. Participating Bidders will get mail intimation from TPCODL E-Tender system (Ariba) when their Technical Bids are opened.

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.

4.3 Preliminary Examination of Bids/ Responsiveness

TPCODL 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. TPCODL 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, TPCODL 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 TPCODL and/or the TPCODL 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, TPCODL may, at its discretion, ask the Bidder for a clarification on its Bid for any deviations with respect to the TPCODL 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 TPCODL. After all techno commercial issues are clarified, price bids will be opened internally by TPCODL.

4.5 Price Bid Opening

Price Bid of only Technically qualified Bidders shall be considered and open internally by TPCODL. Bidders will get mail intimation from TPCODL 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 TPCODL without any further correspondence in this regard.

4.7 Reverse Auctions

TPCODL 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 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.

5.0 Award Decision

TPCODL 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 rate contract / purchase order / LOI solely depends on TPCODL on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that TPCODL may deem relevant.

TPCODL reserves all the rights to award the order/issue of RO as per field requirement and sanctioned of Govt. fund time to time to carry out the work scope under CM PDP. Also TPCODL reserves the right to split the contract full or part.

In case performance of the bidder is found unsatisfactory during the delivery/execution process, the award will be cancelled and TPCODL reserves the right to award other performing bidder who are found fit.

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
5. Technical specification
6. Acceptance form for participation in reverse auction
7. General Conditions of Contract

7.0 Post Award Contract Administration

1. AWARD OF CONTRACT:

After finalization of tender, Rate Contract shall be issued on successful bidder with a validity period of **18 Months**. The Contractor shall complete the Survey of the assigned project jointly with authorized person(s) / agency of TPCODL & submit Substation wise Joint Survey Report along with SLD, Substation wise BOQ & proposed work completion Schedule to TPCODL for approval within 30 days of issue of RC. The Work Completion Schedule should consist of Key Mile Stones covering entire scope of work such as engineering, procurement, manufacturing, shipment and field erection activities including Civil works in line with the Work Completion Schedule of TPCODL. After approval of above reports by TPCODL, Substation wise Release Orders shall be issued to the Contractor basing on the approved BOQ. The Contractor shall take all efforts to complete the Project within scheduled Time.

2. PRICES/ RATES/ TAXES

The Contract price comprising of Supply, Installation, Testing and Commissioning shall remain **FIRM** during the entire Contract period except statutory variation in Taxes, which shall be to the account of TPCODL against Tax Invoice. However, the price shall **remain firmed until the completion of the Project**, even if contract period is extended due to any reason. There shall be no price variation during the Contract Period / Extended Contract Period.

3. PROJECT COMPLETION PERIOD:

Work completion Period shall be **6 Months form date of issue of RO**. The work completion period shall be revised if the reason of delay in completion of works is not attributable to the Contractor. L-1 Schedule (Submission of Activity wise Milestones to complete the project within scheduled time line) shall be furnished with the Bid documents. The Supply shall sequential and as per agreed milestones.

4. PERFORMANCE GUARANTEE :

1. The Contractor shall guarantee that the equipment/materials will be new, unused and in accordance with the Contract documents and free from defects in material and workmanship for a period of **24 (Twenty Four) months commencing immediately after the satisfactory commissioning and handing over of the entire works of the under the Contract (except major materials)**. The Contractor's liability shall be to the extent of repair/replacement of such defective equipment/material either arising from faulty design or defective equipment/materials and/or bad workmanship. Such defective equipment/materials shall be handed over to the Contractor for repair or replacement by a new one, unless otherwise repairable at site. The Contractor shall complete the repair/replacement work within the reasonable time frame intimated by the Engineer-In-Charge.

For **major equipment (Distribution Transformer, SCADA automation, VCB, Switchgear Panels including CT & PT, Isolators, RTUs, RMU , LT/ HT Conductor & XLPE Cables etc.)** and its workmanship, the Contractor shall provide **guarantee of 60 (Sixty) Months commencing immediately after the satisfactory commissioning and handing over of the entire works of the under the Contract**. If any defects are not remedied within the time frame, the Engineer-In-Charge may proceed to do the work at the Contractor's risk and cost.

2. In the event of any emergency, where in the judgment of the Engineer-In-Charge, delay would cause serious loss or damages, repair may be made by the Engineer-In-Charge or a third party chosen by the Engineer-In-Charge without advance notice to the Contractor and the cost of such work shall be recovered from the Contractor. In the event such action is taken by the Engineer-In-Charge, the Contractor will be notified in due course and he shall assist wherever possible in making necessary

corrections. This shall not relieve the Contractor of his liabilities under the terms and conditions of the Contract.

3. The repaired or new parts will be supplied and erected free of cost by the Contractor. If any repair is carried out on his behalf at the site, the Contractor shall bear the cost of such repairs.

5. CONTRACT PERFORMANCE BANK GUARANTEE:

1. The successful Bidder shall be required to furnish **two Contract Performance Bank Guarantee** in non-judicial stamp paper of appropriate value (as per the prescribed format) issued in favour of "TP Central Odisha Distribution Ltd." encashable at Bhubaneswar Branch of the Issuing Bank only within **30 (Thirty) days from the date of issue of the Release Order.**

1.1. First BG : The Contract Performance Bank Guarantee (CPBG) amount shall be equal to **Five percent (5%)** of the Contract Price (including GST) of each **Release Order** related Major items i.e **Distribution Transformers, SCADA Automation, VCB, Switchgear Panels including CT & PT, Isolators, RTUs, RMU , LT/ HT Conductors & XLPE Cables** valid for 03 (three) Months over and above work completion period plus Guarantee Period i.e. **(6 months + 60 Months +3 Months = 69 months).**

1.2. Second BG : The Contract Performance Bank Guarantee (CPBG) amount shall be equal to **Five percent (5%)** of the Contract Price (including GST) for each **Release Order** related minor items (excluding cost of major items as above) valid for 03 (three) Months over and above work completion period plus Guarantee Period i.e. **(6 months + 24 Months +3 Months = 33 months).**

2. If the work completion period gets extended the Contract Performance Bank Guarantee shall be extended accordingly. In case the contract price gets revised, the successful bidder shall submit the amended Bank Guarantee to that effect.

3. The aforesaid CPBG shall be returned to the Contractor after successful completion of the guaranteed obligations under the contract.

6. LATENT DEFECT WARRANTY:

1. The period of latent defect warranty **shall be 5 years reckoned from the date of completion of guarantee period** commencing immediately after the satisfactory commissioning for the entire works under the contract.

2. The latent defect warranty shall mean such warranties which are 'Latent' to the equipment supplied or erected which would not normally be discovered/seen by an inspection nor discoverable during the trial run. These are concealed flaws which one would normally not expect from the item during the execution of the contract or during the guarantee period but subjected from a manufacturing defect for which the contractor shall remain liable for replacement/rectification for such 'Latent' defect.

3. OWNER shall exercise the right of latent defect warranty for replacement/rectification of Supply/Workmanship.

4. OWNER will have a claim in damages against the contractor if the defects are a result of the Contractor's breach of contract and/or negligence and OWNER suffers loss as a result.

7. LIQUIDATED DAMAGE / PENALY:

If the Contractor fails to supply the Materials/Equipment or fails to complete the erection including civil works within the due date of agreed key mile stones as defined in the Works Completion Schedule, TPCODL has the right to levy LD **@0.5% for each week** of delay or part thereof of the contract price of un-finished portion of works subject to the maximum of **5% (five percent) of the total contract price**.

8. SUNMITTAL & INSPECTION AND TESTING:

The time line to submit the GTP & drawing materials(DTR/11Kv & 33Kv Switchgear panel, HT /LT cable, pole, conductor, RMU, isolator, Insulator) shall be submitted within 5 days and balance materials within 15 days after receiving of RC/ LOI. Also, BA shall have to submit PSS layout within 10days.

TPCODL reserves the right to carry out material / services inspection through Third Party Inspecting Agency (TPIA) and or TPCODL or any authorized representative of OWNER at the Contractor's or its Vendor's manufacturing works. The Contractor shall give the advance notice in writing about the place of Inspection and/or Testing at least 15 days before the schedule date on which the equipment/materials will be ready for Inspection and/or Testing.

The Engineer-In-Charge shall have the right to re-inspect any equipment/materials though previously inspected and approved by him at the Contractor's or its Vendor's works, before and after the same are erected at Site. If by the above inspection, TPCODL rejects any equipment, the Contractor shall make good for such rejections either by replacement or modifications/repairs as may be necessary to the satisfaction of the Engineer-In-Charge, free of cost. Such replacement will also include the replacements or re-execution of such of those works of other Contractors and/or agencies, which might have got damaged or affected by the replacements or re-work done to the Contractor's/Vendor's work.

9. INSPECTION COST:

Expenses in respect of witnessing the Inspection & Testing of the equipment / materials offered by the Contractor, at the inspection and testing site, will be to the account of TPCODL. However if re-inspection of same materials is required due to any non-compliance, Additional cost of such re-inspection, if any, shall be borne by the Contractor.

EPC contractor is responsible for arranging the Electrical Inspectorate Clearance and it should be in his purview to get it done. TPCODL will facilitate the process for getting clearance and reimburse the Statutory Fee on production of receipts for such payment.

10. STORE & STORAGE INSURANCE :

1. The Contractor shall make his own arrangements for land for Stores and Workshops as required for storage of materials supplied and brought to site under the Contract at his own cost. The Contractor shall bring to Site all Construction equipment, tools and tackles for the purpose of the works.
2. He shall also employ necessary **watch and ward establishment** for the purpose.
3. All the equipment and materials including spares being supplied by the Contractor shall be kept completely **insured** by the Contractor at his cost from time of dispatch from the Contractor's works / Vender's works, up to the completion of erection, testing & commissioning and taking over of the entire works in accordance with the Contract.

11. SURPLUS MATERIALS/EQUIPMENT:

1. Bidder shall plan & execute the Contract in a manner such that no surplus materials/Equipment is accumulated after completion of the Contract.
2. Surplus Materials/Equipment including construction surplus of the civil works arising out of the contract, if any, the same shall be taken back by the Contractor without any cost to TPCODL.

12. RIGHT OF WAY:

The responsibilities of acquiring Right of Way (ROW) lies with contractor at his risk and cost. However, TPCODL will facilitate process of securing the ROW. The Acquisition of land for Sub- Stations shall be the sole responsibility of TPCODL. Whereas the Contractor shall be responsible for securing the RoW for lines work. Similarly, responsibilities of getting clearance from Railway, NHAI, Forest, Water and other Statutory/Govt. bodies lie with the contractor at his risk and cost (except payment of statutory fees) . However, TPCODL will facilitate the process for getting clearance and reimburse the Statutory Fee on production of receipts for such payment. The Reinstatement of Roads (damaged during laying of UG Cable) & other RoW compensation are to the account of the EPC Contractor, however statutory fees paid, if any will be reimbursed by TPCODL.

13. EMBOSSING / PUNCHING / CASTING:

All equipment and materials supplied /erected under the Project shall bear distinct mark of "TPCODL/ CM PDP" by a way of embossing / punching / casting. This should be clearly visible to naked eye.

14. ELECTRICITY & WATER :

The Contractor shall be entitled to use for the purpose of performing the Services such supplies of electricity and water as may be available on the Site and shall provide any apparatus necessary for such use. The Contractor shall pay at the applicable tariff plus the overheads, if any, for such use. Where such supplies are not available, the Contractor shall make his own arrangement for provision of any supplies he may require.

15. New Items :

In case any new item(s) are required during the execution of the Contract which are not available in the BOQ/Price Schedule contained initial RC issued after completion of this Tender, the same shall be executed by the Contractor at cost not exceeding the latest Benchmarking Price of TPCODL/other Tata Power managed Utilities in Odisha. In case the benchmarks are not available, the prices shall be mutually agreed.

16. Payment Terms:

- A.** 80% (Eighty percent) of contract price shall be paid on pro-rata basis along with taxes and duties within 30 days for completed items/work (Supply and erection at site only) against issued RO as per the agreed Bill of Materials subject to certification by TPCODL Engineer-in-charge.
- B.** Balance 20% (Twenty percent) payment of the actual executed Work Order/RO shall be paid after completion of acceptance test and Taking Over of the complete systems specified in the order, including clearance of Electrical Inspection (if any), compliance thereof and reconciliation .

- All other terms and conditions of TPCODL GCC shall be applicable.

The Contractor shall follow and comply with TPCODL Contractor Safety Management (CSM) and annual safety plan and applicable rules and regulation as per relevant safety guidelines i.e CEA 2010 safety guidelines, CEA 2010 construction guidelines etc., pertaining to the safety of workmen, employees, plant and equipment or as may be prescribed from time to time, without any demur, protest or contest or reservations.

7.2 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. Please refer attached Environment Policy and Sustainability Policy, Annexure-XII, of Tata Power for more details.

7.3 Ethics

- TPCODL is an ethical organization and as a policy TPCODL 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.
- TPCODL 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.

Bidder is advised to refer attached Tata Code of Conduct (TCOC), Annexure-XI, for more information.

Any ethical concerns with respect to this tender can be reported to the following e-mail ID:

ethics@tpcentraodisha.com

8.0 Technical Specification and standards:

Attached in Annexure-II

9.0 General Condition of Contract

Any condition not mentioned above shall be applicable as per GCC. Attached along with this tender in Annexure VIII.

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

10.0 Safety

All jobs are this tender have to be executed strictly in compliance to the Safety terms and Conditions of Tata Power. Please refer attached Safety terms and conditions, Annexure-IX, for details. Violation of Safety norms will result in Penalty as mentioned in the above document. Safety Policy of Tata Power is also enclosed for reference.

ANNEXURE I

Schedule for Items (BOQ)

Rate to be quoted as per BOQ given:

Attached separately with the tender

Importance Note for Price schedule:

- Price shall be quoted considering item description and technical specification.
- The bidders are advised to quote prices strictly in the PRICE format given in Price Annexures. Failing to do so, bids are liable for rejection.
- Bidder should quote as per the "Item description" column. No cutting/ overwriting in the prices is permissible.
- **Bidder have to quote against each items having Unit and Qty. No rate should be quoted where unit and Qty. are blank.**

Mentioning "extra/inclusive" in any of the column may lead for rejection of the price bid.

If any price is mentioned against the line items where unit & Qty. is blank, then the quoted price against the line item will be ignored during evaluation.

- **Unit price of the price bid quoted by the bidder in his bid shall be considered and other than unit price i.e. items description, unit, qty., etc. shall be considered as per the TPCODL tender price schedule.**
- The bids will be evaluated commercially on the overall all-inclusive price of tender BOQ as Price Annexures..
- All materials shall be supplied and erected by the BA on turnkey basis.
- The unit price should be inclusive of freight, insurance and other levies (if any) and exclusive of GST. GST to be mentioned separately. Total price shall be inclusive of all.
- The bidders advised to visit the site and understand scope of the work before price quotation.
- **The Bidder should ensure that the unit prices for the same item furnished in price schedules are consistent with each other. In case of any inconsistency in the Unit prices furnished in the price proposal of the bidder, the TPCODL have right to consider the lowest unit price in evaluation.**
- There shall be no price variation during the Contract Period / Extended Contract Period.

ANNEXURE II

Technical Specification Attached with the tender

Summary of Scope of Work as below.

33 KV Feeder Scope			
SI No.	Name of Division	Location / Feeder details	scope
1	Khordha	Atri GSS To 33 KV Baghamari-II	PART A- OH 232SQ.MM H-POLE
			PART B-33KV UG LINE
2	Khordha	Khordha GSS to 33 KV Malipada	Part-A:- Construction of 33kV New feeder from Khordha GSS 5Ckm 232sq.mm to Malipada PSS proposed RMU.
	Khordha		Part-B:- Construction of 33kV New feeder from Khordha GSS 8Ckm (Forest area) 241sqmm XLPE covered conductor to Malipada PSS proposed RMU.
	Khordha		PART C- Supply & Laying of 0.07Ckm 33KV 1CX630 Sqmm XLPE UG Cable without spare run and Installation of 2nos. 33kV 4W RMU at Malipada PSS.
	Khordha		Part-D:- Conductor augmentation of 6Ckm of 33kV Tangi-Jankia feeder from Malipada T-off to Narangarh PSS (from 55/100sqmm to 232sq.mm overhead conductor)
3	Khordha	Rajpatna GSS 27km 232sq.mm (10km forest area) to Odogaon PSS	Part-A:- Construction of 33kV New feeder from Rajpatna GSS 17Ckm 232sq.mm to Odogaon PSS proposed RMU.
	Khordha		Part-B:- Construction of 33kV New feeder from Rajpatna GSS 10Ckm 241sqmm XLPE covered conductor (Forest area) to Odogaon PSS proposed RMU.
	Khordha		PART C- Supply & Laying of 0.07Ckm 33KV 1CX630 Sqmm XLPE UG Cable without spare run and Installation of 2nos. 33kV 4W RMU at Odogaon PSS.
	Khordha		Part-D:- Conductor augmentation of 14Ckm of 33kV Odogaon feeder from Rajpatna GSS to Odogaon PSS (from 80/100sqmm to 232sq.mm overhead conductor)
	Khordha		Part-E:- Conductor augmentation of 10Ckm 241sqmm XLPE covered conductor (Forest area) of 33kV Odogaon feeder from Rajpatna GSS to Odogaon PSS
4	Khordha	Atri GSS To 33 KV Baghamari-I	PART A- Construction of 5 CKM 33KV OH line using 13 Mtr H pole & 232 Sqmm AAAC.
	Khordha		PART B- Supply & Laying of 1.5 KM 33KV 1CX630 Sqmm XLPE UG Cable without spare run.

5	Jagatsinghpur	Jagatsinghpur GSS to Raghunathpur PSS	PART-A:- Construction of 33 kV new line from Jagatsinghpur GSS to Raghunathpur PSS of length 10.5Ckm, 232sqmm OH conductor.
	Jagatsinghpur		PART-B:- Laying of 33 kV new line from Jagatsinghpur GSS to Raghunathpur PSS of length 6.5Ckm, 1CX630sqmm, UG cable.
	Jagatsinghpur		PART-C:- Construction for 1 no. of 33kV Outdoor Bay at Raghunathpur PSS.
6	BCDD-II	Kantabada GSS to Kurl-on T-off	Part-A:- Laying of 33kV, 1C 630sqmm UG Cable of length -1 km.
	BCDD-II		Part-B:- Construction of 33kV OH line of length -3 km using 232 sq.mm AAA conductor.
7	PURI	Satasankha GSS to Kanas PSS	PART-A:- Construction of 33 kV new line from Satasankha GSS to Kanas PSS of length 20Ckm, 232sqmm OH conductor.
	PURI		PART-B:- Laying of 33 kV new line from Satasankha GSS to Kanas PSS of length 10Ckm, 1CX630sqmm, UG cable.
	PURI		PART-C:- Construction for 1 no. of 33kV Outdoor Bay at Kanas PSS.
8	Chainpal/ Talcher	Telkoi 132/33KV GSS to Kantala 33/11KV PSS	Part-A:- Construction of 10KM overhead line from Telkoi 132/33KV GSS to Kantala 33/11KV PSS on 241sqmm AAAC Covered conductor.
9	Salipur	Conductor augmentation of 33 KV Mahanga feeder	Augmentation of existing Mahanga Feeder of 19 CKM from 100 sq.mm, AAAC to 232 sq.mm from Balia 132/33 KV, GSS to 33/11 KV, Mahanga PSS.
	Salipur		Installation of 1 No. of 33kV Isolator and 1 No. of 33kv VCBat Mahanga PSS for 33 KV outgoing Erkana feeder.
10	Nayagard	33KV Binodpada 33KV Augmentation	PART-A : Refurbishment & Augmentation of 5.8 CKM 3ph 3w 33KV OH line over 13 Mtr WPB & existing pole with 232sqmm AAAC.
	Nayagard		PART B: Construction of 33KV UG line In Open trench method 0.02km without spare.
	Nayagard		PART C- Construction for 1 no. of 33kV Outdoor Bay arrangement at Itamati PSS.
11	Nimapada	33KV Pipili Feeder Augmentation	Augmentation of existing 33kV Pipili feeder of length-24Ckm between Dighalo (Nimapara) Grid to 33/11kV Pipili PSS.
12	PURI	33KV Atharnala Feeder Augmentation	Part-A :- 33kV Alarnath Feeder Refurbishment with Conductor Augmentation (from existing 100 sqmm to 232sqmm) from Samuka Grid to Sunamuhin PSS- Total Length 24Ckm
13	Chainpal/ Talcher	33KV Industrial Feeder Augmentation chainpal to balanda	Part-A :- 33kV Industrial Feeder Refurbishment with Conductor Augmentation (from existing 100sqmm to 232sqmm) from Chainpal Grid to Balanda PSS- Total

			Length 11Ckm
14	Dhenkanal	33kV Hindol Road Feeder Conductor Augmentation	Part-A : 33kV Hindol Road Feeder Refurbishment with Conductor Augmentation (from existing 100sqmm to 232sqmm) from Gundichapada Grid to Hindol Road PSS- Total Length 12.5Ckm
11 KV Feeder Scope locations			
Sl No.	Name of Division	Location / Feeder details	scope
1	Khordha	Paniora to Oil Mill -I	PART A: Construction of 1.5 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm ² AAAC from 16 KVA Grama Diha HP gas DSS of 11KV Oil Mill feeder emanating from 33/11 KV Janla PSS to 100 KVA Paniora DSS of 11KV Paniora feeder emanating from 33/11 KV, Chhatabar PSS. . (Refer Point A-B in SLD).
2	Khordha	11KV Manibandha feeder	PART A: Construction of proposed 11kv Manibandha feeder, 2 CKM 3ph 3w 11KV OH line over existing pole & proposed 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm ² AAAC from 33/11 KV Gediapalli PSS to 63 KVA Gudupangi DSS of 11KV Gediapalli feeder emanating from 33/11 KV, Gediapalli PSS. . (Refer Point A-B in SLD).
3	Khordha	11KV New Medical Feeder	PART A: Construction of 3 Nos. DP with Isolator for U/G cable raising near Medical DSS .
	Khordha		PART B: 1. Supply and laying of, 11 kv ,3C X 400 sqmm XLPE UG cable= Length 2.1 Km , with one run spare.(Refer Point A-B in SLD). 2. Installation of 11kv 3 Way RMU (LLV type) near Medical DSS.(Refer Point B in SLD).
4	Khordha	11KV Dia Khauruni Feeder	PART A: Construction of 2 CKM 3ph 3w 11KV OH line over existing pole & 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm ² AAAC from 3/11 KV Hatabasta PSS to 25 KVA OLIC Dihakhauruni DSS of 11KV Bankoi feeder emanating from 33/11 KV, Binodpada PSS. . (Refer Point A-B in SLD)
5	Khordha	11KV Badakumari Feeder	PART A: Construction of 2 CKM 3ph 3w 11KV OH line over existing pole & 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm ² AAAC from 3/11 KV Hatabasta PSS to 100 KVA OLIC Badakumari DSS of 11KV Bankoi feeder emanating from 33/11 KV, Binodpada PSS. . (Refer Point C-D in SLD)

	Khordha		PART B: Augmentation of 7 CKM 3ph 3w 11KV OH line over existing pole & 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from Badakumari OLIC to Kotani sira Line AB switch (Refer Point D-E in SLD)
6	Khordha	11KV Pubusahi feeder & 11KV Tartua feeder	PART A: Construction of 1.8 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 25 KVA Balaji Pipes DSS of 11KV Pubusahi feeder emanating from 33/11 KV Sarua PSS to 25 KVA Jagannath Temple DSS of 11KV Tartua feeder emanating from 33/11 KV, Khordha (Ten Pole) PSS. (Refer Point A-B in SLD)
7	Puri	11KV Khandiabandha & Narandra pokhari feeder	PART A: Construction of 3 Nos. DP with Isolator for U/G cable raising near Nila Chakra Nagar & Garuda DSS .
	Puri		PART A: 1. Supply and laying of, 11 kV ,3C X 400 sqmm XLPE UG cable= Length 0.3 Km , with one run spare.(Refer Point A-B in SLD). 2. Installation of 11kv 3 Way RMU (LLV type) near Medical DSS.(Refer Point A in SLD).
8	Puri	11KV Guali Gorada feeder	PART A: Construction of 0.35 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from Kala Pahada Line AB switch of 11KV Saranga jodi feeder emanating from 33/11 KV Sakhigopal PSS to Balapur AB switch of 11KV Ketakipatana feeder emanating from 33/11 KV, Gabakunda PSS. (Refer Point C-D in SLD).
	Puri		PART B: Supply and laying of, 11 kV ,3C X 400 sqmm XLPE UG cable= Length 0.9 Km , with one spare run.(Refer Point A-B in SLD).
9	Puri	11 KV Delanga & Chandola	PART A: Construction of 1.5 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 63 KVA Gudupailo DSS of 11KV Delang feeder emanating from 33/11 KV Delang PSS to 25 KVA Jayalunda DSS of 11KV Kalyanpur feeder emanating from 33/11 KV, Kalyanpur PSS. . (Refer Point A-B in SLD).
10	Paradeep	Linking between Krishnandapur feeder 11KV Posal feeder	Part-A: 1. Construction of 11 KV O/H line of length 2 CKM using 100 Sq.mm. AAA conductor from Bisanpur DSS of 11KV Krishnandapur feeder emanating from Krishnandapur 33/11 KV PSS to Behedpur DSS of 11KV Posal feeder emanating from 33/11 KV Paruna PSS.

11	Puri	Panasapada PSS to 11 KV Gambhari line	PART A: Construction of 5 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 33/11 KV Panasapada PSS to Gambhari line AB switch of 11KV Satapada feeder emanating from 33/11 KV, Satapada PSS. . (Refer Point A-B in SLD).
12	Puri	11KV Damodarpur feeder (samangara PSS)	PART A: Supply and laying of, 11 kV ,3C X 400 sqmm XLPE UG cable= Length 0.5 Km , With one run spare.(Refer Point A-B in SLD).
	Puri		PART A: Construction of 2 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 33/11 KV Samang PSS to 100 KVA Kanthapur DSS of 11KV Koilada feeder emanating from 33/11 KV, Samang PSS. . (Refer Point B-C in SLD).
13	Puri	11KV Harekrushanapur feeder	PART A: Supply and laying of, 11 kV ,3C X 400 sqmm XLPE UG cable= Length 0.5 Km , with one run spare.(Refer Point A-B in SLD).
	Puri		PART B: Construction of 2 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 100 KVA Sujata Nagar DSS of 11KV Khandia bandha feeder emanating from 33/11 KV Atharnala PSS to 250 KVA NCC DSS of 11KV Harekrushnapur feeder emanating from 33/11 KV, Charinala PSS.(Refer Point C-D in SLD).
14	Nayagard	11KV Kharabara Feeder	PART A: Construction of 6 CKM 3ph 3w 11KV OH line over Existing pole & 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 33/11 KV Bijipur PSS to 100 KVA Balisahi DSS of 11KV Bijipur feeder emanating from 33/11 KV, Bijipur PSS. . (Refer Point A-B in SLD).
15	Nayagard	11kv Komanda Feeder	PART A: Construction of 0.15 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 250 KVA Kumdo DSS of 11KV Kumonda feeder emanating from 33/11 KV Odagaon PSS to Udayapur village line of 11KV New Kumonda feeder emanating from 33/11 KV, Kurala PSS. . (Refer Point A-B in SLD).
16	Nayagard	11KV Keshpania feeder	PART A: Construction of 0.4 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 25 KVA Panchayat DSS of 11KV Keshpania feeder emanating from 33/11 KV Godipada PSS to 63 KVA Panchumu DSS of 11KV Old Godipada feeder emanating from 33/11 KV, Sarankul PSS. . (Refer Point A-B in SLD).
17	Nayagard	11KV Nagamunduli Feeder	PART A: Construction of 0.1 CKM 3ph 3w 11KV OH line over 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC (Refer Point C-D in SLD).

18	Khordha	11KV Golapokhari feeder to 11KV Hatabasta feeder	Part-A: 1.Construction of 11 KV O/H line of length 1.5 CKM using 99 sq.mm,XLPE covered conductor from 100 KVA Haladiapada DSS of 11KV Golapokhari feeder emanating from 33/11 KV Fategarh PSS to 16 KVA Sahajpur DSS of 11KV Hatabasta feeder emanating from 33/11 KV, Hatabasta PSS.
	Khordha		PART B: Augumentation of 5 CKM 3ph 3w 11KV OH line over existing pole & 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC.
19	Nayagard	11KV Padmabati feeder	PART A: Construction of 6 CKM 3ph 3w 11KV OH line over Existing pole & 11mtr long 160x152 ,30.44KG/MTR WPB Pole with 100 mm2 AAAC from 33/11 KV Bijipur PSS to 100 KVA Balisahi DSS of 11KV Bijipur feeder emanating from 33/11 KV, Bijipur PSS. . (Refer Point A-B in SLD).
20	Jagatsinghpur	Interlinking betwwen 11KV Sibapur & Kantuar feeder	Part-A:1.Construction of 11 KV O/H line of length 2.8 CKM using 100 Sq.mm. AAA conductor from Sibapur DP with AB Switch of 11KV Sibapur feeder emanating from Balia 33/11 KV PSS to Proposed Railway crossing DP & Construction of 11 KV O/H line of length 2 CKM using 100 Sq.mm. AAA conductor from proposed railway crossing DP to Arana DP with AB Switch of 11KV Kantur feeder emanating from 33/11 KV Raghunathpur PSS.
	Jagatsinghpur		PART-B:- Supply & Laying of 0.2 KM 11 KV 3CX400 Sq.mm. UG Cable with One run spare from proposed railway crossing DP-1 to proposed Railway crossing DP-2.
21	Jagatsinghpur	Interlinking betwwen 11KV Kharia & Sangrampur Feeder	Part-A: 1.Construction of 11 KV O/H line of length 2.5 CKM using 100 Sq.mm. AAA conductor from Jakakula DSS of 11KV Khaira feeder emanating from Bhatpada 33/11 KV PSS to Jamugaon Polytechnic of 11KV Sangrampur feeder emanating from 33/11 KV Balikuda PSS.
22	Jagatsinghpur	New 11KV Feeder from Chikinia PSS	Part-A: 1.Construction of 11 KV O/H line of length 10 CKM using 100 Sq.mm. AAA conductor from Chikinia PSS of 11KV Jaipur feeder to Tourism Hart Point , Jaipur of 11KV Kotakanta feeder emanating from 33/11 KV Tirtol PSS.
23	Jagatsinghpur	Interlinking betwwen 11KV Deriki & Machhagaon Feeder	Part-A: 1.Construction of 11 KV O/H line of length 1.5 CKM using 100 Sq.mm. AAA conductor from Deriki DSS of 11KV Deriki feeder emanating from Deriki 33/11 KV PSS to Garoi Gada DSS of 11KV Machhagaon feeder emanating from 33/11 KV Sova PSS.

24	Jagatsinghpur	Interlinking 11KV Salijanga feeder 11KV Sikhara feeder	Part-A: 1.Construction of 11 KV O/H line of length 1 CKM using 100 Sq.mm. AAA conductor from Bodal LI DSS of 11KV Salijanga feeder emanating from Deriki 33/11 KV PSS to Bodal DSS of 11KV Sikhara feeder emanating from 33/11 KV Nuagaon PSS.
25	Paradeep	Interlinking 11KV bailo feeder 11KV Pankapala feeder	Part-A: 1.Construction of 11 KV O/H line of length 1 CKM using 100 Sq.mm. AAA conductor from Bhanarkula Tower DSS of 11KV Bailo feeder emanating from Gorada 33/11 KV PSS to Banikuda-3 DSS of 11KV Pankapala feeder emanating from 33/11 KV Rahama PSS.
26	Paradeep	Interlinking 11KV santata feeder 11KV Jhimani feeder	Part-A: 1.Construction of 2.8 CKM 11 KV O/H line using 11 Mtr. WPB Pole & 100 Sq.mm. AAAC.
	Paradeep		PART-B:- Supply & Laying of 0.2 KM 11 KV 3CX400 Sq.mm. XLPE U/G Cable with One NO. spare Run in Open Trench Method
27	Paradeep	11KV Mulisingh feeder from Kanakpur PSS	Part-A: 1.Construction of 0.5 CKM 11 KV O/H line using 11 Mtr. WPB Pole & 100 Sq.mm. AAAC at Mulisingh Village area.
	Paradeep		Part-B: 1.Renovation of 01 CKM 11 KV O/H line by augmenting conductor from 34 Sq.mm. AAAC to 100 Sq.mm. AAAC from Kanakpur PSS to Near Mulisingh Village.
28	Kendrapada-I	Interlinking 11KV Nahulia feeder 11KV bhariagada feeder	Part-A: 1.Construction of 11 KV O/H line of length 01 CKM using 100 Sq.mm. AAA conductor from Kothasahi DSS of 11KV Nahulia feeder emanating from Ayatan 33/11 KV PSS to Archaitpur DSS of 11KV Bharigada feeder emanating from 33/11 KV Rajkanika PSS.
29	Kendrapada-I	Proposed Vitarakanika feeder from Badadia PSS	Part-A:1.Construction of 11 KV O/H line of length 0.1 CKM using 100 Sq.mm. AAA conductor from Proposed DP near 33/11 KV Badadia PSS to Proposed DP near existing 4-Pole.
	Kendrapada-I		PART-B: 1. Supply & Laying of 0.06 KM 11 KV 3CX400 Sq.mm. XLPE U/G Cable with One NO. spare Run in Open Trench Method 2. Installation of One NO. 11 KV 4-Way RMU (LLVV)
30	Kendrapada-I	Interlinking 11KV Dhumat feeder 11KV Ghagra feeder	Part-A: 1.Construction of 11 KV O/H line of length 01 CKM using 100 Sq.mm. AAA conductor from Cherigan Airtel Tower DSS of 11KV Dhumat feeder emanating from Indupur 33/11 KV PSS to Jaykrushnapur Hanuman Mandir DSS of 11KV Ghagra feeder emanating from 33/11 KV Chaudakulat PSS.

31	Kendrapada-I	Proposed Bhuipur feeder from Madhuban PSS	Part-A: 1.Construction of 11 KV O/H line of length 6 CKM using 100 Sq.mm. AAA conductor from Proposed DP at 33/11 KV Madhuban PSS to Proposed DP near Badamanpur DSS.
	Kendrapada-I		PART-B: 1. Supply & Laying of 0.06 KM 11 KV 3CX400 Sq.mm. XLPE U/G Cable with One NO. spare Run in Open Trench Method 2. Installation of One NO. 11 KV 4-Way RMU (LLVV)
32	Paradeep	Interlinking 11KV Ambiki-2 feeder 11KV Japa feeder	Part-A: 1.Construction of 11 KV O/H line of length 1.35 CKM using 100 Sq.mm. AAA conductor from Kankana DSS of 11KV Ambiki-2 feeder emanating from Gadabishnupur 33/11 KV PSS to Dahibar DSS of 11KV Japa feeder emanating from 33/11 KV Ersama PSS.
	Paradeep		PART B: Construction of 02 Nos 33 KV NBL Tower-HZ type (150 Mtr) for River crossing of 33 KV proposed feeder for River Crossing.
	Paradeep		Part-C: 1.Renovation of 5 CKM 11 O/H trunk line of 11 KV Ambiki-2 Feeder by augmenting conductor from 55 Sq.mm. AAAC to 100 Sq.mm. AAAC.
33	Nimapada	11KV Astaranga feeder	Part-A: 1.Construction of 11 KV O/H line of length 3 CKM using 100 sq.mm,AAA conductor from 16 KVA Sanjhadling DSS of 11KV Patalda feeder emanating from 33/11 KV Patalda PSS to 16 KVA Puinchandia DSS of 11KV Astaranga feeder emanating from 33/11 KV, Astaranga PSS.
34	Chainpal / Talcher	11KV Kandarsingha feeder	Part-A: 1.Construction of 11 KV O/H line of length 3 CKM using 99 sq.mm,XLPE covered conductor from 25 KVA Renthapata RWSS DSS of 11KV Panigengutia feeder emanating from 33/11 KV Sanda PSS to 100KVA Roda DSS of 11KV Kandarsingha feeder emanating from 33/11 KV, Parjang PSS.
	Chainpal / Talcher		Part-B: Construction of 11 KV O/H line of length 1.9 CKM using 99 sq.mm, XLPE Covered conductor from 33/11 KV, Sanda PSS to Kumusi Medical DSS of 11KV Panigengutia feeder.
	Chainpal / Talcher		Part-C: Installation of 1No. of Line DP with AB switch near new Katabahala.

35	Chainpal / Talcher	11KV Kualo Feeder	Part-A:1.Construction of 11 KV O/H line of length 4 CKM using 99 sq.mm,XLPE covered conductor from 100 KVA Kualo Village DSS of 11KV Kualo feeder emanating from 33/11 KV Parjang PSS to 25 KVA Dhaba DSS of 11KV Basulei feeder emanating from 33/11 KV, New Banarpal PSS.
36	Chainpal / Talcher	11KV Old Parjanga Feeder	Part-A: Installation of 1 No. of Line DP with AB switch near Pvt. Fly Ash 63 KVA.
37	Cuttack Electrical Division	11KV sankarpur feeder	Part-A: 1.Construction of 11 KV O/H line of length 1 CKM using 100 Sq.mm. AAA conductor from Badapadagaon 100 kVA DTR of 11KV Sankarpur feeder emanating to Near Railway gate 16 KVA DTR of 11KV Kalinga feeder.
	Cuttack Electrical Division		Part-B: 1.Augmentation of 11 KV O/H line of length 5 CKM using 100 Sq.mm. AAA conductor from Sankarpur PSS to Badapadagaon 100 kVA DTR of 11KV Sankarpur feeder.
38	Cuttack Electrical Division	11kv Sompur feeder	Part-A: 1.Construction of 11 KV O/H line of length 5 CKM using 100 Sq.mm. AAA conductor from Badapokri DSS of 11KV Sompur feeder emanating from Sompur 33/11 KV PSS to Belasupur DSS of 11KV Kantuar feeder emanating from 33/11 KV Raghunathpur PSS.
39	AED, Athagard	11KV Manibandha feeder	Part-A: 1.Construction of 11 KV O/H line of length 0.5 CKM using 100 Sq.mm. AAA conductor from Maa Durga Fly Ash DSS of 11KV Manibandha feeder emanating from Nuapatna 33/11 KV PSS to Babu dhaba of 11KV Manibandha feeder emanating from 33/11 KV Dhobanala PSS.
40	Cuttack Electrical Division	new 11 KV O/H line from 11 KV Byree feeder to 11 KV Salapada feeder	Part-A: 1.Construction of 11 KV O/H New line of length 5 CKM using 99 sq.mm,XLPE covered conductor from 33/11 KV Kaimatia PSS to 100KVA Baunsumulia DSS of 11KV Salapada feeder emanating from 33/11 KV, Kaimatia PSS.
	Cuttack Electrical Division		Part-B: Installation of 1 No. of RMU at Kaimatia PSS.
	Cuttack Electrical Division		Part-C: Augmentation of 11 KV O/H New line of length 4 CKM using 99 sq.mm,XLPE covered conductor from Rangamatia DSS to Basumulia DSS

41	Cuttack Electrical Division	Proposal for augmentation 11 KV O/H line from 11KV Khalarda feeder for mitigation of low voltage.	Part-A: 1.Augmentation of 11 KV O/H line of length 2 CKM using 100 Sq.mm. AAA conductor from OTR Khalarda DTR to Tala Khalarda DTR of of 11KV Khalarda feeder.
42	Cuttack Electrical Division	Proposal for construction of new and augmentataion of 11 KV O/H line for bifuraction of 11 KV 42 Mouza feeder for mitigation of low voltage.	Part-A: 1.Construction of 11 KV O/H linking new line of 6 CKM using 100 sq.mm, AAA conductor from 33/11 KV Gopalpur PSS to near Jaripada 100 KVA DTR for 11 KV 42 Mouza feeder bifuracation.
	Cuttack Electrical Division		Part-B:1. Augmentation of conductor for 4 CKM of 11 KV 42 Mouza feeder from 34/55 sq.mm, AAAC to 100sq.mm, AAA conductor from 33/11 KV Goplapur PSS to Jaripada for for mitigation of low voltage.
LT AB cable Supply & Stringing			Qty (KM)
1		LT AB Cable Line Length with 4C×95 mm ² ABC using PSC Pole.	48
2		LT AB Cable Line Length with 4C×70 mm ² ABC using PSC Pole.	236.5
3		LT AB Cable Line Length with 4C×35 mm ² ABC using PSC Pole.	255
4		LT 1Ph to 3 Ph line length with 4C×35 mm ² ABC using PSC Pole	149
		Total LT AB Cable Scope in KM	688.5
DTR Scope			Nos
1		63 KVA DSS Without DTR	139
2		63 KVA DSS With New DTR	158
3		100 KVA DSS Without DTR	133
4		100 KVA DSS With New DTR	21
5		250 KVA DSS Without DTR	31
6		250 KVA DSS With New DTR	117
7		500 KVA DSS With New DTR	34

	Total DTR Scope in Nos.	633
	11KV Linking LINE EXTENSION IN 100 mm2 AAAC in KM	15.83

DTR Installation division wise.

Sl. No	Circle	Division	No of DTR
1	BBSR-I	NED	37
2	BBSR-II	BAED	149
3		KHD	18
4		NYED	39
5		PURI	58
6		Cuttack	AED
7	CED		34
8	PARADEEP	JED	170
9		KED-II	119
10	Total		633

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 TPCODL'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 GST	Yes / No (If Yes, indicate % rate)
1d.	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 Micro, Small & Medium Enterprises Act, 2020	Yes / No (If Yes, indicate, MSME Reg'n No.)

Seal of the Bidder:

Signature:

Name:

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	Page No
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	Sheet of commercial/ technical deviation if any (Annexure III)		
6	Duly filled Self Declaration Form (Annexure IV)		
7	Duly filled schedule of commercial specifications (Annexure V)		
8	Letter of award/contract documents/ Order Copy, Performance Certificates is to be provided by bidder in proof of qualifying criteria. (Submit a statement indicated order no, value date of completion to support above)		
9	Balance sheet for the last completed three financial years; mandatorily enclosing Profit & loss account statement & Turn Over Certificate certified by CA		
10	Credit rating/ Solvency certificate certified by Bank		
11	HT License and other statutory document (Pan, GSTIN, ESI, EPF)		
12	List of Machine/ tools with updated calibration certificates if applicable		
13	Order copies as a proof of quantity executed		
14	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, TPCODL 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. TPCODL 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. TPCODL will make every effort to make the bid process transparent. However, the award decision by TPCODL would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPCODL, 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 TPCODL.
6. In case of intranet medium, TPCODL shall provide the infrastructure to bidders. Further, TPCODL 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 TPCODL.
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 TPCODL 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 TPCODL.
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

General Conditions of Contract – Attached separately

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Annexure VII (a)**Preferential norms for procurement from Local MSMEs****1) Tender Fees**

To participate in the tender, MSMEs registered in the State of Odisha shall pay Rs.1,000/- including GST towards cost of tender paper.

2) Earnest Money Deposit (EMD)

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.

3) Qualification Requirement for Open Tenders

Qualification Requirement of Financial Turnover for MSME registered in the State of Odisha shall be reduced to 20% of the existing criteria.

For past experience, instead of relying on the volumes / value of earlier Supplies / Projects, assessment of the Bidder shall be done on the basis of feedback from Customers. Past performance experience at Tata Power and its Group Companies shall supersede feedback from other Customers.

4) Reservation for MSME

It shall be mandatory to procure at least 20% of the total volume of the procurement from MSME registered in the State of Odisha (however, it shall not apply where goods/services are not available with the MSME), subject to matching L1 discovered prices and meeting technical specifications including quality requirements.

5) Performance Bank Guarantees

Performance Bank Guarantee for MSME registered in the State of Odisha shall be 25% of the value normally prescribed.

Annexure VIII**Safety Policy and Safety terms and conditions (Attached separately)****Annexure-IX**

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 mail ID: Pravin.jain@tpcentralodisha.com.

Annexure X**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-XI

PROFORMA FOR BANK BALANCE, FIXED DEPOSITS AND AVAILABILITY OF CREDIT FACILITIES BANK CERTIFICATE

This is to certify that M/s. (Full Name & Address), who are submitting their bid to TPCODL against their Tender Specification vide Ref. No.....& Dateis our Customer for the past..... Years.

Their financial transactions with our Bank have been satisfactory. Their Current A/c Balance & Fixed Deposit Balance as on is also indicated below:

SL.NO.	TYPE OF ACCOUNT(CURRENT/ FD/RD/ANY OTHER)	ACCOUNT NUMBER	BALANCE as on Dt..... (Rs. in Cr)

They enjoy the following fund based and non fund based limits (Cash Credit, Bank Guarantees, L/C and other credit facilities) with us against which the extent of utilization as on is also indicated below:

SL.NO.	TYPE OF FACILITY	SANCTIONED LIMIT AS ON DATE	UTILISATION AS ON DATE (Rs. In Cr.)	AVAILABLE AS ON DATE (Rs. in Cr)

This letter is issued at the request of M/s

Sd/-

Name of Bank.....

Name of Authorised Signatory

Designation

Phone No.

Address

SEAL OF THE BANK.

N.B. : To be issued by the Issuing Bank in their Bank Letter Head

ANNEXURE-I

SCOPE- I :

- (A) SUPPLY PART:**
- (B) ERECTION PART**

Construction of 33kV Outdoor Bay at TPCODL 33/11kV PSS with accessories, as per technical specification and scope of work.

Tata Power Central Odisha Distribution Limited (TPCODL)									
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations, 33kV, 11kV, LT Lines, LVRT and DTR									
Supply of Materials Required for Construction of 33kV Bay At TPCODL PSS									
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24, Date:05.04.2023									
SL. No.	DESCRIPTION OF ITEMS			Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY
	SUPPLY OF FOLLOWING EQUIPMENTS/ MATERIALS (As per technical specification and scope of work.)								
				Circle					
BROAD REQUIREMENT FOR INFORMATION (Not to be quoted)				5 (Sum from 1 to 4)	6	7= (6*9%)	8= (6*9%)	9= {6+7+8}	10= {9*5}
1	33kV New bay at existing TPCODL S/s			No's.	4				
DETAIL REQUIREMENT (To be quoted)									
1	Supply of Materials Required for Construction of 33kV Outdoor Bay at TPCODL 33/11kV PSS with accessories, as per technical specification and scope of work.								
Sl. No.	Description of Materials			Unit					
	Switchyard GI Structures Column & Beam (with H-Type Pole) for 33kV side including Foundation Bolts & Nuts, as per technical specification and scope of work.								
1	T-1 GI Column(7.25 mtr long, consisting of 2 Nos of 150X76X6.5 mm channel) for 33kV incoming line, Nominal Unit Wt - 0.35 MT			Nos.	4.00				
2	T-2 GI Column (7.25mtr long, consisting of 2 Nos 175X75X6 mm channel) for 33kV incoming line -1 no, Nominal Unit Wt - 0.42 MT			Nos.	4.00				
3	T-1A GI Column (for 33 kv Bus) (6 mtr long, consisting of 2 Nos of 150X76X6.5 mm channel jointed by plates) Nominal Unit Wt - 0.31 MT			Nos.	7.00				
4	T-2A GI Column (for 33 kv Bus) (6 mtr long, consisting of 2 Nos 175X75X6 mm channel jointed by plates) Nominal Unit Wt - 0.37 MT			Nos.	7.00				
5	G-3 GI Beam(5.05mtr long, consisting of 2 Nos 150X75 X5.7mm) for 33kV incoming line - (2 nos. Beam- one for Surge Arrester and other for Isolator, Nominal Unit Wt - 0.2 MT)			Nos.	5.00				
6	G-2 GI Beam (6.1 mtr long, consisting of 2 Nos 125X65 X5.3 mm channel jointed by plates) for 33kV Bus Stringing , Nominal Unit Wt - 0.175 MT)			Nos.	14.00				
7	Equipment Structures (GI) For 33 KV Isolator (Unit Wt of Equipment Structures per set - 0.33 MT)			KG	2970.00				

8	Equipment Structures (GI) For 33 KV Vacuum Circuit Breaker (Unit Wt of Equipment Structures per set - 0.2 MT)	KG	800.00				
9	GI Column for 33 KV CT (Unit Wt of Equipment Structures per set - 0.285 MT)	KG	1140.00				
10	GI Spikes with cone and GI (2 nos) base plate 10mm (50x3000 mm GI pipe) (Unit Wt=0.035 MT)	Nos.	16.00				
11	GI Pipe Earthing 40mm. 3 Mtr. Long	Nos.	28.00				
12	50x6mm GI Flat for earthing, 2.36kg/mtr., (10 Mtr. For Isolator/VCB , 10 metre mesh formation)= 20x2.36	KG	731.60				
13	400 sq.mm ACSR for 33kV side jumpering and Bus Formation etc.	Km	0.45				
14	33 kV 1250 AMP Double break (Turn & twist center rotating) isolator with earth switch with PI(Polymer)	Set	9.00				
15	33KV Outdoor VCB-1600A, with indoor CR panel without PT, with outdoor CT (CTR-600-300-150/1-1A, 15VA, STC 25KA/3sec, class: 0.5, 5P10) for feeder protection	EA	4.00				
16	33KV.Single Phase PT(33KV/ V3 / 110V/ V3) (Oil cooled) CLASS 0.5 / 3P, with O/P burden of 100VA	EA	12.00				
17	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	36.00				
18	Control Cable 10Core x 2.5 mm2	Mtr	450.00				
19	Control Cable 16Core x 2.5 mm2	Mtr	450.00				
20	Control Cable 4Core x 2.5 mm2	Mtr	200.00				
21	Control Cable 7Core x 2.5 mm2	Mtr	200.00				
22	Disc insulator (B&S) 90 KN polymer	Nos.	54.00				
23	H W fitting(B&S) 90KN,4 Bolt	Nos.	54.00				
24	8 bolted (M-12) "T" clamp for suitable size of conductors	Nos.	54.00				
25	PG Clamp for 232 sq.mm AAA conductor	Nos.	180.00				
26	GI Nut , Bolt & Washer of different sizes (13.718 Kg each Structures)	KG	178.33				
27	Black Paint	Ltr	13.00				
28	Yellow Colour Paint for Background	Ltr	26.00				
TOTAL OF SUPPLY COMPONENT OF THE WORKS CONTRACT FOR 33kV Bay							

Tata Power Central Odisha Distribution Limited (TPCODL)										
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Station, 33kV, 11kV, LT Lines, Erection, Civil & Services of Equipment/Materials Required for Construction of 33kV Bay At TPCODL										
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24, Date:05.04.2023										
SL. No.	DESCRIPTION OF ITEMS									
	ERECTION, TESTING & COMMISSIONING INCLUDING CIVIL WORKS OF FOLLOWING EQUIPMENTS (As per technical specification and scope of work.)			Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY	
				Circle						
BROAD REQUIREMENT FOR INFORMATION (Not to be quoted)				5 (Sum from 1 to 4)	6	7= (6*9%)	8= (6*9%)	9= {6+7+8}	10= {9*5}	
1	33kV New bay at existing TPCODL S/s			No's.	4					
DETAIL REQUIREMENT (To be quoted)										
1	Erection, Testing & Commissioning of Materials of Materials Required for Construction of 33kV Outdoor Bay at TPCODL 33/11kV PSS with accessories, as per technical specification and scope of work.									
Sl. No.	Description of Materials			Unit						
	Switchyard GI Structures Column & Beam (with H-Type Pole) for 33kV side including Foundation Bolts & Nuts, as per technical specification and scope of work.									
1	T-1 GI Column(7.25 mtr long, consisting of 2 Nos of 150X76X6.5 mm channel) for 33kV incoming line, Nominal Unit Wt - 0.35 MT			Nos.	4.00					
2	T-2 GI Column (7.25mtr long, consisting of 2 Nos 175X75X6 mm channel) for 33kV incoming line -1 no, Nominal Unit Wt - 0.42 MT			Nos.	4.00					
3	T-1A GI Column (for 33 kv Bus) (6 mtr long, consisting of 2 Nos of 150X76X6.5 mm channel jointed by plates) Nominal Unit Wt - 0.31 MT			Nos.	7.00					
4	T-2A GI Column (for 33 kv Bus) (6 mtr long, consisting of 2 Nos 175X75X6 mm channel jointed by plates) Nominal Unit Wt - 0.37 MT			Nos.	7.00					
5	G-3 GI Beam(5.05mtr long, consisting of 2 Nos 150X75 X5.7mm) for 33kV incoming line - (2 nos. Beam- one for Surge Arrester and other for Isolator, Nominal Unit Wt - 0.2 MT)			Nos.	5.00					

6	G-2 GI Beam (6.1 mtr long, consisting of 2 Nos 125X65 X5.3 mm channel jointed by plates) for 33kV Bus Stringing , Nominal Unit Wt - 0.175 MT)	Nos.	14.00					
7	Equipment Structures (GI) For 33 KV Isolator (Unit Wt of Equipment Structures per set - 0.33 MT)	KG	2970.00					
8	Equipment Structures (GI) For 33 KV Vacuum Circuit Breaker (Unit Wt of Equipment Structures per set - 0.2 MT)	KG	800.00					
9	GI Column for 33 KV CT (Unit Wt of Equipment Structures per set - 0.285 MT)	KG	1140.00					
10	GI Spikes with cone and GI (2 nos) base plate 10mm (50x3000 mm GI pipe) (Unit Wt=0.035 MT)	Nos.	16.00					
11	GI Pipe Earthing 40mm. 3 Mtr. Long	Nos.	28.00					
12	50x6mm GI Flat for earthing, 2.36kg/mtr., (10 Mtr. For Isolator/VCB , 10 metre mesh formation)= 20x2.36	KG	731.60					
13	400 sq.mm ACSR for 33kV side jumpering and Bus Formation etc.	Km	0.45					
14	33 kV 1250 AMP Double break (Turn & twist center rotating) isolator with earth switch with PI(Polymer)	Set	9.00					
15	33KV Outdoor VCB-1600A, with indoor CR panel without PT, with outdoor CT (CTR- 600-300-150/1-1A, 15VA, STC 25KA/3sec, class: 0.5, 5P10) for feeder protection	EA	4.00					
16	33KV.Single Phase PT(33KV/ V3 / 110V/ V3) (Oil cooled) CLASS 0.5 / 3P, with O/P burden of 100VA	EA	12.00					
17	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	36.00					
18	Control Cable 10Core x 2.5 mm2	Mtr	450.00					
19	Control Cable 16Core x 2.5 mm2	Mtr	450.00					
20	Control Cable 4Core x 2.5 mm2	Mtr	200.00					
21	Control Cable 7Core x 2.5 mm2	Mtr	200.00					
22	Disc insulator (B&S) 90 KN polymer	Nos.	54.00					
23	H W fitting(B&S) 90KN,4 Bolt	Nos.	54.00					
24	8 bolted (M-12) "T" clamp for suitable size of conductors	Nos.	54.00					
25	PG Clamp for 232 sq.mm AAA conductor	Nos.	180.00					
26	GI Nut , Bolt & Washer of different sizes (13.718 Kg each Structures)	KG	178.33					
27	Black Paint	Ltr	13.00					
28	Yellow Colour Paint for Background	Ltr	26.00					
2	Civil Works Including Supply of All Materials Like Cement, MS tor Rod, Brick, Coarse & Fine Agregrates & Labour, T&P etc.; for Construction of 33kV Outdoor Bay at TPCODL 33/11kV							
1	Contour survey (6mts.x 6 mts.)	Sq.mtr.	144.00					
2	Cutting , Filling of Bay area in S/S with borrowed earth (rolling & compacting of filledup soil before taking measurement) , as per technical specification and scope of work.	Cum	144.00					

3	Foundation for Switchyard and Equipment Structures (Including Supply of all materials, good quality planks, ballas, shuttering plates for centering, shuttering, supply of good quality 20 mm machine broken granite chips, good quality river sand and concreting, curing, as per technical specification and scope of work.							
3.1	Column as per Drawing Schedule.							
3.1.1	Excavation with back filling L2.15mxW2.15xD1.85	Cum	34.21					
3.1.2	PCC 1:3:6 (2.15mx2.15x0.075)	Cum	1.39					
3.1.3	RCC :1:1.5:3 (2x2x0.25+0.8x0.8x2.1)	Cum	9.38					
3.2	VCB as per Drawing Schedule.							
3.2.1	Excavation with back filling (2.15x1.4x1.2mtr)	Cum	14.45					
3.2.2	PCC (1:3:6)	Cum	0.43					
3.2.3	RCC(1:1.5:3)	Cum	7.44					
3.3	Isolator as per Drawing Schedule.							
3.3.1	Excavation with back filling	Cum	18.90					
3.3.2	PCC (1:3:6)	Cum	1.13					
3.3.3	RCC(1:1.5:3)	Cum	11.41					
3.4	CT as per Drawing Schedule-							
3.4.1	Excavation with back filling	Cum	8.60					
3.4.2	PCC (1:3:6)	Cum	0.43					
3.4.3	RCC(1:1.5:3)	Cum	3.44					
4	PCC (1:4:8) For S/S area (75 mm) per Sq. mts.((5x5)-(1.4x1.2))x0.075	Cum	7.00					
5	Metal Spreading 100 mm. per Sq. mts. .	Cum	9.33					
6	Making of earth chamber with brick masonry (1:5) , PCC (1:4:8) and with 50mm thick RCC Slab (with 8mm rod) cover for earth pit of size 450mmX450mm X600 mm depth as per direction of Engg in Charge.	No's.	28					
TOTAL OF ERECTION & CIVIL WORKS COMPONENT OF THE WORKS CONTRACT FOR 33kV Bay								

ANNEXURE-I

SCOPE- II :

- (A) SUPPLY PART:**
- (B) ERECTION PART**

Construction of 33kV FEEDER WORK with accessories, as per technical specification and scope of work.

BROAD REQUIREMENT FOR INFORMATION			20 (Sum from 1 to 19)
1	33kV Line with 13mtr long WPB Pole	Km	192.30
2	33kV Line with H-Pole 13mtr	Km	43.70
3	33kV line on Underground Cable	Mtr.	20250.00
4	PC '+6' Tower Requirement for River crossing on 33kV Line	No's.	4

Tata Power Central Odisha Distribution Limited (TPCODL)										
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations, 33kV, 11kV, LT Lines,										
Supply of Materials Required for Construction of 33kV line										
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24, Date:05.04.2023										
SL. No.	DESCRIPTION OF ITEMS			UNITS	Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY (RS.)
	SUPPLY OF FOLLOWING EQUIPMENTS/ MATERIALS (As per technical specification and scope of work.)			Circle						
BROAD REQUIREMENT FOR INFORMATION					20 (Sum from 1 to 19)	21	22= (21*9%)	23= (21*9%)	24= {21+22+23}	25= {20 X 24}
1	33kV Line with 13mtr long WPB Pole			Km	192.30					
2	33kV Line with H-Pole 13mtr			Km	43.70					
3	33kV line on Underground Cable			Mtr.	20250.00					
4	PC '6' Tower Requirement for River crossing on 33kV Line			No's.	4					
DETAIL REQUIREMENT (To be quoted)										
1	Supply of Material required for Construction of Line using 232sqmm conductor on 13 Mtr. long WPB Pole, as per technical specification and scope of work.									
Sl. No.	Description of Materials			Unit						
MATERIALS FOR 33 KV DP Without Isolator										
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)			No's.	330					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)			KG	10253.10					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)			KG	654.19					
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)			KG	11545.38					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required =(4*4.5*3.432)			KG	10193.04					
6	Danger Plate, 2 no's.			No's.	330					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's =(2x0.59x0.510)			KG	99.30					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)			Pair	330					
9	H.T. Stay set (Complete)			Set	330					
10	H.T. Stay Insulator Type-C (2 No's.)			No's.	660					
11	7/8 SWG Stay Wire 15kg /stay			KG	4950.00					
12	Gi Pipe Earthing 40mm. 3 Mtr. Long			No's.	165					

13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	1947.00				
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	990.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	397.19				
16	33KV pin insulator polymer	No's.	495				
17	H W fitting(B&S) 90KN,4 Bolt	No's.	990				
18	Disc insulator (B&S) 90 KN polymer	No's.	990				
19	PG Clamp for 232 sq.mm AAA conductor	No's.	990				
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	2023.07				
21	Black Paint	Ltr	165.00				
22	Yellow Colour Paint for Background	Ltr	330.00				
MATERIALS FOR 33 KV DP With Isolator							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	38				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	1562.10				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	75.33				
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	583.34				
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	1166.68				
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	2333.35				
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	1685.03				
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	108.53				
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	33.17				
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	29.07				
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	181.64				
12	Danger Plate, 2 no's.	No's.	38				
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	11.43				
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	38				
15	H.T. Stay set (Complete)	Set	38				
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	76				
17	7/8 SWG Stay Wire 15kg /stay	KG	570.00				
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	38				
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	1076.16				
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	114.00				

21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	45.74				
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	57				
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with Pl(Polymer)	Set	19				
24	33KV pin insulator polymer	No's.	57				
25	H W fitting(B&S) 90KN,4 Bolt	No's.	114				
26	Disc insulator (B&S) 90 KN polymer	No's.	114				
27	PG Clamp for 232 sq.mm AAA conductor	No's.	114				
28	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	420.85				
29	Black Paint	Ltr	19.00				
30	Yellow Colour Paint for Background	Ltr	38.00				
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	193				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	6273.27				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	1020.28				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	1129.19				
5	Danger Plate, 1 no's.	No's.	193				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	58.07				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	579.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	232.29				
9	33KV pin insulator polymer	No's.	579				
10	H W fitting(B&S)90KN,4 Bolt	No's.	1158				
11	Disc insulator (B&S)90 KN polymer	No's.	1158				
12	Earthing of Support (Coil Type)	EA	193				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	50.57				
14	PG Clamp for 232 sq.mm AAA conductor	No's.	1158				
15	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	941.65				
16	Black Paint	Ltr	193.00				
17	Yellow Colour Paint for Background	Ltr	386.00				
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	162				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	10531.30				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	1712.79				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	1895.63				
5	Danger Plate, 1 no's.	No's.	162				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	48.75				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	486.00				

8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	194.98				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	648				
10	H W fitting(B&S)90KN,4 Bolt	No's.	972				
11	Disc insulator (B&S)90 KN polymer	No's.	972				
12	Earthing of Support (Coil Type)	No's.	162				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	42.44				
14	PG Clamp for 232 sq.mm AAA conductor	No's.	972				
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	162				
16	H.T. Stay set (Complete)	Set	162				
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	162				
18	7/8 SWG Stay Wire 15kg /stay	KG	2430.00				
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	1832.22				
20	Black Paint	Ltr	162.00				
21	Yellow Colour Paint for Background	Ltr	324.00				
MATERIALS FOR 33 KV Pin Points							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	2147				
2	33 KV V cross Arm (GI) 22Kg each	No's.	2147				
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	2147				
4	Danger Plate, 1 no's.	No's.	2147				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	646.03				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	6441.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	2584.13				
8	33KV pin insulator polymer	No's.	6441				
9	Earthing of Support (Coil Type)	No's.	2147				
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	562.51				
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	3113.15				
12	232 sq.mm AAA conductor	Km	455.16				
13	Black Paint	Ltr	2147.00				
14	Yellow Colour Paint for Background	Ltr	4294.00				
2	Supply of Material required for Construction of Line using 148sqmm conductor on 13 Mtr. long WPB Pole, as per technical specification and scope of work.						
MATERIALS FOR 33 KV DP Without Isolator							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	28				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	869.96				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	55.51				
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	979.61				
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	864.86				
6	Danger Plate, 2 no's.	No's.	28				
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	8.43				

8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	28				
9	H.T. Stay set (Complete)	Set	28				
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	56				
11	7/8 SWG Stay Wire 15kg /stay	KG	420.00				
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	14				
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	165.20				
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	84.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	33.70				
16	33KV pin insulator polymer	No's.	42				
17	H W fitting(B&S) 90KN,4 Bolt	No's.	84				
18	Disc insulator (B&S) 90 KN polymer	No's.	84				
19	PG Clamp for 148 sq.mm AAA conductor	No's.	84				
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	171.65				
21	Black Paint	Ltr	14.00				
22	Yellow Colour Paint for Background	Ltr	28.00				
MATERIALS FOR 33 KV DP With Isolator							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	6				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	246.65				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	11.89				
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	92.11				
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	184.21				
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	368.42				
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	266.06				
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	17.14				
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	5.24				
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	4.59				
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	28.68				
12	Danger Plate, 2 no's.	No's.	6				
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	1.81				
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	6				
15	H.T. Stay set (Complete)	Set	6				
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	12				
17	7/8 SWG Stay Wire 15kg /stay	KG	90.00				
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	6				

19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	169.92				
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	18.00				
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	7.22				
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	9				
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with Pl(Polymer)	Set	3				
24	33KV pin insulator polymer	No's.	9				
25	H W fitting(B&S) 90KN,4 Bolt	No's.	18				
26	Disc insulator (B&S) 90 KN polymer	No's.	18				
27	PG Clamp for 148 sq.mm AAA conductor	No's.	18				
28	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	66.45				
29	Black Paint	Ltr	3.00				
30	Yellow Colour Paint for Background	Ltr	6.00				
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	8				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	260.03				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	42.29				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	46.81				
5	Danger Plate, 1 no's.	No's.	8				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	2.41				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	24.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	9.63				
9	33KV pin insulator polymer	No's.	24				
10	H W fitting(B&S)90KN,4 Bolt	No's.	48				
11	Disc insulator (B&S)90 KN polymer	No's.	48				
12	Earthing of Support (Coil Type)	EA	8				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	2.10				
14	PG Clamp for 148 sq.mm AAA conductor	No's.	48				
15	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	39.03				
16	Black Paint	Ltr	8.00				
17	Yellow Colour Paint for Background	Ltr	16.00				
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	10				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	650.08				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	105.73				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	117.01				
5	Danger Plate, 1 no's.	No's.	10				

6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	3.01				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	30.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	12.04				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	40				
10	H W fitting(B&S)90KN,4 Bolt	No's.	60				
11	Disc insulator (B&S)90 KN polymer	No's.	60				
12	Earthing of Support (Coil Type)	No's.	10				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	2.62				
14	PG Clamp for 148 sq.mm AAA conductor	No's.	60				
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	10				
16	H.T. Stay set (Complete)	Set	10				
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	10				
18	7/8 SWG Stay Wire 15kg /stay	KG	150.00				
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	113.10				
20	Black Paint	Ltr	10.00				
21	Yellow Colour Paint for Background	Ltr	20.00				
MATERIALS FOR 33 KV Pin Points							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	140				
2	33 KV V cross Arm (GI) 22Kg each	No's.	140				
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	140				
4	Danger Plate, 1 no's.	No's.	140				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	42.13				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	420.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	168.50				
8	33KV pin insulator polymer	No's.	420				
9	Earthing of Support (Coil Type)	No's.	140				
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	36.68				
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	203.00				
12	148 sq.mm AAA conductor	Km	21.63				
13	Black Paint	Ltr	140.00				
14	Yellow Colour Paint for Background	Ltr	280.00				
3	Supply of Material required for Construction of Line using 241sqmm conductor on 13 Mtr. long WPB Pole, as per technical specification and scope of work.						
MATERIALS FOR 33 KV DP Without Isolator							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	126				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	3914.82				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	249.78				
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	4408.24				
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	3891.89				

6	Danger Plate, 2 no's.	No's.	126				
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	37.91				
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	126				
9	H.T. Stay set (Complete)	Set	126				
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	252				
11	7/8 SWG Stay Wire 15kg /stay	KG	1890.00				
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	63				
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	743.40				
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	378.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	151.65				
16	33KV pin insulator polymer	No's.	189				
17	Non Metallic Ties 33KV (For covered conductor)	No's.	189				
18	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	252				
19	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	378				
20	H W fitting(B&S)90KN,4 Bolt	No's.	378				
21	Disc insulator (B&S) 90 KN polymer	No's.	378				
22	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	772.44				
23	Black Paint	Ltr	63.00				
24	Yellow Colour Paint for Background	Ltr	126.00				
MATERIALS FOR 33 KV DP With Isolator							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	24				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	986.59				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	47.58				
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	368.42				
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	736.85				
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	1473.70				
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	1064.23				
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	68.54				
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	20.95				
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	18.36				
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	114.72				
12	Danger Plate, 2 no's.	No's.	24				

13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	7.22				
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	24				
15	H.T. Stay set (Complete)	Set	24				
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	48				
17	7/8 SWG Stay Wire 15kg /stay	KG	360.00				
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	24				
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	679.68				
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	72.00				
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	28.89				
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	36				
23	33 KV 1250 AVMR Double break (Turn & twist center rotating) isolator without earth switch with DP (Back panel)	Set	12				
24	33KV pin insulator polymer	No's.	36				
25	Non Metallic Ties 33KV (For covered conductor)	No's.	36				
26	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	72				
27	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	48				
28	H W fitting(B&S)90KN,4 Bolt	No's.	72				
29	Disc insulator (B&S) 90 KN polymer	No's.	72				
30	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	265.80				
31	Black Paint	Ltr	12.00				
32	Yellow Colour Paint for Background	Ltr	24.00				
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	44				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	1430.18				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	232.60				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	257.43				
5	Danger Plate, 1 no's.	No's.	44				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	13.24				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	132.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	52.96				
9	33KV pin insulator polymer	No's.	132				
10	Non Metallic Ties 33KV (For covered conductor)	No's.	132				
11	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	264				
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	88				
13	H W fitting(B&S)90KN,4 Bolt	No's.	264				
14	Disc insulator (B&S)90 KN polymer	No's.	264				
15	Earthing of Support (Coil Type)	EA	44				

16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	11.53				
17	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	214.68				
18	Black Paint	Ltr	44.00				
19	Yellow Colour Paint for Background	Ltr	88.00				
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	38				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	2470.30				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	401.77				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	444.65				
5	Danger Plate, 1 no's.	No's.	38				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	11.43				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	114.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	45.74				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	152				
10	H W fitting(B&S)90KN,4 Bolt	No's.	228				
11	Disc insulator (B&S)90 KN polymer	No's.	228				
12	Non Metallic Ties 33KV (For covered conductor)	No's.	152				
13	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	228				
14	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	76				
15	Earthing of Support (Coil Type)	No's.	38				
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	9.96				
17	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	38				
18	H.T. Stay set (Complete)	Set	38				
19	H.T. Stay Insulator Type-C (2 No's.)	No's.	38				
20	7/8 SWG Stay Wire 15kg /stay	KG	570.00				
21	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	429.78				
22	Black Paint	Ltr	38.00				
23	Yellow Colour Paint for Background	Ltr	76.00				
MATERIALS FOR 33 KV Pin Points							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	653				
2	33 KV V cross Arm (GI) 22Kg each	No's.	653				
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	653				
4	Danger Plate, 1 no's.	No's.	653				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	196.49				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	1959.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	785.95				
8	33KV pin insulator polymer	No's.	1959				
9	Non Metallic Ties 33KV (For covered conductor)	No's.	1959				

10	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	1306				
11	Earthing of Support (Coil Type)	No's.	653				
12	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	171.09				
13	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	946.85				
14	241 sq.mm AAA conductor	Km	117.42				
15	Black Paint	Ltr	653.00				
16	Yellow Colour Paint for Background	Ltr	1306.00				
4	Supply of Material required for Construction of Line using 232sqmm conductor on 13 Mtr. long H-Pole, as per technical specification and scope of work.						
MATERIALS FOR 33 KV DP Without Isolator							
1	13 Mtr. Long H-Pole	No's.	112				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	3479.84				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	222.03				
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	3918.43				
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	3459.46				
6	Danger Plate, 2 no's.	No's.	112				
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	33.70				
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	112				
9	H.T. Stay set (Complete)	Set	112				
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	224				
11	7/8 SWG Stay Wire 15kg /stay	KG	1680.00				
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	56				
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	660.80				
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	336.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	134.80				
16	33KV pin insulator polymer	No's.	168				
17	H W fitting(B&S) 90KN,4 Bolt	No's.	336				
18	Disc insulator (B&S) 90 KN polymer	No's.	336				
19	PG Clamp for 232 sq.mm AAA conductor	No's.	336				
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	686.62				
21	Black Paint	Ltr	56.00				
22	Yellow Colour Paint for Background	Ltr	112.00				
MATERIALS FOR 33 KV DP With Isolator							
1	13 Mtr. Long H-Pole	No's.	28				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	1151.02				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	55.51				
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	429.83				

5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	859.66				
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	1719.31				
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required =(4*4.5*4.927)	KG	1241.60				
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	79.97				
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	24.44				
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	21.42				
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	133.84				
12	Danger Plate, 2 no's.	No's.	28				
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	8.43				
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	28				
15	H.T. Stay set (Complete)	Set	28				
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	56				
17	7/8 SWG Stay Wire 15kg /stay	KG	420.00				
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	28				
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	792.96				
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	84.00				
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	33.70				
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	42				
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with Pl(Polymer)	Set	14				
24	33KV pin insulator polymer	No's.	42				
25	H W fitting(B&S) 90KN,4 Bolt	No's.	84				
26	Disc insulator (B&S) 90 KN polymer	No's.	84				
27	PG Clamp for 232 sq.mm AAA conductor	No's.	84				
28	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	310.10				
29	Black Paint	Ltr	14.00				
30	Yellow Colour Paint for Background	Ltr	28.00				
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	49				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	1592.70				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	259.03				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	286.69				
5	Danger Plate, 1 no's.	No's.	49				

6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	14.74				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	147.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	58.98				
9	33KV pin insulator polymer	No's.	147				
10	H W fitting(B&S)90KN,4 Bolt	No's.	294				
11	Disc insulator (B&S)90 KN polymer	No's.	294				
12	Earthing of Support (Coil Type)	EA	49				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	12.84				
14	PG Clamp for 232 sq.mm AAA conductor	No's.	294				
15	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	239.07				
16	Black Paint	Ltr	49.00				
17	Yellow Colour Paint for Background	Ltr	98.00				
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	18				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	1170.14				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	190.31				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	210.63				
5	Danger Plate, 1 no's.	No's.	18				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	5.42				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	54.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	21.66				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	72				
10	H W fitting(B&S)90KN,4 Bolt	No's.	108				
11	Disc insulator (B&S)90 KN polymer	No's.	108				
12	Earthing of Support (Coil Type)	No's.	18				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	4.72				
14	PG Clamp for 232 sq.mm AAA conductor	No's.	108				
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	18				
16	H.T. Stay set (Complete)	Set	18				
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	18				
18	7/8 SWG Stay Wire 15kg /stay	KG	270.00				
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	203.58				
20	Black Paint	Ltr	18.00				
21	Yellow Colour Paint for Background	Ltr	36.00				
MATERIALS FOR 33 KV Pin Points							
1	13 Mtr. Long H-Pole	No's.	701				
2	33 KV V cross Arm (GI) 22Kg each	No's.	701				
3	Top bracket 100x50x6mm GI channel (300mm each)	No's.	701				
4	Danger Plate, 1 no's.	No's.	701				

5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	210.93				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	2103.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	843.72				
8	33KV pin insulator polymer	No's.	2103				
9	Earthing of Support (Coil Type)	No's.	701				
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	183.66				
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	1016.45				
12	232 sq.mm AAA conductor	Km	103.52				
13	Black Paint	Ltr	701.00				
14	Yellow Colour Paint for Background	Ltr	1402.00				
5	Supply of Material required for Construction of Line using 148sqmm conductor on 13 Mtr. long H-Pole, as per technical specification and scope of work.						
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	2				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	130.02				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	21.15				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	23.40				
5	Danger Plate, 1 no's.	No's.	2				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	0.60				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	6.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	2.41				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	8				
10	H W fitting(B&S)90KN,4 Bolt	No's.	12				
11	Disc insulator (B&S)90 KN polymer	No's.	12				
12	Earthing of Support (Coil Type)	No's.	2				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	0.52				
14	PG Clamp for 148 sq.mm AAA conductor	No's.	12				
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	2				
16	H.T. Stay set (Complete)	Set	2				
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	2				
18	7/8 SWG Stay Wire 15kg /stay	KG	30.00				
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	22.62				
20	Black Paint	Ltr	2.00				
21	Yellow Colour Paint for Background	Ltr	4.00				
MATERIALS FOR 33 KV Pin Points							
1	13 Mtr. Long H-Pole	No's.	4				
2	33 KV V cross Arm (GI) 22Kg each	No's.	4				
3	Top bracket 100x50x6mm GI channel (300mm each)	No's.	4				
4	Danger Plate, 1 no's.	No's.	4				

5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	1.20				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	12.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	4.81				
8	33KV pin insulator polymer	No's.	12				
9	Earthing of Support (Coil Type)	No's.	4				
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	1.05				
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	5.80				
12	148 sq.mm AAA conductor	Km	0.62				
13	Black Paint	Ltr	4.00				
14	Yellow Colour Paint for Background	Ltr	8.00				
6	Supply of Material required for Construction of Line using 241sqmm conductor on 13 Mtr. long H-Pole, as per technical specification and scope of work.						
MATERIALS FOR 33 KV DP Without Isolator							
1	13 Mtr. Long H-Pole	No's.	40				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	1242.80				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	79.30				
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	1399.44				
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	1235.52				
6	Danger Plate, 2 no's.	No's.	40				
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	12.04				
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	40				
9	H.T. Stay set (Complete)	Set	40				
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	80				
11	7/8 SWG Stay Wire 15kg /stay	KG	600.00				
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	20				
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	236.00				
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	120.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	48.14				
16	33KV pin insulator polymer	No's.	60				
17	Non Metallic Ties 33KV (For covered conductor)	No's.	60				
18	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	80				
19	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	120				
20	H W fitting(B&S)90KN,4 Bolt	No's.	120				
21	Disc insulator (B&S) 90 KN polymer	No's.	120				
22	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	245.22				
23	Black Paint	Ltr	20.00				
24	Yellow Colour Paint for Background	Ltr	40.00				

MATERIALS FOR 33 KV DP With Isolator								
1	13 Mtr. Long H-Pole	No's.	12					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	493.30					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	23.79					
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	184.21					
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	368.42					
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	736.85					
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	532.12					
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	34.27					
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	10.48					
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	9.18					
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	57.36					
12	Danger Plate, 2 no's.	No's.	12					
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	3.61					
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	12					
15	H.T. Stay set (Complete)	Set	12					
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	24					
17	7/8 SWG Stay Wire 15kg /stay	KG	180.00					
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	12					
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	339.84					
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	36.00					
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	14.44					
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	18					
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with PI(Polymer)	Set	2					
24	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator with earth switch with PI(Polymer)	Set	4					
25	33KV pin insulator polymer	No's.	18					
26	Non Metallic Ties 33KV (For covered conductor)	No's.	18					
27	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	24					
28	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	36					
29	H W fitting(B&S)90KN,4 Bolt	No's.	36					
30	Disc insulator (B&S) 90 KN polymer	No's.	36					

31	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	132.90				
32	Black Paint	Ltr	6.00				
33	Yellow Colour Paint for Background	Ltr	12.00				
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	20				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	650.08				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	105.73				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	117.01				
5	Danger Plate, 1 no's.	No's.	20				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	6.02				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	60.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	24.07				
9	33KV pin insulator polymer	No's.	60				
10	Non Metallic Ties 33KV (For covered conductor)	No's.	60				
11	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	120				
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	40				
13	H W fitting(B&S)90KN,4 Bolt	No's.	120				
14	Disc insulator (B&S)90 KN polymer	No's.	120				
15	Earthing of Support (Coil Type)	EA	20				
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	5.24				
17	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	97.58				
18	Black Paint	Ltr	20.00				
19	Yellow Colour Paint for Background	Ltr	40.00				
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	20				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	1300.16				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	211.46				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	234.03				
5	Danger Plate, 1 no's.	No's.	20				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	6.02				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	60.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	24.07				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	80				
10	H W fitting(B&S)90KN,4 Bolt	No's.	120				
11	Disc insulator (B&S)90 KN polymer	No's.	120				
12	Non Metallic Ties 33KV (For covered conductor)	No's.	80				
13	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	120				

14	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	40				
15	Earthing of Support (Coil Type)	No's.	20				
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	5.24				
17	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	20				
18	H.T. Stay set (Complete)	Set	20				
19	H.T. Stay Insulator Type-C (2 No's.)	No's.	20				
20	7/8 SWG Stay Wire 15kg /stay	KG	300.00				
21	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	226.20				
22	Black Paint	Ltr	20.00				
23	Yellow Colour Paint for Background	Ltr	40.00				
MATERIALS FOR 33 KV Pin Points							
1	13 Mtr. Long H-Pole	No's.	188				
2	33 KV V cross Arm (GI) 22Kg each	No's.	188				
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	188				
4	Danger Plate, 1 no's.	No's.	188				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	56.57				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	564.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	226.28				
8	33KV pin insulator polymer	No's.	564				
9	Non Metallic Ties 33KV (For covered conductor)	No's.	630				
10	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	376				
11	Earthing of Support (Coil Type)	No's.	188				
12	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	49.26				
13	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	272.60				
14	241 sq.mm AAA conductor	Km	30.90				
15	Black Paint	Ltr	188.00				
16	Yellow Colour Paint for Background	Ltr	376.00				
7	Supply of Material for 33kV Line on 1CX 630sqmm UG Cable, as per technical specification and scope of work.						
1	Supply of materials for 33kV, 1Core, 630sqmm Aluminium, XLPE insulation UG Cable with accessories						
a	Length of 33kV 1C, 630sqmm cable (open trench) (Mtr.)						
b	Length of 33kV 1C, 630sqmm cable (HDD) (Mtr)						
1.1	Supply of 33kV, 1Core, 630sqmm Aluminium, XLPE insulation UG Cable (SC rating of cable in kA- 59.4kA and SC rating of Armour in kA-20kA)	Mtr.	60480.00				
1.2	Supply of Straight through jointing kits Heat Shrinkable type suitable for 33kV, 1Core, 630sqmm, aluminium UG Cable kits for 1Core	Set	182				
1.3	Supply of Outdoor termination kits Heat Shrinkable type suitable for 33kV, 1Core, 630sqmm, HT UG Cable kits for 1Core	Set	141				
1.4	Supply of Indoor termination kits Heat Shrinkable type suitable for 33kV, 1Core, 630sqmm, HT UG Cable kits for 1Core	Set	102				

1.5	Supply of materials for High Density Polyethelene (HDPE) pipe 110mm diameter, PE 80- PN8 for laying of 33kV UG cable	Mtr.	43548.00					
2	Supply of 33kV RMU							
2.1	Supply of RMU 33KV 4WAY 630A (2ISLTR+2 BKR) (LLVV)	No's.	9					
3	Earthing							
3.1	Earthing Conductor: 50X6 mm (2.4kg./mtr.) GI Flat for equipment, structure etc.)	KG	118.80					
3.2	Pipe Earthing 40mm. GI Pipe	No's.	18					
4	Supply of Standard FRTU 4Way with FRTU networking Equipment consisting of Fibre Optic switch (Mono mode along with associate LIU unit for connection of FO Cable. for 3 Way & 4 way RMU.	No's.	8					
8	Supply of Material for 33kV Line on 3CX 400sqmm UG Cable, as per technical specification and scope of work.							
1	Supply of materials for 33kV, 3Core, 400sqmm Aluminium, XLPE insulation UG Cable with accessories							
a	Length of 33kV 3C, 400sqmm cable (open trench) (Mtr)							
b	Length of 33kV 3C, 400sqmm cable (HDD) (Mtr)							
1.1	Supply of 33kV, 3Core, 400sqmm Aluminium, XLPE insulation UG Cable with spare (SC rating of cable in kA- 37.7kA and SC rating of Armour in kA-20kA)	Mtr.	180.00					
1.2	Supply of Outdoor termination kits Heat Shrinkable type suitable for 33kV, 3Core, 400sqmm, HT UG Cable kits	Set	6					
1.3	Supply of Indoor termination kits Heat Shrinkable type suitable for 33kV, 3Core, 400sqmm, HT UG Cable kits	Set	6					
1.4	Supply of materials for High Density Polyethelene (HDPE) pipe 160mm diameter, PE 80- PN8 for laying of 33kV UG cable	Mtr.	180.00					
2	Supply of 33kV RMU							
2.1	Supply of RMU 33KV 3WAY 630A (2ISLTR+ 1BKR) (LLV)	No's.	1					
3	Earthing							
3.1	Earthing Conductor: 50X6 mm (2.4kg./mtr.) GI Flat for equipment, structure etc.)	KG	13.20					
3.2	Pipe Earthing 40mm. GI Pipe	No's.	2					
4	Supply of Standard FRTU 4Way with FRTU networking Equipment consisting of Fibre Optic switch (Mono mode along with associate LIU unit for connection of FO Cable. for 3 Way & 4 way RMU.	No's.	1					
9	Supply of GI PC '+6' EHT Tower for River crossing including all types of materials, as per technical specification and scope of work.							
1	GI PC '+6' Tower super structure G.I (Main + Extention +Stub + Template), as per technical specification and scope of work.							
i)	PC Tower	MT	49.71					
ii)	'+6' Mtr. Extention	MT	18.74					
iii)	Template	MT	15.23					
2	GI Nut , Bolt & Washer of different sizes, as per technical specification and scope of work.							
i)	PC Tower	MT	13.23					
ii)	'+6' Mtr. Extention	MT	4.74					
3	Supply of Conductor and Accessories, as per technical specification and scope of work.							
i	232 mm2 AAAC, as per technical specification and scope of work.	Km	1.85					

ii	Earth wire 7/1.5 G.I, as per technical specification and scope of work.	Km	0.62					
iii	Double tension Hardware Fittings suitable for Conductor size.	Set	96					
iv	Disc insulator (B&S) 120 KN polymer type.	No's.	192					
v	Tension fittings suitable for Earth wire.	Set	16					
vi.	Vibration damper suitable for earth wire	No's.	16					
vii.	Vibration damper suitable for conductor size.	No's.	96					
viii	Copper flexible bond	No's.	8					
ix	Phase Plate (R,Y,B)	Set	48					
x	GI Tower Number Plate	No's.	16					
xi	Circuit Plate	No's.	16					
xii	Earthing Device & Associated Accessories (Heavy duty GI Perforated Pipe of ID=40mm & OD=50mm with 3000mm long for treated Earth Pit), as per technical specification and scope of work.	No's.	16					
xiii	Earthing Conductor: 50X6 mm (2.4Kg./Mtr.) GI Flat for Raiser from the burial earth mat to equipment, structure etc), as per technical specification and scope of work.	KG	800.00					
xiv	GI Danger Board	No's.	16					
xv	Bird Guard	No's.	96					
xvi	Anticlimbing Device (G.I)	KG	844.80					
xvii	Loop Connector	No's.	48					
TOTAL OF SUPPLY COMPONENT OF THE WORKS CONTRACT FOR 33kV LINE								

Tata Power Central Odisha Distribution Limited (TPCODL)								
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations, 33kV, 11kV,								
Erection, Civil & Services of Equipment/Materials Required for Construction of 33kV line								
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24,								
SL. No.	DESCRIPTION OF ITEMS							
	ERECTION, TESTING & COMMISSIONING INCLUDING CIVIL WORKS OF FOLLOWING EQUIPMENTS (As per technical specification and scope of work.)	UNITS	Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY (RS.)
		Circle						
BROAD REQUIREMENT FOR INFORMATION			20 (Sum from	21	22= (21*9%)	23= (21*9%)	24= {21+22+23}	25= {20 X 24}
1	33kV Line with 13mtr long WPB Pole	Km	192.30					
2	33kV Line with H-Pole 13mtr	Km	43.70					
3	33kV line on Underground Cable	Mtr.	20250.00					
4	PC '+6' Tower Requirement for River crossing on 33kV Line	No's.	4					
DETAIL REQUIREMENT (To be quoted)								
1	Erection, Testing & Commissioning of Material required for Construction of Line using 232sqmm conductor on 13 Mtr. long WPB Pole, as per technical specification and scope of work.							
Sl. No.	Description of Materials	Unit						
MATERIALS FOR 33 KV DP Without Isolator								
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	330					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	10253.10					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	654.19					
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	11545.38					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	10193.04					
6	Danger Plate, 2 no's.	No's.	330					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	99.30					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	330					
9	H.T. Stay set (Complete)	Set	330					
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	660					
11	7/8 SWG Stay Wire 15kg /stay	KG	4950.00					

12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	165				
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	1947.00				
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	990.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	397.19				
16	33KV pin insulator polymer	No's.	495				
17	H W fitting(B&S) 90KN,4 Bolt	No's.	990				
18	Disc insulator (B&S) 90 KN polymer	No's.	990				
19	PG Clamp for 232 sq.mm AAA conductor	No's.	990				
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	2023.07				
21	Black Paint	Ltr	165.00				
22	Yellow Colour Paint for Background	Ltr	330.00				
MATERIALS FOR 33 KV DP With Isolator							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	38				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	1562.10				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	75.33				
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	583.34				
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	1166.68				
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	2333.35				
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	1685.03				
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	108.53				
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	33.17				
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	29.07				
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	181.64				

12	Danger Plate, 2 no's.	No's.	38					
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	11.43					
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	38					
15	H.T. Stay set (Complete)	Set	38					
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	76					
17	7/8 SWG Stay Wire 15kg /stay	KG	570.00					
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	38					
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	1076.16					
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	114.00					
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	45.74					
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	57					
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with PI(Polymer)	Set	19					
24	33KV pin insulator polymer	No's.	57					
25	H W fitting(B&S) 90KN,4 Bolt	No's.	114					
26	Disc insulator (B&S) 90 KN polymer	No's.	114					
27	PG Clamp for 232 sq.mm AAA conductor	No's.	114					
28	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	420.85					
29	Black Paint	Ltr	19.00					
30	Yellow Colour Paint for Background	Ltr	38.00					
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle								
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	193					
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	6273.27					

3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	1020.28				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	1129.19				
5	Danger Plate, 1 no's.	No's.	193				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	58.07				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	579.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	232.29				
9	33KV pin insulator polymer	No's.	579				
10	H W fitting(B&S)90KN,4 Bolt	No's.	1158				
11	Disc insulator (B&S)90 KN polymer	No's.	1158				
12	Earthing of Support (Coil Type)	EA	193				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	50.57				
14	PG Clamp for 232 sq.mm AAA conductor	No's.	1158				
15	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	941.65				
16	Black Paint	Ltr	193.00				
17	Yellow Colour Paint for Background	Ltr	386.00				
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	162				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	10531.30				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	1712.79				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	1895.63				
5	Danger Plate, 1 no's.	No's.	162				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	48.75				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	486.00				

8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	194.98				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	648				
10	H W fitting(B&S)90KN,4 Bolt	No's.	972				
11	Disc insulator (B&S)90 KN polymer	No's.	972				
12	Earthing of Support (Coil Type)	No's.	162				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	42.44				
14	PG Clamp for 232 sq.mm AAA conductor	No's.	972				
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	162				
16	H.T. Stay set (Complete)	Set	162				
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	162				
18	7/8 SWG Stay Wire 15kg /stay	KG	2430.00				
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	1832.22				
20	Black Paint	Ltr	162.00				
21	Yellow Colour Paint for Background	Ltr	324.00				
MATERIALS FOR 33 KV Pin Points							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	2147				
2	33 KV V cross Arm (GI) 22Kg each	No's.	2147				
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	2147				
4	Danger Plate, 1 no's.	No's.	2147				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	646.03				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	6441.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	2584.13				
8	33KV pin insulator polymer	No's.	6441				

9	Earthing of Support (Coil Type)	No's.	2147					
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	562.51					
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	3113.15					
12	232 sq.mm AAA conductor	Km	455.16					
13	Black Paint	Ltr	2147.00					
14	Yellow Colour Paint for Background	Ltr	4294.00					
2	Erection, Testing & Commissioning of Material required for Construction of Line using 148sqmm conductor on 13 Mtr. long WPB Pole, as per technical specification and scope of work.							
MATERIALS FOR 33 KV DP Without Isolator								
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	28					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	869.96					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	55.51					
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	979.61					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	864.86					
6	Danger Plate, 2 no's.	No's.	28					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	8.43					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	28					
9	H.T. Stay set (Complete)	Set	28					
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	56					
11	7/8 SWG Stay Wire 15kg /stay	KG	420.00					
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	14					

13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	165.20				
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	84.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	33.70				
16	33KV pin insulator polymer	No's.	42				
17	H W fitting(B&S) 90KN,4 Bolt	No's.	84				
18	Disc insulator (B&S) 90 KN polymer	No's.	84				
19	PG Clamp for 148 sq.mm AAA conductor	No's.	84				
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	171.65				
21	Black Paint	Ltr	14.00				
22	Yellow Colour Paint for Background	Ltr	28.00				
MATERIALS FOR 33 KV DP With Isolator							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	6				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	246.65				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	11.89				
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	92.11				
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	184.21				
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	368.42				
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	266.06				
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	17.14				
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	5.24				
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	4.59				

11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	28.68					
12	Danger Plate, 2 no's.	No's.	6					
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	1.81					
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	6					
15	H.T. Stay set (Complete)	Set	6					
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	12					
17	7/8 SWG Stay Wire 15kg /stay	KG	90.00					
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	6					
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	169.92					
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	18.00					
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	7.22					
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	9					
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with PI(Polymer)	Set	3					
24	33KV pin insulator polymer	No's.	9					
25	H W fitting(B&S) 90KN,4 Bolt	No's.	18					
26	Disc insulator (B&S) 90 KN polymer	No's.	18					
27	PG Clamp for 148 sq.mm AAA conductor	No's.	18					
28	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	66.45					
29	Black Paint	Ltr	3.00					
30	Yellow Colour Paint for Background	Ltr	6.00					

MATERIALS FOR 33 KV Cut Point with 180 Degree Angle									
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	8						
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	260.03						
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	42.29						
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	46.81						
5	Danger Plate, 1 no's.	No's.	8						
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	2.41						
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	24.00						
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	9.63						
9	33KV pin insulator polymer	No's.	24						
10	H W fitting(B&S)90KN,4 Bolt	No's.	48						
11	Disc insulator (B&S)90 KN polymer	No's.	48						
12	Earthing of Support (Coil Type)	EA	8						
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	2.10						
14	PG Clamp for 148 sq.mm AAA conductor	No's.	48						
15	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	39.03						
16	Black Paint	Ltr	8.00						
17	Yellow Colour Paint for Background	Ltr	16.00						
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle									
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	10						

2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	650.08					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	105.73					
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	117.01					
5	Danger Plate, 1 no's.	No's.	10					
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	3.01					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	30.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	12.04					
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	40					
10	H W fitting(B&S)90KN,4 Bolt	No's.	60					
11	Disc insulator (B&S)90 KN polymer	No's.	60					
12	Earthing of Support (Coil Type)	No's.	10					
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	2.62					
14	PG Clamp for 148 sq.mm AAA conductor	No's.	60					
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	10					
16	H.T. Stay set (Complete)	Set	10					
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	10					
18	7/8 SWG Stay Wire 15kg /stay	KG	150.00					
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	113.10					
20	Black Paint	Ltr	10.00					
21	Yellow Colour Paint for Background	Ltr	20.00					

MATERIALS FOR 33 KV Pin Points									
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	140						
2	33 KV V cross Arm (GI) 22Kg each	No's.	140						
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	140						
4	Danger Plate, 1 no's.	No's.	140						
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	42.13						
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	420.00						
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	168.50						
8	33KV pin insulator polymer	No's.	420						
9	Earthing of Support (Coil Type)	No's.	140						
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	36.68						
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	203.00						
12	148 sq.mm AAA conductor	Km	21.63						
13	Black Paint	Ltr	140.00						
14	Yellow Colour Paint for Background	Ltr	280.00						
3	Erection, Testing & Commissioning of Material required for Construction of Line using 241sqmm conductor on 13 Mtr. long WPB Pole, as per technical specification and scope of work								
MATERIALS FOR 33 KV DP Without Isolator									
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	126						
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	3914.82						
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	249.78						

4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	4408.24					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	3891.89					
6	Danger Plate, 2 no's.	No's.	126					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	37.91					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	126					
9	H.T. Stay set (Complete)	Set	126					
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	252					
11	7/8 SWG Stay Wire 15kg /stay	KG	1890.00					
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	63					
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	743.40					
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	378.00					
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	151.65					
16	33KV pin insulator polymer	No's.	189					
17	Non Metallic Ties 33KV (For covered conductor)	No's.	189					
18	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	252					
19	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	378					
20	H W fitting(B&S)90KN,4 Bolt	No's.	378					
21	Disc insulator (B&S) 90 KN polymer	No's.	378					
22	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	772.44					
23	Black Paint	Ltr	63.00					

24	Yellow Colour Paint for Background	Ltr	126.00					
MATERIALS FOR 33 KV DP With Isolator								
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	24					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	986.59					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	47.58					
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	368.42					
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	736.85					
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	1473.70					
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	1064.23					
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	68.54					
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	20.95					
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	18.36					
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	114.72					
12	Danger Plate, 2 no's.	No's.	24					
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	7.22					
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	24					
15	H.T. Stay set (Complete)	Set	24					
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	48					
17	7/8 SWG Stay Wire 15kg /stay	KG	360.00					
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	24					

19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	679.68					
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	72.00					
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	28.89					
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	36					
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with PI(Polymer)	Set	12					
24	33KV pin insulator polymer	No's.	36					
25	Non Metallic Ties 33KV (For covered conductor)	No's.	36					
26	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	72					
27	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	48					
28	H W fitting(B&S)90KN,4 Bolt	No's.	72					
29	Disc insulator (B&S) 90 KN polymer	No's.	72					
30	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	265.80					
31	Black Paint	Ltr	12.00					
32	Yellow Colour Paint for Background	Ltr	24.00					
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle								
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	44					
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	1430.18					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	232.60					
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	257.43					
5	Danger Plate, 1 no's.	No's.	44					

6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	13.24					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	132.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	52.96					
9	33KV pin insulator polymer	No's.	132					
10	Non Metallic Ties 33KV (For covered conductor)	No's.	132					
11	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	264					
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	88					
13	H W fitting(B&S)90KN,4 Bolt	No's.	264					
14	Disc insulator (B&S)90 KN polymer	No's.	264					
15	Earthing of Support (Coil Type)	EA	44					
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	11.53					
17	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	214.68					
18	Black Paint	Ltr	44.00					
19	Yellow Colour Paint for Background	Ltr	88.00					
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle								
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	38					
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	2470.30					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	401.77					
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	444.65					
5	Danger Plate, 1 no's.	No's.	38					

6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	11.43				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	114.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	45.74				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	152				
10	H W fitting(B&S)90KN,4 Bolt	No's.	228				
11	Disc insulator (B&S)90 KN polymer	No's.	228				
12	Non Metallic Ties 33KV (For covered conductor)	No's.	152				
13	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	228				
14	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	76				
15	Earthing of Support (Coil Type)	No's.	38				
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	9.96				
17	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	38				
18	H.T. Stay set (Complete)	Set	38				
19	H.T. Stay Insulator Type-C (2 No's.)	No's.	38				
20	7/8 SWG Stay Wire 15kg /stay	KG	570.00				
21	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	429.78				
22	Black Paint	Ltr	38.00				
23	Yellow Colour Paint for Background	Ltr	76.00				
MATERIALS FOR 33 KV Pin Points							
1	WPB 160x152 (13Mtr. Long, 30.44KG/Mtr.)	No's.	653				

2	33 KV V cross Arm (GI) 22Kg each	No's.	653				
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	653				
4	Danger Plate, 1 no's.	No's.	653				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	196.49				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	1959.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	785.95				
8	33KV pin insulator polymer	No's.	1959				
9	Non Metallic Ties 33KV (For covered conductor)	No's.	1959				
10	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	1306				
11	Earthing of Support (Coil Type)	No's.	653				
12	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	171.09				
13	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	946.85				
14	241 sq.mm AAA conductor	Km	117.42				
15	Black Paint	Ltr	653.00				
16	Yellow Colour Paint for Background	Ltr	1306.00				
4	Erection, Testing & Commissioning of Material required for Construction of Line using 232sqmm conductor on 13 Mtr. long H-Pole, as per technical specification and scope of work						
MATERIALS FOR 33 KV DP Without Isolator							
1	13 Mtr. Long H-Pole	No's.	112				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	3479.84				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	222.03				

4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	3918.43					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	3459.46					
6	Danger Plate, 2 no's.	No's.	112					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	33.70					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	112					
9	H.T. Stay set (Complete)	Set	112					
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	224					
11	7/8 SWG Stay Wire 15kg /stay	KG	1680.00					
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	56					
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	660.80					
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	336.00					
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	134.80					
16	33KV pin insulator polymer	No's.	168					
17	H W fitting(B&S) 90KN,4 Bolt	No's.	336					
18	Disc insulator (B&S) 90 KN polymer	No's.	336					
19	PG Clamp for 232 sq.mm AAA conductor	No's.	336					
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	686.62					
21	Black Paint	Ltr	56.00					
22	Yellow Colour Paint for Background	Ltr	112.00					
MATERIALS FOR 33 KV DP With Isolator								

1	13 Mtr. Long H-Pole	No's.	28				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	1151.02				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	55.51				
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	429.83				
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	859.66				
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	1719.31				
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	1241.60				
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	79.97				
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	24.44				
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	21.42				
11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	133.84				
12	Danger Plate, 2 no's.	No's.	28				
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	8.43				
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	28				
15	H.T. Stay set (Complete)	Set	28				
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	56				
17	7/8 SWG Stay Wire 15kg /stay	KG	420.00				
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	28				
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	792.96				
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	84.00				

21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	33.70				
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	42				
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with PI(Polymer)	Set	14				
24	33KV pin insulator polymer	No's.	42				
25	H W fitting(B&S) 90KN,4 Bolt	No's.	84				
26	Disc insulator (B&S) 90 KN polymer	No's.	84				
27	PG Clamp for 232 sq.mm AAA conductor	No's.	84				
28	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	310.10				
29	Black Paint	Ltr	14.00				
30	Yellow Colour Paint for Background	Ltr	28.00				
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	49				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	1592.70				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	259.03				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	286.69				
5	Danger Plate, 1 no's.	No's.	49				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	14.74				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	147.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	58.98				
9	33KV pin insulator polymer	No's.	147				

10	H W fitting(B&S)90KN,4 Bolt	No's.	294					
11	Disc insulator (B&S)90 KN polymer	No's.	294					
12	Earthing of Support (Coil Type)	EA	49					
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	12.84					
14	PG Clamp for 232 sq.mm AAA conductor	No's.	294					
15	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	239.07					
16	Black Paint	Ltr	49.00					
17	Yellow Colour Paint for Background	Ltr	98.00					
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle								
1	13 Mtr. Long H-Pole	No's.	18					
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	1170.14					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	190.31					
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	210.63					
5	Danger Plate, 1 no's.	No's.	18					
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	5.42					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	54.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	21.66					
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	72					
10	H W fitting(B&S)90KN,4 Bolt	No's.	108					
11	Disc insulator (B&S)90 KN polymer	No's.	108					

12	Earthing of Support (Coil Type)	No's.	18					
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	4.72					
14	PG Clamp for 232 sq.mm AAA conductor	No's.	108					
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	18					
16	H.T. Stay set (Complete)	Set	18					
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	18					
18	7/8 SWG Stay Wire 15kg /stay	KG	270.00					
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	203.58					
20	Black Paint	Ltr	18.00					
21	Yellow Colour Paint for Background	Ltr	36.00					
MATERIALS FOR 33 KV Pin Points								
1	13 Mtr. Long H-Pole	No's.	701					
2	33 KV V cross Arm (GI) 22Kg each	No's.	701					
3	Top bracket 100x50x6mm GI channel (300mm each)	No's.	701					
4	Danger Plate, 1 no's.	No's.	701					
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	210.93					
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	2103.00					
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	843.72					
8	33KV pin insulator polymer	No's.	2103					
9	Earthing of Support (Coil Type)	No's.	701					

10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	183.66				
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	1016.45				
12	232 sq.mm AAA conductor	Km	103.52				
13	Black Paint	Ltr	701.00				
14	Yellow Colour Paint for Background	Ltr	1402.00				
5	Erection, Testing & Commissioning of Material required for Construction of Line using 148sqmm conductor on 13 Mtr. long H-Pole, as per technical specification and scope of work						
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	2				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	130.02				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	21.15				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	23.40				
5	Danger Plate, 1 no's.	No's.	2				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	0.60				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	6.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	2.41				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	8				
10	H W fitting(B&S)90KN,4 Bolt	No's.	12				
11	Disc insulator (B&S)90 KN polymer	No's.	12				
12	Earthing of Support (Coil Type)	No's.	2				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	0.52				

14	PG Clamp for 148 sq.mm AAA conductor	No's.	12					
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	2					
16	H.T. Stay set (Complete)	Set	2					
17	H.T. Stay Insulator Type-C (2 No's.)	No's.	2					
18	7/8 SWG Stay Wire 15kg /stay	KG	30.00					
19	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	22.62					
20	Black Paint	Ltr	2.00					
21	Yellow Colour Paint for Background	Ltr	4.00					
MATERIALS FOR 33 KV Pin Points								
1	13 Mtr. Long H-Pole	No's.	4					
2	33 KV V cross Arm (GI) 22Kg each	No's.	4					
3	Top bracket 100x50x6mm GI channel (300mm each)	No's.	4					
4	Danger Plate, 1 no's.	No's.	4					
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	1.20					
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	12.00					
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	4.81					
8	33KV pin insulator polymer	No's.	12					
9	Earthing of Support (Coil Type)	No's.	4					
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	1.05					
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	5.80					

12	148 sq.mm AAA conductor	Km	0.62					
13	Black Paint	Ltr	4.00					
14	Yellow Colour Paint for Background	Ltr	8.00					
6	Erection, Testing & Commissioning of Material required for Construction of Line using 241sqmm conductor on 13 Mtr. long H-Pole, as per technical specification and scope of work.							
MATERIALS FOR 33 KV DP Without Isolator								
1	13 Mtr. Long H-Pole	No's.	40					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3.25 mtr., 2 no's channel required =(2x9.56x3.25)	KG	1242.80					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	79.30					
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.96 Mtr., 5 no's channel required =(5x7.14x1.96)	KG	1399.44					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.432 mtr., 4 nos angle required = (4*4.5*3.432)	KG	1235.52					
6	Danger Plate, 2 no's.	No's.	40					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	12.04					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	40					
9	H.T. Stay set (Complete)	Set	40					
10	H.T. Stay Insulator Type-C (2 No's.)	No's.	80					
11	7/8 SWG Stay Wire 15kg /stay	KG	600.00					
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	20					
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	236.00					
14	GI barbed wire anticlimbing device 3 Kg. Per support	KG	120.00					
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	48.14					

16	33KV pin insulator polymer	No's.	60					
17	Non Metallic Ties 33KV (For covered conductor)	No's.	60					
18	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	80					
19	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	120					
20	H W fitting(B&S)90KN,4 Bolt	No's.	120					
21	Disc insulator (B&S) 90 KN polymer	No's.	120					
22	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without Isolator)	KG	245.22					
23	Black Paint	Ltr	20.00					
24	Yellow Colour Paint for Background	Ltr	40.00					
MATERIALS FOR 33 KV DP With Isolator								
1	13 Mtr. Long H-Pole	No's.	12					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 4.3 mtr., 2 no's channel required =(2x9.56x4.3)	KG	493.30					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	23.79					
4	Insulator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 1 no's channel required =(1x7.14x4.3)	KG	184.21					
5	Isolator Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 2 no's channel required =(2x7.14x4.3)	KG	368.42					
6	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 4.3 Mtr., 4 no's channel required =(4x7.14x4.3)	KG	736.85					
7	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 4.927 mtr., 4 nos angle required = (4*4.5*4.927)	KG	532.12					
8	Isolator Operating Down Pipe Support Cahnnel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(1x7.14x0.8)	KG	34.27					
9	Down Pipe Diagonal Support Angle, 4.5Kg./mtr., each angle length 0.388mtr., 1 nos angle required = (1*4.5*0.388)	KG	10.48					
10	Down Pipe Base Support Angle, 4.5Kg./mtr., each angle length 0.34mtr., 1 nos angle required = (1*4.5*0.340)	KG	9.18					

11	Isolator Support Side Cahnnel 100X50X6mm, 9.56 KG/Mtr., each channel length 0.5 mtr., 2 no's channel required =(2x9.56x0.5)	KG	57.36					
12	Danger Plate, 2 no's.	No's.	12					
13	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	3.61					
14	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	12					
15	H.T. Stay set (Complete)	Set	12					
16	H.T. Stay Insulator Type-C (2 No's.)	No's.	24					
17	7/8 SWG Stay Wire 15kg /stay	KG	180.00					
18	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	12					
19	50x6mm GI Flat for earthing, 2.36kg/mtr., (15 Mtr. For L.A, 4 Mtr for Isolator Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 24x2.36	KG	339.84					
20	GI barbed wire anticlimbing device 3 Kg. Per support	KG	36.00					
21	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	14.44					
22	Lightning Arrester(30KV,10KA) (Station Class,class-2)	EA	18					
23	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator without earth switch with PI(Polymer)	Set	2					
24	33 KV 1250 AMP Double break (Turn & twist center rotating) isolator with earth switch with PI(Polymer)	Set	4					
25	33KV pin insulator polymer	No's.	18					
26	Non Metallic Ties 33KV (For covered conductor)	No's.	18					
27	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	24					
28	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	36					
29	H W fitting(B&S)90KN,4 Bolt	No's.	36					
30	Disc insulator (B&S) 90 KN polymer	No's.	36					

31	GI Nut , Bolt & Washer of different sizes (22.15 Kg each DP with Isolator)	KG	132.90					
32	Black Paint	Ltr	6.00					
33	Yellow Colour Paint for Background	Ltr	12.00					
MATERIALS FOR 33 KV Cut Point with 180 Degree Angle								
1	13 Mtr. Long H-Pole	No's.	20					
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 2 No's of Channel = (2x 9.56x1.7)	KG	650.08					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	105.73					
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 2 No's of Channel = (2x 9.56x0.306)	KG	117.01					
5	Danger Plate, 1 no's.	No's.	20					
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	6.02					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	60.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	24.07					
9	33KV pin insulator polymer	No's.	60					
10	Non Metallic Ties 33KV (For covered conductor)	No's.	60					
11	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	120					
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	40					
13	H W fitting(B&S)90KN,4 Bolt	No's.	120					
14	Disc insulator (B&S)90 KN polymer	No's.	120					
15	Earthing of Support (Coil Type)	EA	20					
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	5.24					

17	GI Nut , Bolt & Washer of different sizes (4.879 Kg each 180 deg. Cut point)	KG	97.58				
18	Black Paint	Ltr	20.00				
19	Yellow Colour Paint for Background	Ltr	40.00				
MATERIALS FOR 33 KV Cut Point with 90 Degree Angle							
1	13 Mtr. Long H-Pole	No's.	20				
2	Straight Cross Arm Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 1.7 Mtr., 4 No's of Channel = (4x 9.56x1.7)	KG	1300.16				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	211.46				
4	Straight Cross Arm Top Channel 100 x 50 x 6 mm, 9.56 KG/mtr, each channel length 0.306 Mtr., 4 No's of Channel = (4x 9.56x0.306)	KG	234.03				
5	Danger Plate, 1 no's.	No's.	20				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	6.02				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	60.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	24.07				
9	33KV pin insulator polymer (4 No's each 90 Deg. Cut point)	No's.	80				
10	H W fitting(B&S)90KN,4 Bolt	No's.	120				
11	Disc insulator (B&S)90 KN polymer	No's.	120				
12	Non Metallic Ties 33KV (For covered conductor)	No's.	80				
13	IPC for 241 sq.mm AAA conductor (For covered conductor)	No's.	120				
14	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	40				
15	Earthing of Support (Coil Type)	No's.	20				
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	5.24				

17	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.511 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	20					
18	H.T. Stay set (Complete)	Set	20					
19	H.T. Stay Insulator Type-C (2 No's.)	No's.	20					
20	7/8 SWG Stay Wire 15kg /stay	KG	300.00					
21	GI Nut , Bolt & Washer of different sizes (11.31 Kg each 90 deg. Cut point)	KG	226.20					
22	Black Paint	Ltr	20.00					
23	Yellow Colour Paint for Background	Ltr	40.00					
MATERIALS FOR 33 KV Pin Points								
1	13 Mtr. Long H-Pole	No's.	188					
2	33 KV V cross Arm (GI) 22Kg each	No's.	188					
3	Top bracket 100x50x6mm GI channel (2kg each)	No's.	188					
4	Danger Plate, 1 no's.	No's.	188					
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	56.57					
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	564.00					
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	226.28					
8	33KV pin insulator polymer	No's.	564					
9	Non Metallic Ties 33KV (For covered conductor)	No's.	630					
10	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	376					
11	Earthing of Support (Coil Type)	No's.	188					
12	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	49.26					

13	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	272.60					
14	241 sq.mm AAA conductor	Km	30.90					
15	Black Paint	Ltr	188.00					
16	Yellow Colour Paint for Background	Ltr	376.00					
7	Erection, Testing & Commissioning of Material for 33kV Line on 1CX 630sqmm UG Cable, as per technical specification and scope of work.							
1.1	Laying, Commissioning & Testing of 33kV, 1Core, 3Runs, 630sqmm, XLPE insulation (extruded type) UG cable (with one single 1core, 630sqmm, XLPE cable as spare) in trefoil formation by open trench method.	Mtr.	44280					
1.2	Erection of Straight through jointing kits Heat Shrinkable type suitable for 33kV, 1Core, 630sqmm, aluminium UG cable kits	Set	182					
1.3	Erection of Outdoor termination kits Heat Shrinkable type suitable for 33kV, 1Core, 630sqmm, HT UG cable kits	Set	141					
1.4	Erection of Indoor termination kits Heat Shrinkable type suitable for 33kV, 1Core, 630sqmm, HT UG cable kits	Set	102					
1.5	Installation, Laying, Commissioning & Testing of 33kV, 1Core, 3Runs, 630sqmm, XLPE insulation (extruded type) UG cable including looping at cable terminations and straight through joints by HDD method with HDPE pipe (110mm dia, PN8 PE80) for laying of individual run of UG cable at main road and unaccessible place.	Mtr.	16200					
1.6	Laying of 110mm dia PE 80-PN8, HDPE pipe inside open trench.	Mtr.	43548					
2	Erection, Commissioning, Wiring and Testing of 33kV RMU							
2.4	Erection of RMU 33KV 4WAY 630A (2ISLTR+2 BKR) (LLVV)	No's.	9					
3	Earthing							
3.1	Earthing Conductor: 50X6 mm (2.4kg./mtr.) GI Flat for equipment, structure etc.)	KG	118.80					
3.2	Pipe Earthing 40mm. GI Pipe	No's.	18					
4	Erection, Testing & Commissioning of Standard FRTU 4Way with FRTU networking Equipment consisting of Fibre Optic switch (Mono mode along with associate LIU unit for connection of FO Cable. for 3 Way & 4 way RMU.	No's.	8					
8	Erection, Testing & Commissioning of Material for 33kV Line on 3CX 400sqmm UG Cable, as per technical specification and scope of work.							
1	Erection, Commissioning & Testing of 33kV new line by 3Core, 400sqmm, XLPE UG cable without spare							

1.1	Laying, Commissioning & Testing of 33kV, 3Core, 1Run, 400sqmm, XLPE insulation (extruded type) UG cable with spare by open trench method .	Mtr.	198.00				
1.3	Erection of Outdoor termination kits Heat Shrinkable type suitable for 33kV, 3Core, 400sqmm, HT UG cable kits	Set	14.00				
1.4	Erection of Indoor termination kits Heat Shrinkable type suitable for 33kV, 3Core, 400sqmm, HT UG cable kits	Set	6.00				
1.6	Laying of 160mm dia PE 80-PN8, HDPE pipe inside open trench.	Mtr.	180				
2	Erection, Commissioning, Wiring and Testing of 33kV RMU						
2.3	Erection of RMU 33KV 3WAY 630A (2ISLTR+ 1BKR) (LLV)	No's.	1				
3	Earthing						
3.1	Earthing Conductor: 50X6 mm (2.4kg./mtr.) GI Flat for equipment, structure etc.)	KG	13.20				
3.2	Pipe Earthing 40mm. GI Pipe	No's.	2				
4	Erection, Testing & Commissioning of Standard FRTU 4Way with FRTU networking Equipment consisting of Fibre Optic switch (Mono mode along with associate LIU unit for connection of FO Cable. for 3 Way & 4 way RMU.	No's.	1				
9	Erection, Testing & Commissioning of GI PC '+6' EHT Tower for River crossing including all types of materials, as per technical specification and scope of work.						
1	GI PC '+6' Tower super structure G.I (Main + Extention +Stub + Template), as per technical specification and scope of work.						
i)	PC Tower	MT	49.71				
ii)	'+6' Mtr. Extention	MT	18.74				
iii)	Template	MT	15.23				
2	GI Nut , Bolt & Washer of different sizes, as per technical specification and scope of work.						
i)	PC Tower	MT	13.23				
ii)	'+6' Mtr. Extention	MT	4.74				
3	Erection, Testing & Commissioning of Conductor and Accessories, as per technical specification and scope of work.						
i	232 mm2 AAAC, as per technical specification and scope of work.	Km	1.85				

ii	Earth wire 7/1.5 G.I, as per technical specification and scope of work.	Km	0.62					
iii	Double tension Hardware Fittings suitable for Conductor size.	Set	96					
iv	Disc insulator (B&S) 120 KN polymer type.	No's.	192					
v	Tension fittings suitable for Earth wire.	Set	16					
vi.	Vibration damper suitable for earth wire	No's.	16					
vii.	Vibration damper suitable for conductor size.	No's.	96					
viii	Copper flexible bond	No's.	8					
ix	Phase Plate (R,Y,B)	Set	48					
x	GI Tower Number Plate	No's.	16					
xi	Circuit Plate	No's.	16					
xii	Earthing Device & Associated Accessories (Heavy duty GI Perforated Pipe of ID=40mm & OD=50mm with 3000mm long for treated Earth Pit), as per technical specification and scope of work.	No's.	16					
xiii	Earthing Conductor: 50X6 mm (2.4Kg./Mtr.) GI Flat for Raiser from the burial earth mat to equipment, structure etc), as per technical specification and scope of work.	KG	800.00					
xiv	GI Danger Board	No's.	16					
xv	Bird Guard	No's.	96					
xvi	Anticlimbing Device (G.I)	KG	844.80					
xvii	Loop Connector	No's.	48					
10	Civil Works Including Supply of All Materials Like Cement, MS tor Rod, Brick, Coarse & Fine Agregrates & Labour, T&P etc.; for Construction of 33kV Line.							
1	Civil Works for Construction of 33kV OH Line, as per technical specification and scope of work.							
1.1	Detail Survey of 33kV lines profile plotting, pole spotting and preparation of pole schedule, as per technical specification and scope of work.	Km	256					

1.2	Excavation of Earth for 13 Mtr. long poles pit. (1000mm X 500mm X 2275mm) = 1.14 Cu.mtr.), as per technical specification and scope of work.	Cum	5861				
1.3	Concreting of poles in ratio 1:1.5:3 (500mmX500mmX2200mm) = 0.55 Cu.mtr, as per technical specification and scope of work.	Cum	2828				
1.4	Couping of poles in ratio 1:1.5:3 with dimension (500X500X450)= 0.1125 Cu mtr, as per technical specification and scope of work.	Cum	578				
1.5	Fixing of stay set with 0.5Cum cement concrete foundation PCC 1:3:6 size (900mmx600mmx900mm) using 40mm BHG metal with all labor and material, including excavation and required backfilling, as per technical specification and scope of work.	No's.	994				
1.6	Dismantling of Poles with Accessories and h&w and return to store	No's.	505				
1.7	Dismantling of Line Conductor with all accessorise and return to store	Km	359				
2	Civil Works for Construction of 33kV Line on UG Cable, as per technical specification and scope of work.						
2.1	Earth work excavation of soil (1mtr. width X 1.2 mtr. depth)	Cum	12303				
2.2	Earth work excavation of hard rock (1mtr. width X 1.2 mtr. depth)	Cum	5273				
2.3	Back filling with excavated soil outside and above the trench	Cum	17575				
2.4	Damage of asphalt/tar road and other utilities and reconstructing to bring to its original shape after laying of cable in open trench (1mtr. width)	Mtr.	6805				
3	Civil Works for 33kV RMU, as per technical specification and scope of work.						
3.1	Prefabricated RCC foundation of 33kV RMU	No's.	10				
3.2	Erection of Galvanised Fencing around each RMU with height 2 mtr for external protection including supply of the same	Sq. mtr.	200				
4	Making of earth chamber with brick masonry (1:5) , PCC (1:4:8) and with 50mm thick RCC Slab (with 8mm rod) cover for earth pit of size 450mmX450mm X600 mm depth as per direction of Engg in Charge.	No's.	20				
5	Supply and erection of GI Pipe of dia. 150mm, Class-B (8Mtr.)	Mtr.	1176				
6	Supply and Erection of Cable Route Marker along the cable route at an interval of 30mtrs with civil works	No's.	674				
7	Civil Work for PC '+6' EHT Tower, as per technical specification and scope of work.						
7.1	Detail Survey of lines profile plotting, spotting and marking, as per technical specification and scope of work.	No's.	8				

7.2	Excavation with back filling in all types of soil for PC + 6 Tower , including de-watering, Shoring & Shuttering	Cum	1760.00					
7.3	PCC (1:3:6) for PC + 6 Tower with cement, including de- watering, Shoring & Shuttering including supply of Materials	Cum	0.80					
7.4	PCC (1:3:6) for Tower Foundation as blind layer (1Cum for 1tower) including supply of Materials	Cum	8.00					
7.5	PCC (1:2:4) for Tower Foundation as blind layer (1Cum for 1tower) Per Tower= 1Cum including supply of Materials	Cum	8.00					
7.6	RCC (1:1.5:3) for PC + 6 Tower with cement & with tor rod including setting of stub by providing required templets with proper alignment including de-watering. including supply of Materials	Cum	352.00					
TOTAL OF ERECTION & CIVIL WORKS COMPONENT OF THE WORKS CONTRACT FOR 33kV LINE								

ANNEXURE-I

SCOPE- III :

- (A) SUPPLY PART:**
- (B) ERECTION PART**

Construction of 11kV FEEDER WORK with accessories, as per technical specification and scope of work.

BROAD REQUIREMENT FOR INFORMATION			55 (Sum from 1 to 55)
1	11kV Line with 11mtr long WPB Pole	Km	186.27
2	11kV line on Underground Cable	Mtr.	4880.00
3	PC '+6' Tower Requirement for River crossing on 11kV Line	No's.	1

Tata Power Central Odisha Distribution Limited (TPCODL)											
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Station, 33kV, 11kV, LT											
Supply of Materials Required for Construction of 11kV line											
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24, Date:05.04.2023											
SL. No.	DESCRIPTION OF ITEMS				UNITS	Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY
	SUPPLY OF FOLLOWING EQUIPMENTS/ MATERIALS (As per technical specification and scope of work.)				Circle						
BROAD REQUIREMENT FOR INFORMATION						55 (Sum from	56	57= (56*9%)	58= (56*9%)	59= {56+57+58}	60= {59*55}
1	11kV Line with 11mtr long WPB Pole				Km	186.27					
2	11kV line on Underground Cable				Mtr.	4880.00					
3	PC '+6' Tower Requirement for River crossing on 11kV Line				No's.	1					
DETAIL REQUIREMENT (To be quoted)											
1	Supply of Material required for Construction of Line using 100sqmm conductor on 11 Mtr. long WPB Pole, as per technical specification and scope of work.										
Sl. No.	Description of Materials				Unit						
MATERIALS OF DP Without AB Switch											
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)				Nos.	522					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 2.3 mtr., 2 no's channel required =(2x9.56x2.3)				KG	11477.74					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)				KG	1034.81					
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.66 Mtr., 4 no's channel required =(7.14x1.66x4)				KG	12373.91					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 2.671 mtr., 4 nos angle required = (4.5x2.671x4)				KG	12548.36					
6	Danger Plate, 2 no's.				Nos.	522					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)				KG	157.07					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)				Pair	522					
9	H.T. Stay set (Complete)				Set	522					

10	H.T. Stay Insulator Type-C	Nos.	522				
11	7/10 SWG Stay Wire 15kg /stay	KG	7830.00				
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	Nos.	261				
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	3079.80				
14	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	1566.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	628.28				
16	11 KV pin insulator polymer	Nos.	783				
17	H W fitting(B&S) 70KN, 3Bolt	Nos.	1566				
18	Disc insulator (B&S) 70 KN polymer	Nos.	1566				
19	PG Clamp for 100 sq.mm AAA conductor	Nos.	1566				
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without AB Switch)	KG	3200.12				
21	Black Paint	Ltr	261.00				
22	Yellow Colour Paint for Background	Ltr	522.00				
MATERIALS OF DP With AB Switch							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	248				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3 mtr., 2 no's channel required =(2x9.56x3)	KG	7456.80				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	479.74				
4	AB switch Mounting Channel 75X40X4.8mm, 7.14KG/Mtr, each channel length 3 Mtr., 2 no's channel required =(7.14x3x2)	KG	5440.68				
5	AB Switch Side Support Channel 100X50X6mm,9.56 KG/Mtr., each channel length 0.35 mtr., 2 no's channel required =(9.56x2x0.35)	KG	849.88				
6	Channel Support for down Pipe 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(7.14x0.8x1)	KG	725.42				
7	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 3.0 Mtr., 4 no's channel required =(7.14x3x4)	KG	11138.40				
8	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.512 mtr., 4 nos angle required = (4.5x3.512x4)	KG	8218.08				
9	Danger Plate, 2 no's.	Nos.	248				
10	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	74.62				
11	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	242				
12	H.T. Stay set (Complete)	Set	242				
13	H.T. Stay Insulator Type-C	Nos.	242				
14	7/10 SWG Stay Wire 15kg /stay	KG	3630.00				
15	Gi Pipe Earthing 40mm. 3 Mtr. Long	Nos.	242				
16	50x6mm GI Flat for earthing, 2.36kg/mtr., (12.5 Mtr. For L.A, 3 Mtr for AB Switch Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 20.5x2.36	KG	5853.98				
17	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	744.00				
18	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	298.49				
19	Lightning Arrester(12KV,10KA) (Station Class,class-2)	EA	363				

20	AB Switch (11KV,400A,3pole,50Hz)	Set	127				
21	11 KV pin insulator polymer	Nos.	363				
22	H W fitting(B&S) 70KN, 3Bolt	Nos.	762				
23	Disc insulator (B&S) 70 KN polymer	Nos.	762				
24	PG Clamp for 100 sq.mm AAA conductor	Nos.	762				
25	GI Nut , Bolt & Washer of different sizes (13.718 Kg each DP with AB Switch)	KG	1768.72				
26	Black Paint	Ltr	124.00				
27	Yellow Colour Paint for Background	Ltr	248.00				
MATERIALS FOR 11 KV Cut Point with 180 Degree Angle							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	189				
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 2 no's channel required =(2x9.56x1.2)	KG	4336.42				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	999.13				
4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 2 no's channel required =(2x9.56x0.306)	KG	1105.79				
5	Danger Plate, 1 no's.	Nos.	189				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	56.87				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	567.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	227.48				
9	11 KV pin insulator polymer	Nos.	567				
10	H W fitting(B&S) 70KN, 3Bolt	Nos.	1134				
11	Disc insulator (B&S) 70 KN polymer	Nos.	1134				
12	Earthing of Support (Coil Type)	EA	189				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	49.52				
14	PG Clamp for 100 sq.mm AAA conductor	Nos.	1134				
15	GI Nut , Bolt & Washer of different sizes (3.55 Kg each Cut Pole)	KG	670.95				
16	Black Paint	Ltr	94.50				
17	Yellow Colour Paint for Background	Ltr	378.00				
MATERIALS FOR 11 KV Cut Point with 90 Degree Angle							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	162				
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 4 no's channel required =(4x9.56x1.2)	KG	7433.86				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	1712.79				
4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 4 no's channel required =(4x9.56x0.306)	KG	1895.63				
5	Danger Plate, 1 no's.	Nos.	162				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	48.75				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	486.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	194.98				
9	11 KV pin insulator polymer	Nos.	648				

10	H W fitting(B&S) 70KN, 3Bolt	Nos.	972				
11	Disc insulator (B&S) 70 KN polymer	Nos.	972				
12	Earthing of Support (Coil Type)	EA	162				
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	42.44				
14	PG Clamp for 100 sq.mm AAA conductor	Nos.	972				
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	324				
16	H.T. Stay set (Complete)	Set	324				
17	H.T. Stay Insulator Type-C	Nos.	324				
18	7/10 SWG Stay Wire 15kg /stay	KG	4860.00				
19	GI Nut , Bolt & Washer of different sizes (7.433 Kg each Cut Pole)	KG	1204.15				
20	Black Paint	Ltr	81.00				
21	Yellow Colour Paint for Background	Ltr	324.00				
MATERIALS FOR 11 KV Pin Points With WPB							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	2790				
2	11 KV V cross Arm (10.2 K.g. each)	Nos.	2790				
3	Top bracket 100x50X6 mm GI channel (2kg each)	Nos.	2790				
4	Danger Plate, 1 no's. for each pole	Nos.	2790				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	839.51				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	8370.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	3358.04				
8	11 KV pin insulator polymer, 3 Nos. required for each support	Nos.	8370				
9	Earthing of Support (Coil Type)	Nos.	2790				
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	730.98				
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	4045.50				
12	100 mm ² AAAC	Km	492.70				
13	Black Paint	Ltr	2790.00				
14	Yellow Colour Paint for Background	Ltr	5580.00				
2	Supply of Material required for Construction of Line using 99sqmm conductor on 11 Mtr. long WPB Pole, as per technical specification and scope of work.						
MATERIALS OF DP Without AB Switch							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	58				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 2.3 mtr., 2 no's channel required =(2x9.56x2.3)	KG	1275.30				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	114.98				
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.66 Mtr., 4 no's channel required =(7.14x1.66x4)	KG	1374.88				
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 2.671 mtr., 4 nos angle required = (4.5x2.671x4)	KG	1394.26				
6	Danger Plate, 2 no's.	Nos.	58				
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	17.45				
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	58				

9	H.T. Stay set (Complete)	Set	58				
10	H.T. Stay Insulator Type-C	Nos.	58				
11	7/10 SWG Stay Wire 15kg /stay	KG	870.00				
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	Nos.	29				
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	342.20				
14	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	174.00				
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	69.81				
16	11 KV pin insulator polymer	Nos.	87				
17	H W fitting(B&S) 70KN, 3Bolt	Nos.	174				
18	Disc insulator (B&S) 70 KN polymer	Nos.	174				
19	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	116				
20	Non Metallic Ties 11KV (For covered conductor)	Nos.	87				
21	IPC for 99 sq.mm AAA conductor (For covered conductor)	Nos.	174				
22	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without AB Switch)	KG	355.57				
23	Black Paint	Ltr	29.00				
24	Yellow Colour Paint for Background	Ltr	58.00				
MATERIALS OF DP With AB Switch							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	32				
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3 mtr., 2 no's channel required =(2x9.56x3)	KG	917.76				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	63.44				
4	AB switch Mounting Channel 75X40X4.8mm, 7.14KG/Mtr, each channel length 3 Mtr., 2 no's channel required =(7.14x3x2)	KG	685.44				
5	AB Switch Side Support Channel 100X50X6mm,9.56 KG/Mtr., each channel length 0.35 mtr., 2 no's channel required =(9.56x2x0.35)	KG	107.07				
6	Channel Support for down Pipe 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(7.14x0.8x1)	KG	91.39				
7	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 3.0 Mtr., 4 no's channel required =(7.14x3x4)	KG	1370.88				
8	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.512 mtr., 4 nos angle required = (4.5x3.512x4)	KG	1011.46				
9	Danger Plate, 2 no's.	Nos.	32				
10	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	9.63				
11	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	32				
12	H.T. Stay set (Complete)	Set	32				
13	H.T. Stay Insulator Type-C	Nos.	32				
14	7/10 SWG Stay Wire 15kg /stay	KG	480.00				
15	Gi Pipe Earthing 40mm. 3 Mtr. Long	Nos.	32				
16	50x6mm GI Flat for earthing, 2.36kg/mtr., (12.5 Mtr. For L.A, 3 Mtr for AB Switch Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 20.5x2.36	KG	774.08				

17	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	96.00				
18	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	38.52				
19	Lightning Arrester(12KV,10KA) (Station Class,class-2)	EA	48				
20	AB Switch (11KV,400A.3pole,50Hz)	Set	16				
21	11 KV pin insulator polymer	Nos.	48				
22	H W fitting(B&S) 70KN, 3Bolt	Nos.	96				
23	Disc insulator (B&S) 70 KN polymer	Nos.	96				
24	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	64				
25	Non Metallic Ties 11KV (For covered conductor)	Nos.	48				
26	IPC for 99 sq.mm AAA conductor (For covered conductor)	Nos.	96				
27	GI Nut , Bolt & Washer of different sizes (13.718 Kg each DP with AB Switch)	KG	219.49				
28	Black Paint	Ltr	16.00				
29	Yellow Colour Paint for Background	Ltr	32.00				
MATERIALS FOR 11 KV Cut Point with 180 Degree Angle							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	23				
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 2 no's channel required =(2x9.56x1.2)	KG	527.71				
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	121.59				
4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 2 no's channel required =(2x9.56x0.306)	KG	134.57				
5	Danger Plate, 1 no's.	Nos.	23				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	6.92				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	69.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	27.68				
9	11 KV pin insulator polymer	Nos.	69				
10	H W fitting(B&S) 70KN, 3Bolt	Nos.	138				
11	Disc insulator (B&S) 70 KN polymer	Nos.	138				
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	46				
13	Non Metallic Ties 11KV (For covered conductor)	Nos.	69				
14	IPC for 99 sq.mm AAA conductor (For covered conductor)	Nos.	138				
15	Earthing of Support (Coil Type)	EA	23				
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	6.03				
17	GI Nut , Bolt & Washer of different sizes (3.55 Kg each Cut Pole)	KG	81.65				
18	Black Paint	Ltr	11.50				
19	Yellow Colour Paint for Background	Ltr	46.00				
MATERIALS FOR 11 KV Cut Point with 90 Degree Angle							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	24				
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 4 no's channel required =(4x9.56x1.2)	KG	1101.31				

3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	253.75				
4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 4 no's channel required =(4x9.56x0.306)	KG	280.83				
5	Danger Plate, 1 no's.	Nos.	24				
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	7.22				
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	72.00				
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	28.89				
9	11 KV pin insulator polymer	Nos.	96				
10	H W fitting(B&S) 70KN, 3Bolt	Nos.	144				
11	Disc insulator (B&S) 70 KN polymer	Nos.	144				
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	48				
13	Non Metallic Ties 11KV (For covered conductor)	Nos.	96				
14	IPC for 99 sq.mm AAA conductor (For covered conductor)	Nos.	144				
15	Earthing of Support (Coil Type)	EA	24				
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	6.29				
17	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	48				
18	H.T. Stay set (Complete)	Set	48				
19	H.T. Stay Insulator Type-C	Nos.	48				
20	7/10 SWG Stay Wire 15kg /stay	KG	720.00				
21	GI Nut , Bolt & Washer of different sizes (7.433 Kg each Cut Pole)	KG	178.39				
22	Black Paint	Ltr	12.00				
23	Yellow Colour Paint for Background	Ltr	48.00				
MATERIALS FOR 11 KV Pin Points With WPB							
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	Nos.	464				
2	11 KV V cross Arm (10.2 K.g. each)	Nos.	464				
3	Top bracket 100x50X6 mm GI channel (2kg each)	Nos.	464				
4	Danger Plate, 1 no's. for each pole	Nos.	464				
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	139.62				
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	1392.00				
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	558.47				
8	11 KV pin insulator polymer, 3 Nos. required for each support	Nos.	1392				
9	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	928				
10	Non Metallic Ties 11KV (For covered conductor)	Nos.	1392				
11	Earthing of Support (Coil Type)	Nos.	464				
12	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	121.57				
13	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	672.80				
14	99 SQ.MM. AAAC XLPE Covered Conductor	Km	82.86				
16	Black Paint	Ltr	464.00				

17	Yellow Colour Paint for Background	Ltr	928.00					
3	Supply of Material for 11kV Line on UG Cable, as per technical specification and scope of work.							
1	Supply of materials for 11kV, 3Core, 400sqmm, XLPE insulation armoured UG cable with accessories							
a	Length of 11kV 3C, 400sqmm cable (open trench) (Mtr.)							
b	Length of 11kV 3C, 400sqmm cable (HDD) (Mtr)							
1.1	Supply of 11kV, 3Core, 400sqmm, XLPE insulation armoured UG cable (SC rating of cable in kA- 37.7kA and SC rating of Armour in kA- 15kA)	Mtr.	9760.00					
1.2	Supply of Straight through jointing kits Heat Shrinkable type suitable for 11kV, 3Core, 400 sqmm, Aluminium UG cable for 3Core (Set)	Set	36					
1.3	Supply of Indoor termination kits Heat Shrinkable type suitable for 11kV, 3Core, 400 sqmm, HT UG cable for 3Core (Set)	Set	32					
1.4	Supply of Outdoor termination kits Heat Shrinkable type suitable for 11kV, 3Core, 400 sqmm, HT UG cable for 3Core (Set)	Set	42					
1.5	Supply of HDPE PE 80-PN8 pipe of 160mm diameter (for 400sqmm HT cable laying)	Mtr.	8504.00					
2	Supply of 11kV RMU							
2.1	Supply of 11kV RMU 3 Way, 2 Iso & 1 Brk 630A (LLV)	Nos.	3					
2.2	Supply of 11kV RMU 4 Way, 2 Iso & 2 Brk 630A (LLVV)	Nos.	2					
3	Earthing							
3.1	Earthing Conductor: 50X6 mm (2.4kg./mtr.) GI Flat for equipment, structure etc.)	KG	66.00					
3.2	Pipe Earthing 40mm. GI Pipe	Nos.	10					
4	Supply of Standard FRTU 4Way with FRTU networking Equipment consisting of Fibre Optic switch (Mono mode along with associate LIU unit for connection of FO Cable. for 3 Way & 4 way RMU.	Nos.	5					
4	Supply of GI PC '+6' EHT Tower for River crossing including all types of materials, as per technical specification and scope of work.							
1	GI PC '+6' Tower super structure G.I (Main + Extension +Stub + Template), as per technical specification and scope of work.							
i)	PC Tower	MT	12.43					
ii)	'+6' Mtr. Extension	MT	4.68					
iii)	Template	MT	3.81					
2	GI Nut , Bolt & Washer of different sizes, as per technical specification and scope of work.							
i)	PC Tower	MT	3.31					
ii)	'+6' Mtr. Extension	MT	1.18					
3	Supply of Conductor and Accessories, as per technical specification and scope of work.							
i	232 mm2 AAAC, as per technical specification and scope of work.	Km	0.46					
ii	Earth wire 7/1.5 G.I, as per technical specification and scope of work.	Km	0.15					
iii	Double tension Hardware Fittings suitable for Conductor size.	Set	24					
iv	Disc insulator (B&S) 120 KN polymer type.	Nos.	48					
v	Tension fittings suitable for Earth wire.	Set	4					
vi.	Vibration damper suitable for earth wire	Nos.	4					
vii.	Vibration damper suitable for conductor size.	Nos.	24					
viii	Copper flexible bond	Nos.	2					

ix	Phase Plate (R,Y,B)	Set	12					
x	GI Tower Number Plate	Nos.	4					
xi	Circuit Plate	Nos.	4					
xii	Earthing Device & Associated Accessories (Heavy duty GI Perforated Pipe of ID=40mm & OD=50mm with 3000mm long for treated Earth Pit), as per technical specification and scope of work.	Nos.	4					
xiii	Earthing Conductor: 50X6 mm (2.4Kg./Mtr.) GI Flat for Raiser from the burial earth mat to equipment, structure etc), as per technical specification and scope of work.	KG	200.00					
xiv	GI Danger Board	Nos.	4					
xv	Bird Guard	Nos.	24					
xvi	Anticlimbing Device (G.I)	KG	211.20					
xvii	Loop Connector	Nos.	37					
TOTAL OF SUPPLY COMPONENT OF THE WORKS CONTRACT FOR 11kV LINE								

Tata Power Central Odisha Distribution Limited (TPCODL)											
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations, 33kV, 11kV, LT Lines, LVRT											
Supply of Materials Required for Construction of 11kV line											
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24, Date:05.04.2023											
SL. No.	DESCRIPTION OF ITEMS				UNITS	Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY (Rs.)
	BROAD REQUIREMENT FOR INFORMATION				Circle	55 (Sum from	56	57= (56*9%)	58= (56*9%)	59= {56+57+58}	60= {59*55}
1	11kV Line with 11mtr long WPB Pole				Km	186.27					
2	11kV line on Underground Cable				Mtr.	4880.00					
3	PC '6' Tower Requirement for River crossing on 11kV Line				No's.	1					
	DETAIL REQUIREMENT (To be quoted)										
1	Erection, Testing & Commissioning of Material required for Construction of Line using 100sqmm conductor on 11 Mtr. long WPB Pole, as per technical specification and scope of work.										
Sl. No.	Description of Materials				Unit						
	MATERIALS OF DP Without AB Switch										
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)				No's.	522					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 2.3 mtr., 2 no's channel required =(2x9.56x2.3)				KG	11477.74					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)				KG	1034.81					
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.66 Mtr., 4 no's channel required =(7.14x1.66x4)				KG	12373.91					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 2.671 mtr., 4 nos angle required = (4.5x2.671x4)				KG	12548.36					
6	Danger Plate, 2 no's.				No's.	522					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)				KG	157.07					
8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)				Pair	522					
9	H.T. Stay set (Complete)				Set	522					

10	H.T. Stay Insulator Type-C	No's.	522					
11	7/10 SWG Stay Wire 15kg /stay	KG	7830.00					
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	261					
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	3079.80					
14	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	1566.00					
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	628.28					
16	11 KV pin insulator polymer	No's.	783					
17	H W fitting(B&S) 70KN, 3Bolt	No's.	1566					
18	Disc insulator (B&S) 70 KN polymer	No's.	1566					
19	PG Clamp for 100 sq.mm AAA conductor	No's.	1566					
20	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without AB Switch)	KG	3200.12					
21	Black Paint	Ltr	261.00					
22	Yellow Colour Paint for Background	Ltr	522.00					
MATERIALS OF DP With AB Switch								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	248					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3 mtr., 2 no's channel required =(2x9.56x3)	KG	7456.80					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	479.74					
4	AB switch Mounting Channel 75X40X4.8mm, 7.14KG/Mtr, each channel length 3 Mtr., 2 no's channel required =(7.14x3x2)	KG	5440.68					
5	AB Switch Side Support Channel 100X50X6mm,9.56 KG/Mtr., each channel length 0.35 mtr., 2 no's channel required =(9.56x2x0.35)	KG	849.88					
6	Channel Support for down Pipe 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(7.14x0.8x1)	KG	725.42					
7	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 3.0 Mtr., 4 no's channel required =(7.14x3x4)	KG	11138.40					

8	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.512 mtr., 4 nos angle required = (4.5x3.512x4)	KG	8218.08					
9	Danger Plate, 2 no's.	No's.	248					
10	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	74.62					
11	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	242					
12	H.T. Stay set (Complete)	Set	242					
13	H.T. Stay Insulator Type-C	No's.	242					
14	7/10 SWG Stay Wire 15kg /stay	KG	3630.00					
15	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	242					
16	50x6mm GI Flat for earthing, 2.36kg/mtr., (12.5 Mtr. For L.A, 3 Mtr for AB Switch Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 20.5x2.36	KG	5853.98					
17	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	744.00					
18	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	298.49					
19	Lightning Arrester(12KV,10KA) (Station Class,class-2)	EA	363					
20	AB Switch (11KV,400A.3pole,50Hz)	Set	127					
21	11 KV pin insulator polymer	No's.	363					
22	H W fitting(B&S) 70KN, 3Bolt	No's.	762					
23	Disc insulator (B&S) 70 KN polymer	No's.	762					
24	PG Clamp for 100 sq.mm AAA conductor	No's.	762					
25	GI Nut , Bolt & Washer of different sizes (13.718 Kg each DP with AB Switch)	KG	1768.72					
26	Black Paint	Ltr	124.00					
27	Yellow Colour Paint for Background	Ltr	248.00					
MATERIALS FOR 11 KV Cut Point with 180 Degree Angle								

1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	189					
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 2 no's channel required =(2x9.56x1.2)	KG	4336.42					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	999.13					
4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 2 no's channel required =(2x9.56x0.306)	KG	1105.79					
5	Danger Plate, 1 no's.	No's.	189					
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	56.87					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	567.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	227.48					
9	11 KV pin insulator polymer	No's.	567					
10	H W fitting(B&S) 70KN, 3Bolt	No's.	1134					
11	Disc insulator (B&S) 70 KN polymer	No's.	1134					
12	Earthing of Support (Coil Type)	EA	189					
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	49.52					
14	PG Clamp for 100 sq.mm AAA conductor	No's.	1134					
15	GI Nut , Bolt & Washer of different sizes (3.55 Kg each Cut Pole)	KG	670.95					
16	Black Paint	Ltr	94.50					
17	Yellow Colour Paint for Background	Ltr	378.00					
MATERIALS FOR 11 KV Cut Point with 90 Degree Angle								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	162					
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 4 no's channel required =(4x9.56x1.2)	KG	7433.86					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	1712.79					

4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 4 no's channel required =(4x9.56x0.306)	KG	1895.63					
5	Danger Plate, 1 no's.	No's.	162					
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	48.75					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	486.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	194.98					
9	11 KV pin insulator polymer	No's.	648					
10	H W fitting(B&S) 70KN, 3Bolt	No's.	972					
11	Disc insulator (B&S) 70 KN polymer	No's.	972					
12	Earthing of Support (Coil Type)	EA	162					
13	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	42.44					
14	PG Clamp for 100 sq.mm AAA conductor	No's.	972					
15	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	324					
16	H.T. Stay set (Complete)	Set	324					
17	H.T. Stay Insulator Type-C	No's.	324					
18	7/10 SWG Stay Wire 15kg /stay	KG	4860.00					
19	GI Nut , Bolt & Washer of different sizes (7.433 Kg each Cut Pole)	KG	1204.15					
20	Black Paint	Ltr	81.00					
21	Yellow Colour Paint for Background	Ltr	324.00					
MATERIALS FOR 11 KV Pin Points With WPB								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	2790					
2	11 KV V cross Arm (10.2 K.g. each)	No's.	2790					

3	Top bracket 100x50X6 mm GI channel (2kg each)	No's.	2790					
4	Danger Plate, 1 no's. for each pole	No's.	2790					
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	839.51					
6	GI barbed wire anticlimbing device 3 Kg. Per support	KG	8370.00					
7	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	3358.04					
8	11 KV pin insulator polymer, 3 Nos. required for each support	No's.	8370					
9	Earthing of Support (Coil Type)	No's.	2790					
10	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	730.98					
11	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	4045.50					
12	100 mm2 AAAC	Km	492.70					
13	Black Paint	Ltr	2790.00					
14	Yellow Colour Paint for Background	Ltr	5580.00					
2	Erection, Testing & Commissioning of Material required for Construction of Line using 99sqmm conductor on 11 Mtr. long WPB Pole, as per technical specification and scope of work.							
MATERIALS OF DP Without AB Switch								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	58					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 2.3 mtr., 2 no's channel required =(2x9.56x2.3)	KG	1275.30					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	114.98					
4	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 1.66 Mtr., 4 no's channel required =(7.14x1.66x4)	KG	1374.88					
5	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 2.671 mtr., 4 nos angle required = (4.5x2.671x4)	KG	1394.26					
6	Danger Plate, 2 no's.	No's.	58					
7	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	17.45					

8	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	58					
9	H.T. Stay set (Complete)	Set	58					
10	H.T. Stay Insulator Type-C	No's.	58					
11	7/10 SWG Stay Wire 15kg /stay	KG	870.00					
12	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	29					
13	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 5x2.36	KG	342.20					
14	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	174.00					
15	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	69.81					
16	11 KV pin insulator polymer	No's.	87					
17	H W fitting(B&S) 70KN, 3Bolt	No's.	174					
18	Disc insulator (B&S) 70 KN polymer	No's.	174					
19	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	116					
20	Non Metallic Ties 11KV (For covered conductor)	No's.	87					
21	IPC for 99 sq.mm AAA conductor (For covered conductor)	No's.	174					
22	GI Nut , Bolt & Washer of different sizes (12.261 Kg each DP without AB Switch)	KG	355.57					
23	Black Paint	Ltr	29.00					
24	Yellow Colour Paint for Background	Ltr	58.00					
MATERIALS OF DP With AB Switch								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	32					
2	Top Channel 100X50X6mm, 9.56 KG/Mtr., each channel length 3 mtr., 2 no's channel required =(2x9.56x3)	KG	917.76					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)	KG	63.44					

4	AB switch Mounting Channel 75X40X4.8mm, 7.14KG/Mtr, each channel length 3 Mtr., 2 no's channel required =(7.14x3x2)	KG	685.44					
5	AB Switch Side Support Channel 100X50X6mm,9.56 KG/Mtr., each channel length 0.35 mtr., 2 no's channel required =(9.56x2x0.35)	KG	107.07					
6	Channel Support for down Pipe 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(7.14x0.8x1)	KG	91.39					
7	Double Pole Belting Channel 75X40X 4.8mm., 7.14KG/Mtr., each channel length 3.0 Mtr., 4 no's channel required =(7.14x3x4)	KG	1370.88					
8	50x50x6mm.GI Bracing Angle, 4.5Kg./mtr., each angle length 3.512 mtr., 4 nos angle required = (4.5x3.512x4)	KG	1011.46					
9	Danger Plate, 2 no's.	No's.	32					
10	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	9.63					
11	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	32					
12	H.T. Stay set (Complete)	Set	32					
13	H.T. Stay Insulator Type-C	No's.	32					
14	7/10 SWG Stay Wire 15kg /stay	KG	480.00					
15	Gi Pipe Earthing 40mm. 3 Mtr. Long	No's.	32					
16	50x6mm GI Flat for earthing, 2.36kg/mtr., (12.5 Mtr. For L.A, 3 Mtr for AB Switch Body, 2.5 mtr. For mesh formation and 2.5 mtr. For raising)= 20.5x2.36	KG	774.08					
17	GI barbed wire anticlimbing device 3 Kg. Per support, 2 no's qty. required =(2x3kg)	KG	96.00					
18	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	38.52					
19	Lightning Arrester(12KV,10KA) (Station Class,class-2)	EA	48					
20	AB Switch (11KV,400A.3pole,50Hz)	Set	16					
21	11 KV pin insulator polymer	No's.	48					
22	H W fitting(B&S) 70KN, 3Bolt	No's.	96					
23	Disc insulator (B&S) 70 KN polymer	No's.	96					
24	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	64					

25	Non Metallic Ties 11KV (For covered conductor)	No's.	48					
26	IPC for 99 sq.mm AAA conductor (For covered conductor)	No's.	96					
27	GI Nut , Bolt & Washer of different sizes (13.718 Kg each DP with AB Switch)	KG	219.49					
28	Black Paint	Ltr	16.00					
29	Yellow Colour Paint for Background	Ltr	32.00					
MATERIALS FOR 11 KV Cut Point with 180 Degree Angle								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	23					
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 2 no's channel required =(2x9.56x1.2)	KG	527.71					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 8 no's required = (8x2.36x0.280)	KG	121.59					
4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 2 no's channel required =(2x9.56x0.306)	KG	134.57					
5	Danger Plate, 1 no's.	No's.	23					
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	6.92					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	69.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	27.68					
9	11 KV pin insulator polymer	No's.	69					
10	H W fitting(B&S) 70KN, 3Bolt	No's.	138					
11	Disc insulator (B&S) 70 KN polymer	No's.	138					
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	46					
13	Non Metallic Ties 11KV (For covered conductor)	No's.	69					
14	IPC for 99 sq.mm AAA conductor (For covered conductor)	No's.	138					
15	Earthing of Support (Coil Type)	EA	23					

16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	6.03					
17	GI Nut , Bolt & Washer of different sizes (3.55 Kg each Cut Pole)	KG	81.65					
18	Black Paint	Ltr	11.50					
19	Yellow Colour Paint for Background	Ltr	46.00					
MATERIALS FOR 11 KV Cut Point with 90 Degree Angle								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	24					
2	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 1.2 mtr., 4 no's channel required =(4x9.56x1.2)	KG	1101.31					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 16 no's required = (16x2.36x0.280)	KG	253.75					
4	Straight Cross Arm 100X50X6mm, 9.56 KG/Mtr., each channel length 0.306 mtr., 4 no's channel required =(4x9.56x0.306)	KG	280.83					
5	Danger Plate, 1 no's.	No's.	24					
6	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	7.22					
7	GI barbed wire anticlimbing device 3 Kg. Per support	KG	72.00					
8	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	28.89					
9	11 KV pin insulator polymer	No's.	96					
10	H W fitting(B&S) 70KN, 3Bolt	No's.	144					
11	Disc insulator (B&S) 70 KN polymer	No's.	144					
12	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	48					
13	Non Metallic Ties 11KV (For covered conductor)	No's.	96					
14	IPC for 99 sq.mm AAA conductor (For covered conductor)	No's.	144					
15	Earthing of Support (Coil Type)	EA	24					
16	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	6.29					

17	H.T. Stay clamp, 50x8 mm. flat, 3.14Kg/Mtr., 0.551 Mtr. Length, 2 no's qty. required (1 Pair)	Pair	48					
18	H.T. Stay set (Complete)	Set	48					
19	H.T. Stay Insulator Type-C	No's.	48					
20	7/10 SWG Stay Wire 15kg /stay	KG	720.00					
21	GI Nut , Bolt & Washer of different sizes (7.433 Kg each Cut Pole)	KG	178.39					
22	Black Paint	Ltr	12.00					
23	Yellow Colour Paint for Background	Ltr	48.00					
MATERIALS FOR 11 KV Pin Points With WPB								
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)	No's.	464					
2	11 KV V cross Arm (10.2 K.g. each)	No's.	464					
3	Top bracket 100x50X6 mm GI channel (2kg each)	No's.	464					
4	Danger Plate, 1 no's. for each pole	No's.	464					
5	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	139.62					
6	GI barbed wire antilimbing device 3 Kg. Per support	KG	1392.00					
7	Back Clamp for antilimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	558.47					
8	11 KV pin insulator polymer, 3 Nos. required for each support	No's.	1392					
9	Spike (GI) (using 50x6mm Flat welded with 8 mm square bar) (2 Nos of spike per Set in each Pole)	Set	928					
10	Non Metallic Ties 11KV (For covered conductor)	No's.	1392					
11	Earthing of Support (Coil Type)	No's.	464					
12	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	KG	121.57					
13	GI Nut , Bolt & Washer of different sizes (1.45 Kg/ Pin Point)	KG	672.80					

14	99 SQ.MM. AAAC XLPE Covered Conductor	Km	82.86					
16	Black Paint	Ltr	464.00					
17	Yellow Colour Paint for Background	Ltr	928.00					
3	Erection, Testing & Commissioning of Material for 11kV Line on UG Cable, as per technical specification and scope of work.							
1	Laying, Commissioning, Testing of 11kV, 3core, 400sqmm, aluminium, XLPE insulation armoured (extruded type) UG cable by open trench method and HDD method							
1.1	Laying, Commissioning, Testing of 11kV, 3core, 400sqmm, aluminium, XLPE insulation armoured (extruded type) UG cable by open trench method.	Mtr	8760.00					
1.2	Erection of Straight through jointing kits Heat Shrinkable type suitable for 11kV, 3Core, 400sqmm, aluminium UG cable kits for 3core (set)	Set	36.00					
1.3	Erection of Indoor termination kits Heat Shrinkable type suitable for 11kV, 3Core, 400sqmm, aluminium UG cable kits for 3core (set)	Set	32.00					
1.4	Erection of Outdoor termination kits Heat Shrinkable type suitable for 11kV, 3Core, 400sqmm, aluminium UG cable kits for 3core (set)	Set	42.00					
1.5	Erection, Testing & Commissioning , Installation, Laying, Commissioning, Testing of 11kV, 3core, 1Run, 400sqmm, aluminium, XLPE insulation armoured (extruded type) UG cable in HDD method with HDPE pipe (160mm dia, PN8 PE80) for laying of individual run of UG cable at main road and unaccessible place.	Mtr	1000.00					
1.6	Laying of 160mm dia PE 80-PN8, HDPE pipe inside open trench.	Mtr	8504.00					
2	Erection, Commissioning, Wiring and Testing of 11kV RMU							
2.1	Erection of 11kV RMU 3 Way, 2 Iso & 1 Brk 630A (LLV)	No's.	3.00					
2.2	Erection of 11kV RMU 4 Way, 2 Iso & 2 Brk 630A (LLVV)	No's.	2.00					
3	Earthing							
3.1	Earthing Conductor: 50X6 mm (2.4kg./mtr.) GI Flat for equipment, structure etc.)	KG	66.00					
3.2	Pipe Earthing 40mm. GI Pipe	Nos.	10					
4	Erection of Standard FRTU 4Way with FRTU networking Equipment consisting of Fibre Optic switch (Mono mode along with associate LIU unit for connection of FO Cable. for 3 Way & 4 way RMU.	Nos.	5					
4	Erection, Testing & Commissioning of GI PC '+6' EHT Tower for River crossing including all types of materials, as per technical specification and scope of work.							
1	GI PC '+6' Tower super structure G.I (Main + Extention +Stub + Template), as per technical specification and scope of work.							
i)	PC Tower	MT	12.43					

ii)	'+6' Mtr. Extention	MT	4.68					
iii)	Template	MT	3.81					
2	GI Nut , Bolt & Washer of different sizes, as per technical specification and scope of work.							
i)	PC Tower	MT	3.31					
ii)	'+6' Mtr. Extention	MT	1.18					
3	Erection, Testing & Commissioning of Conductor and Accessories, as per technical specification and scope of work.							
i	232 mm2 AAAC, as per technical specification and scope of work.	Km	0.46					
ii	Earth wire 7/1.5 G.I, as per technical specification and scope of work.	Km	0.15					
iii	Double tension Hardware Fittings suitable for Conductor size.	Set	24					
iv	Disc insulator (B&S) 120 KN polymer type.	No's.	48					
v	Tension fittings suitable for Earth wire.	Set	4					
vi.	Vibration damper suitable for earth wire	No's.	4					
vii.	Vibration damper suitable for conductor size.	No's.	24					
viii	Copper flexible bond	No's.	2					
ix	Phase Plate (R,Y,B)	Set	12					
x	GI Tower Number Plate	No's.	4					
xi	Circuit Plate	No's.	4					
xii	Earthing Device & Associated Accessories (Heavy duty GI Perforated Pipe of ID=40mm & OD=50mm with 3000mm long for treated Earth Pit), as per technical specification and scope of work.	No's.	4					
xiii	Earthing Conductor: 50X6 mm (2.4Kg./Mtr.) GI Flat for Raiser from the burial earth mat to equipment, structure etc), as per technical specification and scope of work.	KG	200.00					
xiv	GI Danger Board	No's.	4					
xv	Bird Guard	No's.	24					

xvi	Anticlimbing Device (G.I)	KG	211.20					
xvii	Loop Connector	No's.	37					
5	Civil Works Including Supply of All Materials Like Cement, MS tor Rod, Brick, Coarse & Fine Agregrates & Labour, T&P etc.; for Construction of 33kV Line.							
1	Civil Works for Construction of 33kV OH Line, as per technical specification and scope of work.							
1.1	Detail Survey of 11kV lines profile plotting, pole spotting and preparation of pole schedule, as per technical specification and scope of work.	Km	235					
1.2	Excavation of Earth for 11 Mtr. long poles pit. (1000mm X 500mm X 1875mm) = 0.94 Cu.mtr.), as per technical specification and scope of work.	Cum	4241					
1.3	Concreting of poles in ratio 1:1.5:3 (500mmX500mmX1800mm) = 0.45 Cu.mtr, as per technical specification and scope of work.	Cum	2030					
1.4	Couping of poles in ratio 1:1.5:3 with dimension (500X500X450)=0.1125 Cu mtr, as per technical specification and scope of work.	Cum	508					
1.5	Fixing of stay set with 0.5Cum cement concrete foundation PCC 1:3:6 size (900mmx600mmx900mm) using 40mm BHG metal with all labor and material, including excavation and required backfilling, as per technical specification and scope of work.	No's.	1226					
1.6	Dismantling of Poles with Accessories and h&w and return to store	No's.	126					
1.7	Dismantling of Line Conductor with all accessorise and return to store	Km	97					
2	Civil Works for Construction of 33kV Line on UG Cable, as per technical specification and scope of work.							
2.1	Earth work excavation of soil (1mtr. width X 1.2 mtr. depth)	Cum	3010					
2.2	Earth work excavation of hard rock (1mtr. width X 1.2 mtr. depth)	Cum	1290					
2.3	Back filling with excavated soil outside and above the trench	Cum	4300					
2.4	Damage of asphalt/tar road and other utilities and reconstructing to bring to its original shape after laying of cable in open trench (1mtr. width)	Mtr	2060					
3	Civil Works for 33kV RMU, as per technical specification and scope of work.							
3.1	Prefabricated RCC foundation of 33kV RMU	No's.	5					
3.2	Erection of Galvanised Fencing around each RMU with height 2 mtr for external protection including supply of the same	Sq. mtr.	40					
4	Making of earth chamber with brick masonry (1:5) , PCC (1:4:8) and with 50mm thick RCC Slab (with 8mm rod) cover for earth pit of size 450mmX450mm X600 mm depth as per direction of Engg in Charge.	No's.	10					

5	Supply and erection of GI Pipe of dia. 150mm, Class-B (8Mtr.)	Mtr	336					
6	Supply and Erection of Cable Route Marker along the cable route at an interval of 30mtrs with civil works	No's.	162					
7	Civil Work for PC '+6' EHT Tower, as per technical specification and scope of work.							
7.1	Detail Survey of lines profile plotting, spotting and marking, as per technical specification and scope of work.	No's.	2					
7.2	Excavation with back filling in all types of soil for PC + 6 Tower , including de- watering, Shoring & Shuttering	Cum	440					
7.3	PCC (1:3:6) for PC + 6 Tower with cement, including de- watering, Shoring & Shuttering including supply of Materials	Cum	0					
7.4	PCC (1:3:6) for Tower Foundation as blind layer (1Cum for 1tower) including supply of Materials	Cum	2					
7.5	PCC (1:2:4) for Tower Foundation as blind layer (1Cum for 1tower) Per Tower= 1Cum including supply of Materials	Cum	2					
7.6	RCC (1:1.5:3) for PC + 6 Tower with cement & with tor rod including setting of stub by providing required templets with proper alignment including de-watering. including supply of Materials	Cum	88					
TOTAL OF ERECTION & CIVIL WORKS COMPONENT OF THE WORKS CONTRACT FOR 11kV LINE								

ANNEXURE-I

SCOPE- IV :

- (A) SUPPLY PART:**
- (B) ERECTION PART**

Up-gradation and Replacement of DTRs with accessories, as per technical specification and scope of work.

BROAD REQUIREMENT FOR INFORMATION			33 (Sum from 1 to 32)
1	Up-gradation and Replacement of DTRs	No's	633

Tata Power Central Odisha Distribution Limited (TPCODL)										
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations,										
Supply of Materials Required for Construction of New/ Aug. of DTRs										
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24,										
Date:05.04.2023										
SL. No.	DESCRIPTION OF ITEMS									
	SUPPLY OF FOLLOWING EQUIPMENTS/ MATERIALS (As per technical specification and scope of work.)			Circle	Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA- STATE)	OGST @ 9% PER UNIT (INTRA- STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY (Rs.)
BROAD REQUIREMENT FOR INFORMATION					33 (Sum from 1 to 32)	34	35=(34*9%)	36=(34*9%)	37={34+35+36}	38={37x33}
1	Up-gradation and Replacement of DTRs			No's	633					
DETAIL REQUIREMENT (To be quoted)										
1	Supply of Material required for Construction of DTR with accessories, as per technical specification and scope of work.			Type						
Sl. No.	Description of Materials			Unit						
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)			No's	594					
2	Top Channel GI 100 X 50 X 6 MM (3000 mm long) (9.56Kg./Mtr, 2 No's.) (Each 2x3.000x9.56= 57.36 Kg)			Kg	17036					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)			KG	1178					
4	AB Switch Mounting Channel 75x40x4.8 mm GI Channel (3000 mm long)(7.14Kg./Mtr., 2 No's.) (Each 2x3.000x7.14= 42.84 Kg)			Kg	12723					
5	AB Switch Side Support Channel 100X50X6mm,9.56 KG/Mtr., each channel length 0.35 mtr., 2 no's channel required =(9.56x2x0.35)			Kg	1988					
6	Channel Support for down Pipe 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(7.14x0.8x1)			Kg	1696					
7	HG/ DO Fuse Mounting Channel 75x40x4.8 mm GI Channel (3000 mm long)(7.14Kg./Mtr., 2 No's.) (Each 2x3.000x7.14= 42.84 Kg)			Kg	12723					
8	Cantilever Support Channel 75x40x4.8 mm GI Channel (810 mm long,2 No's.) (7.14Kg./Mtr., 2 No's.) (Each 2x0.810x7.14= 11.57 Kg)			Kg	3435					
9	Cantilever Support Angle 50 X 50 X 6MM GI (1282 mm long)(4.5Kg./Mtr, 2 No's.) (Each 2x1.282x4.5= 11.54 Kg)			Kg	3427					
10	Transformer Base GI Channel 100 X 50 X 6 MM (3000 mm long) (9.56Kg./Mtr, 2 No's.) (Each 2x3.000x9.56= 57.36 Kg)			Kg	25869					
11	Transformer Base Support GI Channel 100 X 50 X 6 MM (315 mm long) (9.56Kg./Mtr, 2 No's.) (Each 2x0.515x9.56= 9.85 Kg)			Kg	4441					
12	Transformer Belting Angle 50 X 50 X 6MM GI (3000 mm long)(4.5Kg./Mtr, 2 No's) (Each 2x3.0x4.5 Kg)			Kg	12177					
13	Transformer Belting Support Angle 50 X 50 X 6MM GI (380 mm long)(4.5Kg./Mtr, 2 No's) (Each 2x0.580x4.5= Kg)			Kg	2354					
14	LTDB Mounting Angle 50 X 50 X 6MM GI (1000 mm long)(4.5Kg./Mtr, 2 No's) (Each 2x1x4.5 Kg)			Kg	4059					

15	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5x7 mtr. For mesh formation, 12 Mtr. For LA and 2.5 mtr. For raising, 11 mtr for AB switch, 2.8 mtr for HG Fuse, 5x2 mtr. for DTR Neutral, (1.3+4.5) mtr. For DTR Body, 0.500 mtr for LTDB & AB Switch operating handle, 3 mtr. for Fencing) (Each 65.6x 2.36= 154.81 Kg)	KG	97999				
16	63 KVA , 11/ 0.4 KV (AL) Transformer BIS Energy level II	No's	158				
17	100 KVA , 11/ 0.4 KV (AL) Transformer BIS Energy level II	No's	21				
18	250 KVA , 11/ 0.4 KV (Cu) Transformer with Tap Changer BIS Energy level II	No's	117				
19	500 KVA , 11/ 0.4 KV (Cu) Transformer with Tap Changer BIS Energy level II	No's	34				
20	LT Distribution Box with MCCB, Aluminium Busbar of single Bay with kit kat fuse for 63 KVA S/S	No's	297				
21	LT Distribution Box with MCCB, Aluminium Busbar of single Bay with kit kat fuse for 100 KVA S/S	No's	154				
22	LT Distribution Box with MCCB, Aluminium Busbar for 3 Bay with kit kat fuse for 250 KVA S/S	No's	148				
23	LT Distribution Box with MCCB, Aluminium Busbar for 3 Bay with kit kat fuse for 500 KVA S/S	No's	34				
24	55mm ² All Alloy Aluminum Conductor (AAAC) - PVC Insulated (50 Mtr. Each Dtr.)	Mtr.	53850				
25	4 Cx 95 mm ² LT XLPE Cable(Armoured) - FOR 63 KVA Trf.	Mtr.	4455				
26	4 Cx 150 mm ² LT XLPE Cable(Armoured) - FOR 100 KVA Trf.	Mtr.	2310				
27	1 Cx 400 mm ² LT XLPE Cable(Un-Armoured)	Mtr.	23880				
28	AB Switch(11KV,200A,3pole,50Hz)	Set	297				
29	H.G.Fuse(11KV.200A.3Pole)	Set	297				
30	PG Clamp for 55 sq.mm AAA conductor	No's	1782				
31	Disc insulator (B&S)70 KN polymer	No's	891				
32	H W fitting (B&S)70KN(3bolted)	Set	891				
33	Lightning Arrester(12KV,10KA) Station Class 2	No's	1899				
34	11KV pin insulator polymer	No's	891				
35	HT stay set complete	Set	594				
36	HT stay Clamp (1.9Kg/pair)	Pair	594				
37	HT stay insulator TYPE-C	No's	594				
38	7/10 SWG GI stay wire, Grade -2 (15Kg./ Set)	Kg	8910				
39	40 mm Nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No's	4431				
40	GI Nuts & Bolts of Assorted size (25 Kg/ DSS DP)	Kg	5420				
41	GI Barbed wire/Anticlimbing device (3Kg /Pole)	Kg	1782				
42	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	715				
43	Danger plate 11kv	No's	594				
44	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	179				
45	Name plate	No's	297				
46	Yellow Colour Paint for Background (Structure Numbering and Marking)	Ltr	594				
47	Black Colour Paint for numbering (Structure Numbering and Marking)	Ltr	297				
TOTAL OF SUPPLY COMPONENT OF THE WORKS CONTRACT FOR DTR							

Tata Power Central Odisha Distribution Limited (TPCODL)									
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations, 33kV,									
Erection, Civil & Services of Equipment/Materials Required for Construction of									
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24,									
SL. No.	DESCRIPTION OF ITEMS		Circle	Total Quantity					
	ERECTION, TESTING & COMMISSIONING INCLUDING CIVIL WORKS OF FOLLOWING EQUIPMENTS (As per technical specification and scope of work.)		DTR Rating		BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY (RS.)
BROAD REQUIREMENT FOR INFORMATION				33 (Sum from 1 to 32)	34	35=(34*9%)	36=(34*9%)	37={34+35+36}	38={37x33}
1	Up-gradation and Replacement of DTRs		No's	633					
DETAIL REQUIREMENT (To be quoted)									
1	Erection, Testing & Commissioning of Material required for Construction of DTR with accessories, as per technical specification and scope of work.		Type						
Sl. No.	Description of Materials		Unit						
1	WPB 160x152 (11Mtr. Long, 30.44KG/Mtr.)		No's	594					
2	Top Channel GI 100 X 50 X 6 MM (3000 mm long) (9.56Kg./Mtr, 2 No's.) (Each 2x3.000x9.56= 57.36 Kg)		Kg	17036					
3	Fish Plate 50x6 mm., 2.36 kg/Mtr., each 0.280 mtr. length, 6 no's required = (6x2.36x0.280)		KG	1178					
4	AB Switch Mounting Channel 75x40x4.8 mm GI Channel (3000 mm long)(7.14Kg./Mtr., 2 No's.) (Each 2x3.000x7.14= 42.84 Kg)		Kg	12723					
5	AB Switch Side Support Channel 100X50X6mm,9.56 KG/Mtr., each channel length 0.35 mtr., 2 no's channel required =(9.56x2x0.35)		Kg	1988					
6	Channel Support for down Pipe 75X40X 4.8mm., 7.14KG/Mtr., each channel length 0.8 Mtr., 1 no's channel required =(7.14x0.8x1)		Kg	1696					
7	HG/ DO Fuse Mounting Channel 75x40x4.8 mm GI Channel (3000 mm long)(7.14Kg./Mtr., 2 No's.) (Each 2x3.000x7.14= 42.84 Kg)		Kg	12723					
8	Cantilever Support Channel 75x40x4.8 mm GI Channel (810 mm long,2 No's.) (7.14Kg./Mtr., 2 No's.) (Each 2x0.810x7.14= 11.57 Kg)		Kg	3435					
9	Cantilever Support Angle 50 X 50 X 6MM GI (1282 mm long) (4.5Kg./Mtr, 2 No's.) (Each 2x1.282x4.5= 11.54Kg)		Kg	3427					
10	Transformer Base GI Channel 100 X 50 X 6 MM (3000 mm long) (9.56Kg./Mtr, 2 No's.) (Each 2x3.000x9.56= 57.36 Kg)		Kg	25869					
11	Transformer Base Support GI Channel 100 X 50 X 6 MM (515 mm long) (9.56Kg./Mtr, 2 No's) (Each 2x0.515x9.56= 9.85Kg)		Kg	4441					

12	Transformer Belting Angle 50 X 50 X 6MM GI (3000 mm long)(4.5Kg./Mtr, 2 No's) (Each 2x3.0x4.5 Kg)	Kg	12177				
13	Transformer Belting Support Angle 50 X 50 X 6MM GI (580 mm long)(4.5Kg./Mtr,2 No's) (Each 2x0.580x4.5= Kg)	Kg	2354				
14	LTDB Mounting Angle 50 X 50 X 6MM GI (1000 mm long)(4.5Kg./Mtr, 2 No's) (Each 2x1x4.5 Kg)	Kg	4059				
15	50x6mm GI Flat for earthing, 2.36kg/mtr., (2.5x7 mtr. For mesh formation, 12 Mtr. For LA and 2.5 mtr. For raising, 11 mtr for AB switch, 2.8 mtr for HG Fuse, 5x2 mtr. for DTR Nutral, (1.3+4.5) mtr. For DTR Body, 0.500 mtr for LTDB & AB Switch operating handle, 3 mtr. for Fencing) (Each 65.6x 2.36= 154.81 Kg)	KG	97999				
16	63 KVA , 11/ 0.4 KV (AL) Transformer BIS Energy level II	No's	297				
17	100 KVA , 11/ 0.4 KV (AL) Transformer BIS Energy level II	No's	154				
18	250 KVA , 11/ 0.4 KV (Cu) Transformer with Tap Changer BIS Energy level II	No's	148				
19	500 KVA , 11/ 0.4 KV (Cu) Transformer with Tap Changer BIS Energy level II	No's	34				
20	LT Distribution Box with MCCB, Aluminium Busbar of single Bay with kit kat fuse for 63 KVA c/c	No's	297				
21	LT Distribution Box with MCCB, Aluminium Busbar of single Bay with kit kat fuse for 100 KVA c/c	No's	154				
22	LT Distribution Box with MCCB, Aluminium Busbar for 3 Bay with kit kat fuse for 250 KV,	No's	148				
23	LT Distribution Box with MCCB, Aluminium Busbar for 3 Bay with kit kat fuse for 500 KVA c/c	No's	34				
24	55mm2 All Alloy Aluminum Conductor (AAAC) - PVC Insulated (50 Mtr. Each Dtr.)	Mtr.	53850				
25	4 Cx 95 mm2 LT XLPE Cable(Armoured) - FOR 63 KVA Trf.	Mtr.	4455				
26	4 Cx 150 mm2 LT XLPE Cable(Armoured) - FOR 100 KVA Trf.	Mtr.	2310				
27	1 Cx 400 mm2 LT XLPE Cable(Un-Armoured)	Mtr.	23880				
28	AB Switch(11KV,200A,3pole,50Hz)	Set	297				
29	H.G.Fuse(11KV.200A.3Pole)	Set	297				
30	PG Clamp for 55 sq.mm AAA conductor	No's	1782				
31	Disc insulator (B&S)70 KN polymer	No's	891				
32	H W fitting (B&S)70KN(3bolted)	Set	891				
33	Lightning Arrester(12KV,10KA) Station Class 2	No's	1899				
34	11KV pin insulator polymer	No's	891				
35	HT stay set complete	Set	594				
36	HT stay Clamp (1.9Kg/pair)	Pair	594				
37	HT stay insulator TYPE-C	No's	594				
38	7/10 SWG GI stay wire, Grade -2 (15Kg./ Set)	Kg	8910				
39	40 mm Nominal bore GI pipe (medium gauge) earthing device with 3 mtr .Long	No's	4431				
40	GI Nuts & Bolts of Assorted size (25 Kg/ DSS DP)	Kg	5420				
41	GI Barbed wire/Anticlimbing device (3Kg /Pole)	Kg	1782				
42	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 8 no's = (8x0.59x0.510)	KG	715				
43	Danger plate 11kv	No's	594				
44	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 2 no's = (2x0.59x0.510)	KG	179				
45	Name plate	No's	297				
46	Yellow Colour Paint for Background (Structure Numbering and Marking)	Ltr	594				
47	Black Colour Paint for numbering (Structure Numbering and Marking)	Ltr	297				

2	Civil Works Including Supply of All Materials Like Cement, MS for Rod, Brick, Coarse & Fine Aggregates & Labour, T&P etc.; for Construction of DTR							
1	Fixing of complete 11KV line Complete stay set includes 1) Turn Buckle Assembly 2) Stay Rod & Stay plate 3) Stay Insulator 4) Stay Wire. 5) Stay clamps with Nuts & bolts BA will do the excavation including excavation, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm) using 20mm BHG metal with all labour and material as per TPCODL Drawing & Standard	No.	594					
2	Excavation of Earth for 11 Mtr. long poles pit. (1000mm X 500mm X 1875mm) = 0.94 Cu.mtr.), as per technical specification and scope of work.	Cum	558					
3	Concreting ratio 1:1.5:3 (500mmX500mmX1800mm) = 0.450Cu.mtr	Cu.mtr	267					
4	Couping ratio 1:1.5:3 (500mmX500mmX450mm) = 0.113Cu.mtr	Cu.mtr	67					
5	Construction Earthing chamber including installation of earthing pipe.Making earthing chamber including excavation , soil treatment with bentonide powder , calculation of earth resistance, including Installation of 3Mtr GI Pipe 40mm/50mm including welding of GI flat around pipe . BA has to supply of charcoal.etc with brick masanory (1:5), PCC (1:4:8) d with cast iron cover. size of the pit 450mmx450mmx600mm depth as per direction of engineer in charge. Supply of GI Pipe 40mm dia 3Mtr long is in scope of TPCODL.The installation will be done as per TPCODL drawing	No.	4431					
6	Civil cost for making TRF plinth from 250KVA DTR and necessary civil material, manpower, machinery for construction of plinth as per TPCODL Drawing,,	EA	148					
7	Civil cost for making TRF plinth from 500KVA DTR and necessary civil material, manpower, machinery for construction of plinth as per TPCODL Drawing,,	EA	34					
8	Supply all civil Material, excavation , removal of Malba ,refilling, including Manpower, machinery etc as per TPCODL Drawing for Plinth for L.T. Distribution box 6ft high (below GL2ft) x5ftx5ft	EA	182					
9	Dismantling of existing DTR with all accessories (including removal of HT/LT leads, earth connections and unloading by crane if required. Scope of work also includes loading, transportation, unloading and staking at a proper place in safe position/site store)							
9.1	Dismantling of existing 11/0.4kV, Single Three Phase Distribution Transformer upto 25KVA	EA	297					
9.2	Dismantling of existing 11/0.4kV, Three Phase Distribution Transformer 63KVA	EA	154					
9.3	Dismantling of existing 11/0.4kV, Three Phase Distribution Transformer 100KVA	EA	148					
9.4	Dismantling of existing 11/0.4kV, Three Phase Distribution Transformer 250KVA	EA	34					
10	Dismantling / Removal of Channel,Angle,AB switch,HG Fuse,Insulator,LA,earthing material from existing DTR Pole Structure including loading, transportation, unloading and staking of dismantled material at a proper place in safe position at Site store	EA	297					
TOTAL OF ERECTION & CIVIL WORKS COMPONENT OF THE WORKS CONTRACT								

ANNEXURE-I

SCOPE- V :

- (A) SUPPLY PART:**
- (B) ERECTION PART**

LT Line with 9mtr long PSC Pole with accessories, as per technical specification and scope of work.

BROAD REQUIREMENT FOR INFORMATION		UNIT	12 (Sum from1 to 11)
1	LT Line with 9mtr long PSC Pole	Km	690.00

Tata Power Central Odisha Distribution Limited (TPCODL)										
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations, 33kV, 11kV,										
Supply of Materials Required for Construction of LT Line										
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/100000364/2023-24,										
SL. No.	DESCRIPTION OF ITEMS									
	SUPPLY OF FOLLOWING EQUIPMENTS/ MATERIALS (As per technical specification and scope of work.)			Circle	Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY (RS.)
BROAD REQUIREMENT FOR INFORMATION					12 (Sum from 1 to 11)	13	14=(13*9%)	15=(13*9%)	16={13+14+15}	17={12x16}
1	LT Line with 9mtr long PSC Pole			Km	690.00					
DETAIL REQUIREMENT (To be quoted)										
1	Supply of Material required for Construction of LT Line using 35sqmm, 70sqmm and 95sqmm LT AB Cable on 9 Mtr. long PSC Pole, as per technical specification and scope of work.			Size of AB Cable						
Sl. No.	Description of Materials			Unit						
1	9 Mtr. long 300 Kg. PSC Pole			No's	20700					
2	LT Stay set Complete			Set	6210					
3	7/12 SWG GI stay wire, Grade -2			Kg	74520					
4	LT stay Clamp (1.40Kg/pair)			Pair	6210					
5	LT Stay insulator			No's	6210					
6	LT Accessories with Eye hook and Clamp									
6.i.	Pole clamp for EYE hook for (XLPE Aerial bunched Cable)			Pair	26910					
6.ii.	EYE hook for XLPE Aerial bunched Cable (25-70 sq.mm)			No's	11538					
6.iii.	Dead End Clamp suitable for messenger XLPE Aerial bunched Cable (25-70 sq.mm)			No's	11538					
6.iv.	Suspension Clamp with EYE hook for ABC (25-70 sq.mm)			Pair	13461					
7	4C×35 mm ² (P)+1C×35 mm ² (M)+1CX16 mm ² (Street Light) (LT AB Cable)			K.M	424					
8	4C×70 mm ² (P)+1C×70 mm ² (M)+1CX16 mm ² (Street Light)			K.M	248					
9	4C×95 mm ² (P)+1C×95 mm ² (M)+1CX16 mm ² (Street Light) (LT AB Cable)			K.M	53					
10	4 WAY SERVICE Distb. Box with kit kat fuse and Aluminium bus bar.			No's	2400					
11	8 WAY SERVICE Distb.Box with kit kat fuse and Aluminium bus bar.			No's	544					
12	Insulated piercing connector.Type-A-main 50 to 150 sq.mm & Tap-50 to 150 sq.mm			No's	5720					
13	Insulated piercing connector.Type-B-main 25 to 150 sq.mm & Tap-6 to 35 sq.mm			No's	8488					
14	Insulated piercing connector.Type-C-main 16 to 95 sq.mm & Tap-1.5 to 16 sq.mm			No's	3000					
15	Insulated piercing connector.Type-D-main 10 to 50 sq.mm & Tap-1.5 to 10 sq.mm			No's	750					
16	Pipe Earthing (each 5th pole to earth)			No's	4140					
17	Coil Earthing			No's	16560					
18	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing			Kg	5423					
19	Danger plate (LT)			No's	20700					
20	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)			KG	6229					

21	GI barbed wire anticlimbing device 3 Kg. Per support	Kg	62100					
22	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	24915					
23	GI Nut , Bolt & Washer of different sizes (0.5 Kg/ Pole)	Kg	10350					
24	Black Paint	Ltr	20700					
25	Yellow Colour Paint for Background	Ltr	41400					
TOTAL OF SUPPLY COMPONENT OF THE WORKS CONTRACT FOR LT LINE								

Tata Power Central Odisha Distribution Limited (TPCODL)								
Engineering, Supply, Erection and Commissioning of 33/11 kV Sub-Stations,								
Erection, Civil & Services of Equipment/Materials Required for Construction of								
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24,								
SL. No.	DESCRIPTION OF ITEMS							
	ERECTION, TESTING & COMMISSIONING INCLUDING CIVIL WORKS OF FOLLOWING EQUIPMENTS (As per technical specification and scope of work.)	Circle	Total Quantity	BASIC PRICE PER UNIT (Taxable Value) In Rs	CGST @ 9% PER UNIT (INTRA-STATE)	OGST @ 9% PER UNIT (INTRA-STATE)	TOTAL PRICE PER UNIT (In Rs)	TOTAL PRICE FOR THE TENDER QUANTITY (RS.)
BROAD REQUIREMENT FOR INFORMATION			12 (Sum from 1 to 11)	13	14=(13*9%)	15=(13*9%)	16={13+14+15 }	17={12x16}
1	LT Line with 9mtr long PSC Pole	Km	690.00					
DETAIL REQUIREMENT (To be quoted)								
1	Erection, Testing & Commissioning of Material required for Construction of LT Line using 35sqmm & 70sqmm LT AB Cable on 9 Mtr. long PSC Pole, as per technical specification and scope of work.	Size of AB Cable						
Sl. No.	Description of Materials	Unit						
1	9 Mtr. long 300 Kg. PSC Pole	No's	20700					
2	LT Stay set Complete	Set	6210					
3	7/12 SWG GI stay wire, Grade -2	Kg	74520					
4	LT stay Clamp (1.40Kg/pair)	Pair	6210					
5	LT Stay insulator	No's	6210					
6	LT Accessories with Eye hook and Clamp							
6.i.	Pole clamp for EYE hook for (XLPE Aerial bunched Cable)	Pair	26910					
6.ii.	EYE hook for XLPE Aerial bunched Cable (25-70 sq.mm)	No's	11538					
6.iii.	Dead End Clamp suitable for messenger XLPE Aerial bunched Cable (25-70 sq.mm)	No's	11538					
6.iv.	Suspension Clamp with EYE hook for ABC (25-70 sq.mm)	Pair	13461					
7	4C×35 mm ² (P)+1C×35 mm ² (M)+1CX16 mm ² (Street Light) (LT AB Cable)	K.M	424					
8	4C×70 mm ² (P)+1C×70 mm ² (M)+1CX16 mm ² (Street Light)	K.M	248					
9	4C×95 mm ² (P)+1C×95 mm ² (M)+1CX16 mm ² (Street Light) (LT AB Cable)	K.M	53					
10	4 WAY SERVICE Distb. Box with kit kat fuse and Aluminium bus bar.	No's	2400					
11	8 WAY SERVICE Distb.Box with kit kat fuse and Aluminium bus bar.	No's	544					

12	Insulated piercing connector.Type-A-main 50 to 150 sq.mm & Tap-50 to 150 sq.mm	No's	5720					
13	Insulated piercing connector.Type-B-main 25 to 150 sq.mm & Tap-6 to 35 sq.mm	No's	8488					
14	Insulated piercing connector.Type-C-main 16 to 95 sq.mm & Tap-1.5 to 16 sq.mm	No's	3000					
15	Insulated piercing connector.Type-D-main 10 to 50 sq.mm & Tap-1.5 to 10 sq.mm	No's	750					
16	Pipe Earthing (each 5th pole to earth)	No's	4140					
17	Coil Earthing	No's	16560					
18	No-8 GI wire (Dia 4.6mm) 0.131 KG/ Mtr.- 2 Mtr. For connecting pole with Coil earthing	Kg	5423					
19	Danger plate (LT)	No's	20700					
20	Back Clamp for danger Plate 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 1 no's = (1x0.59x0.510)	KG	6229					
21	GI barbed wire anticlimbing device 3 Kg. Per support	Kg	62100					
22	Back Clamp for anticlimbing device 25X3 mm. flat, 0.59Kg/Mtr. Flat of 0.510mtr length 4 no's = (4x0.59x0.510)	KG	24915					
23	GI Nut , Bolt & Washer of different sizes (0.5 Kg/ Pole)	Kg	10350					
24	Black Paint	Ltr	20700					
25	Yellow Colour Paint for Background	Ltr	41400					
2	Civil Works Including Supply of All Materials Like Cement, MS tor Rod, Brick, Coarse & Fine Agregrates & Labour, T&P etc.; for Construction of LT Line							
1	Fixing of LT Complete stay set includes 1) Turn Buckle Assembly 2) Stay Rod & Stay plate 3) Stay Insulator 4) Stay Wire. 5)Stay clamps with Nuts & bolts, including excvaton, supply of 0.5Cum cement concrete foundation 1:2:4 size (500mmx500mmx800mm) using 20mm BHG metal with all labour and material (Excavation of earth will be done of size 500X500X1500 mm.)	No.	6210					
2	Excavation of Earth for 9 Mtr. long poles pit. (1000mm X 500mm X 1500mm) = 0.75 Cu.mtr.), as per technical specification and scope of work.	Cum	15525					
3	Concreting ratio 1:1.5:3 (500mmX500mmX1500mm) = 0.375Cu.mtr	Cum	7763					
4	Construction Earthing chamber including installation of earthing pipe.Making earthing chamber including excavation , soil treatment with bentonide powder , calculation of earth resistance, including Installation of 3Mtr GI Pipe 40mm/50mm including welding of GI flat around pipe .	No.	4140					
TOTAL OF ERECTION & CIVIL WORKS COMPONENT OF THE WORKS								

Tata Power Central Odisha Distribution Limited (TPCODL)				
Engineering, Supply, Erection and Commissioning of Bay at 33/11 kV Sub-Stations, 33kV, 11kV, LT Lines and DTR with associated 11kV Interlinking Lines Under CMPDP				
ABSTRACT OF PRICE SCHEDULES				
NOTICE INVITING TENDER- NIT NO- TPCODL/P&S/1000000364/2023-24, Date:05.04.2023				
Description		ALL PRICE IN INR		
SL NO.	NAME OF THE SCHEDULE	Supply part in Rs.	Erection part in Rs.	Total in Rs.
1	Source PSS 33kV Bay			
2	33kv Line			
3	11kV Line			
4	DTR			
5	LT ABC Line			
	Sub Total			

Importance Note for Price schedule:

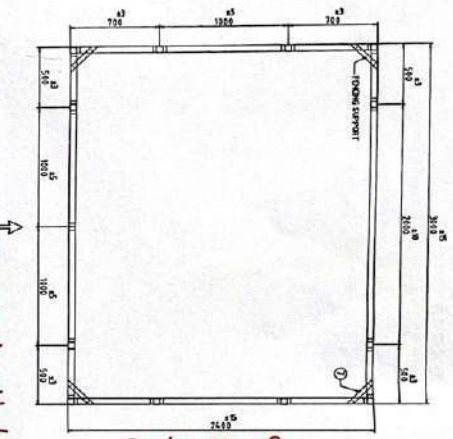
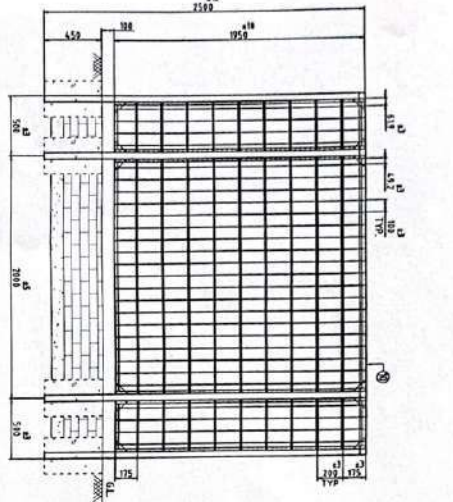
- Price shall be quoted considering item description and technical specification.
 - The bidders are advised to quote prices strictly in the PRICE format given in Price Annexures. Failing to do so, bids are liable for rejection.
 - Bidder should quote as per the "Item description" column. No cutting/ overwriting in the prices is permissible.
 - **Bidder have to quote against each items having Unit and Qty. No rate should be quoted where unit and Qty. are blank.**
- Mentioning “extra/inclusive” in any of the column may lead for rejection of the price bid.**
If any price is mentioned against the line items where unit & Qty. is blank, then the quoted price against the line item will be ignored during evaluation.
- **Unit price of the price bid quoted by the bidder in his bid shall be considered and other than unit price i.e. items description, unit, qty., etc. shall be considered as per the TPCODL tender price schedule.**
 - The bids will be evaluated commercially on the overall all-inclusive price of tender BOQ as Price Annexures..
 - All materials shall be supplied and erected by the BA on turnkey basis.
 - The unit price should be inclusive of freight, insurance and other levies (if any) and exclusive of GST. GST to be mentioned separately. Total price shall be inclusive of all.
 - The bidders advised to visit the site and understand scope of the work before price quotation.
 - **The Bidder should ensure that the unit prices for the same item furnished in price schedules are consistent with each other. In case of any inconsistency in the Unit prices furnished in the price proposal of the bidder, the TPCODL have right to consider the lowest unit price in evaluation.**
 - There shall be no price variation during the Contract Period / Extended Contract Period.

Note: Installation supervision to be provided for all fencing work/installation.

15	✓	Heat Distortion Temperature	125°C Min	Confirm
16	✓	Oxygen Index	23% Min	Confirm
17		Material type test certificate	* type test certificate should not be older than 5 years as on the date of tender opening	Confirm
18		Foundation drawing details	* Provided	Confirm
19		Name Plate	Name plate with P.O. no. & date to be provided on door	Confirm
20		Colour of Sections	Brilliant Blue (RAL 5007)	Confirm - Blue.
21		Sides Sections with 2.4 m length	Side of 2.4 m length should have three sections	Confirm
22		Grouting pipes	The grouting pipes load bearing should have stopper arrangement for fixing in the civil work	Confirm
23		Fluorescent tape permanent type	on all side of frame	Required.
Components of Fencing -				
1		FRP Picket	Flat 35 x 5 mm	Confirm
2		Box Section (Hollow Square Section)	50.8 x 50.8 x 3.175 mm	Confirm
3		Sub Frame Rec. Section	50.8 x 25.4 x 3.175 mm	Confirm
4		Rail - FRP Notch & Groove Bar	12 mm dia	Confirm
5		Hinges	SS304.	Confirm
6		Door Stopper	SS	Confirm
7		Name Plate	FRP	Confirm
8		TPCODL Logo	Painted on FRP surface	Confirm
9		Danger Board	MS plate of 250x200 mm	Confirm
10		Fasteners	SS304	Confirm

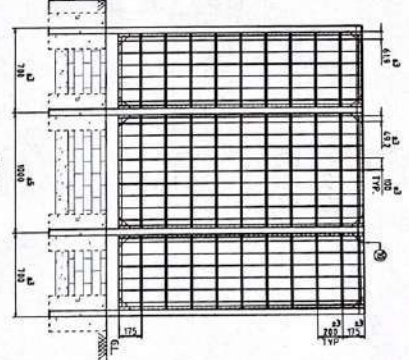
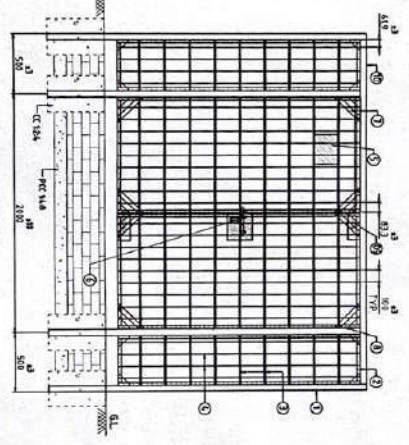
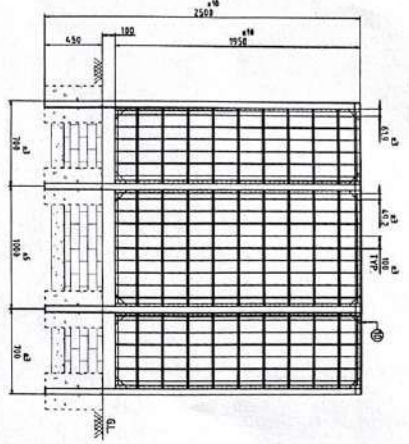
22/10/2020
 9 MEO
 S. S. Sam

One FRP Based fencing to be installed as prototype at TPCODL side, for after quality evaluation, further decision would be taken.



GATE No-1 (Double Lift)

GATE No-2 (Single Lift)



Note - Gate No-2 will be as per site location (Left, Right, Back side)

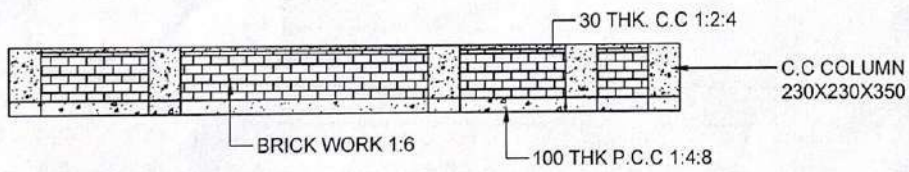
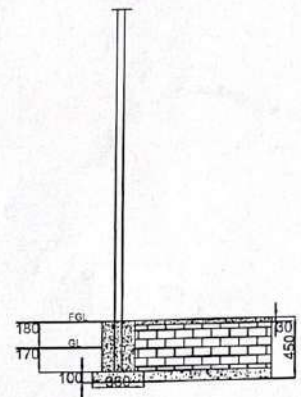
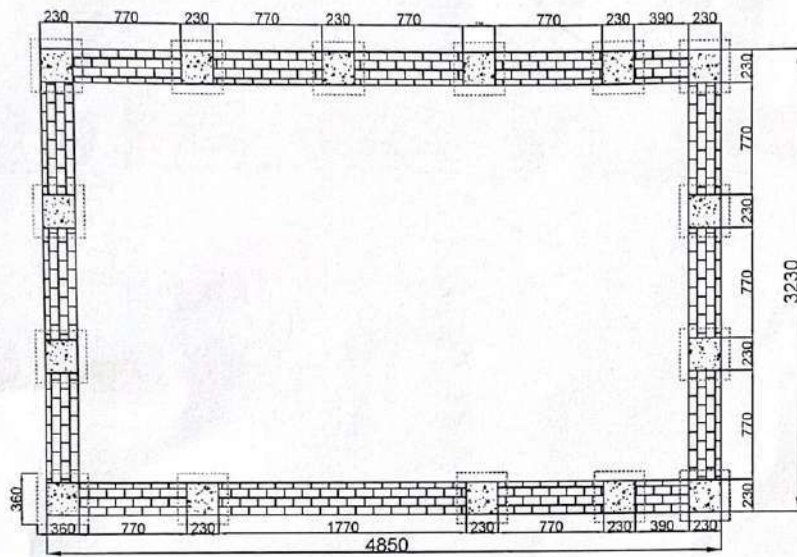
22/10/2020
S.S. Sahu
NER

PROJECT	DATE	SCALE	BY	CHECKED
3 UNIT 3 FLAT X 20M				
DESIGNER	DATE	SCALE	BY	CHECKED
APPROVED	DATE	SCALE	BY	CHECKED

EPP EPP COMPOSITES PVT. LTD.
 101/102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

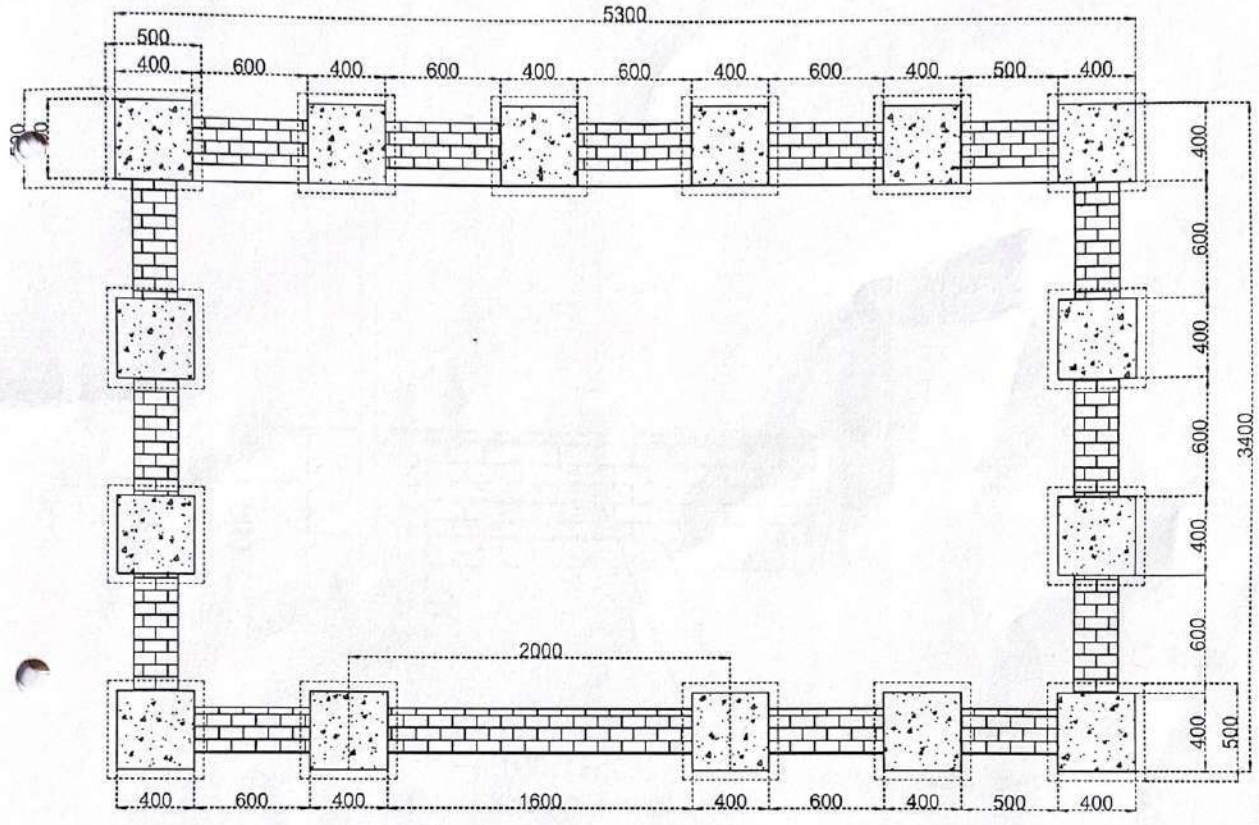
- COMPONENTS:-**
- 01) VERTICAL POST 50X50X3.0MM SQ. HOLLOW FRP PULTRUDED SECTION
 - 02) SUB FRAME 50X50X3.0MM SQ. HOLLOW FRP PULTRUDED SECTION
 - 03) PAL MADE OUT OF FRP NOTCH BARS & GROOVE BAR 910 Ø 20MM C/C
 - 04) FPOCKETS - FRP/SHC HOLLOW ROUND TUBE Ø 20MM C/C
 - 05) DANGER BOUNDARY PLATE 25X25X3.0MM THK.
 - 06) ALUMINUM - SS304 W/FRP FLAT LENS - 30MM LENGTH
 - 07) SUPPORTING SS304 W/FRP FLAT LENS - 30MM LENGTH
 - 08) HOLLOW SS304 W/FRP FLAT LENS - 10MM - 4 NOS.
 - 09) HOLLOW DOOR AND EXHAUSTIVE OR OUTWARD 90 DEGREE MOVEMENT OF THE GATE FLAPS
 - 10) SS304 STOPPER BAR OF 10MM AND 30MM LONG
 - 11) FRP PULTRUDED ANGLE 50X50X3MM
- TYPICAL SECTION FOR SUB FRAME WITH GRADE**
- 01) VERTICAL POST 12 NOS. WITH GROUTING 450 PH
 - 02) GATE 2 NOS. EACH 11MTR. WIDE
 - 03) SUB FRAME WITH FPOCKETS & BARS 17 NOS. OF 11MTR. LENGTH
 - 04) SS304 ALUMINUM 2 NOS. ON LEFT SPOKETS OF GATE
 - 05) SS304 SUPPORTING BRACING AT TOP & BOTTOM AREA OF FRAME
 - 06) 2 NOS. OF SUPPORTING BRACING AT TOP
 - 07) FRP ANGLE SECTION 10MM. SHOULD BE OPENABLE ACROSS GATE SPAN
 - 08) 18 NOS. SS304 HEX BOLT M12X14, WASHER & NUT
 - 09) 20 NOS. SS304 HEX BOLT M12X10, WASHER & NUT

FOR NORMAL SOIL



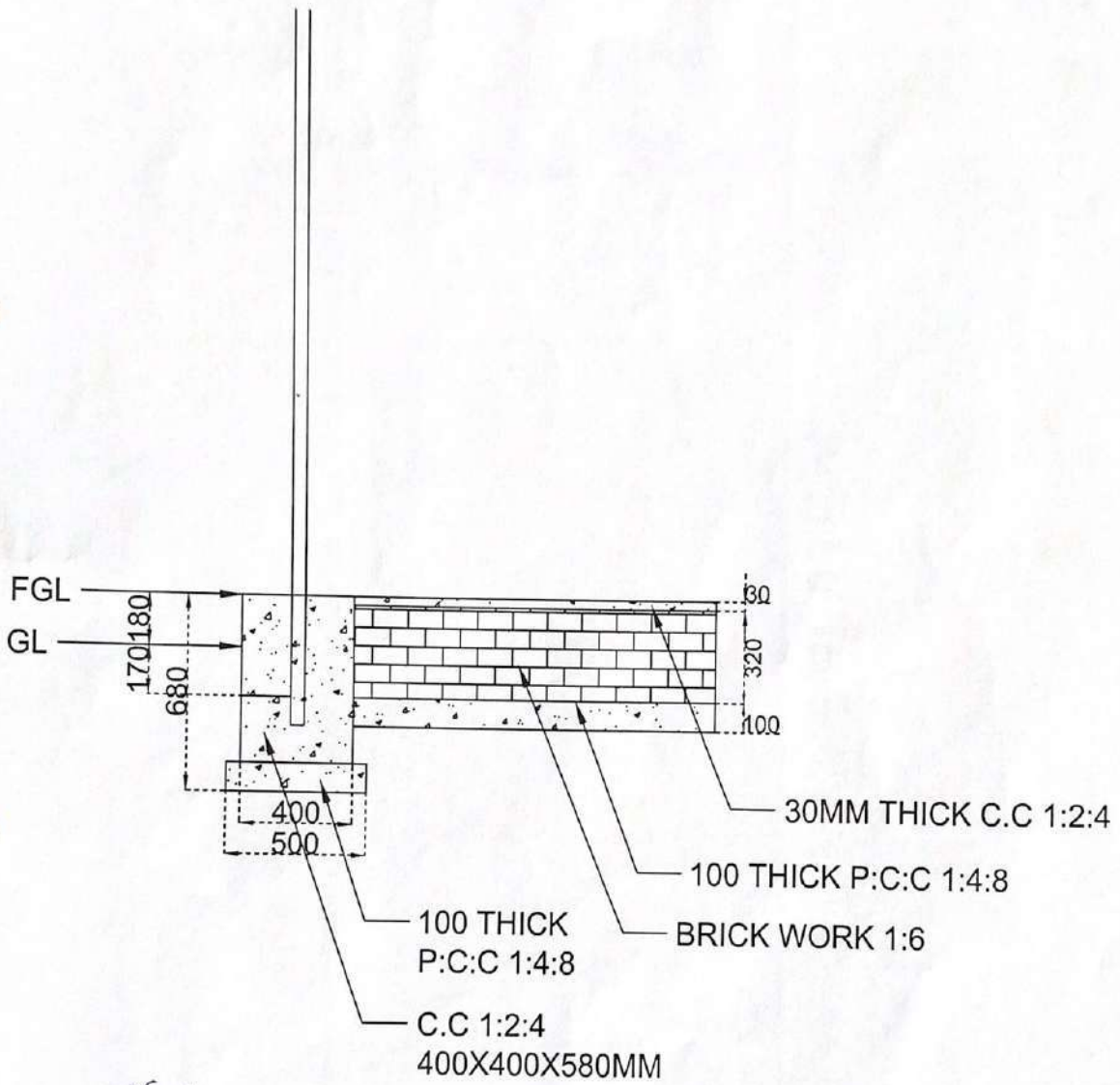
OK.
A.G. Pradhan
TPC/DL

FOR SANDY SOIL



OK.
[Signature]
G. B. Pradhan,
TPCODL

SECTION OF FOUNDATION PLAN
(SANDY SOIL)



OK.

[Signature]
G. B. Pradhan
TPCOOL

TPC/CODL/TP&S/54/2020-21/02

250


TPC/CODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

CUSTOMER NAME :-
~~CONTRACTOR NAME~~

LOI NO. :- TPCODL/P&S/54/2020-21/02

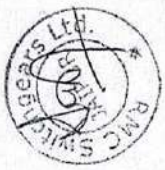
MANUFACTURER NAME :- RMC SWITCHGEARS LTD.

Property of T P COAL
(Restricted Area)



YOTI :- MONTH/YEAR

200



NAME PLATE

TOLERANCE: ± 0.25		PAGE NO. 05		TOTAL PAGE NO. 07	
PO. NO. : LOA NO. TPCODL/P&S/54/2020-21/02		UTILITY BOARD : TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.		SIGN & DATE	
TITLE : FRP FENCING FOR DISTRIBUTION SUBSTATION		PROJECT DETAILS : SUPPLY & INSTALLATION OF FRP FENCING		MATERIAL FRP	
DATE	SIGN.	REV. NO.	DATE	SCALE	N.T.S.
03.10.20	L.S.				
DND. BY.					
APPR. BY.					
MODEL: FRP FENCING		DRG. No.: RMC/FRP/FENCING/736-5		LAST INSTRUCTION	
CUSTOMER : TATA POWER		ITEM CODE:		RMC SWITCHGEARS LTD.	
SIZE: A4		MODIFICATION: NEW		Regd. Off. : Gram - Berozoya, Taluk - Choudas, Dist - Bhubaneswar, Odisha. Tata Road - Bhubaneswar - 751029	

YOTI 7 YEAR OF INSTALLATION

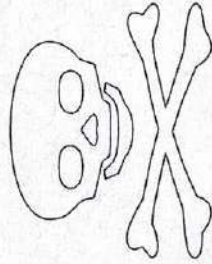
250

200

DANGER

415

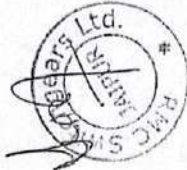
415



VOLTS

बोल्ट

खतरा



DANGER BOARD

△	PO. NO. : LOA NO. TPOODL/P&S/5+/2020-21/02	TOLERANCE: ± 5%
	JUNITY BOARD : TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	PAGE NO. 06
	TITLE : FRP FENCING FOR DISTRIBUTION SUBSTATION	TOTAL PAGE NO. 07
	PROJECT DETAILS : SUPPLY & INSTALLATION OF FRP FENCING	MATERIAL: FRP
	DRG No.: RMC/FRP/FENCING/736-6	WT.
		REV. NO
		DATE
		SCALE
		KEY INSTRUCTION
		N.T.S.

DATE	SIGN.	
DRN. BY. 03.10.20	L.S.	
CRD. BY.		
APPD. BY.		
MODEL: FRP FENCING		
CUSTOMER : TATA POWER	ITEM CODE:	
SIZE & MODIFICATION: NEW		

RMC
RMC Engineers Ltd.
RMC
RMC



TPCODL



GUARANTEED TECHNICAL PARTICULARS OF FRP FENCING

Project: FRP Fencing for 11KV Distribution Sub Station in TPCODL area

CLIENT :- Tata Power Central Odisha Distribution Limited

DATE : [Redacted]

Contractor:- [Redacted]

Doc No. :- [Redacted]

LOI. No. :- TA [Redacted]

Sr.No.	Particulars	Detailed Particulars	Offered
1 ✓	Manufacturer Name	[Redacted]	EPP Composite Pvt. Ltd.
2 ✓	Material	FRP	Confirm
3 ✓	Properties of Material of Construction of FRP fencing.	FRP Pultruded Section UV & Fire Resistant conforming to specification as per IS 6746	Required.
4 ✓	Total dimensions of FRP Fencing	i. Width	2400 mm
		ii. Length	3000 mm
5 ✓	Glass Content	ii. Height	2050 mm
			60%
6 ✓	Resin Content	40%	Confirm
7 ✓	Density	1.8 to 2.1 gm/cm ³	Confirm
8 ✓	Water Absorption	0.5% Max	Confirm
9 ✓	Impact Strength	45 KJ/m ²	Confirm
10 ✓	Tensile Strength	206 MPa	Confirm
11 ✓	Flexural Strength	210 MPa	Confirm
12 ✓	Modulus of Elasticity	12x10 ³ to 15x10 ³ MPa	Confirm
13 ✓	Power Arc Resistance	120 sec. Min	Confirm
14 ✓	Dielectric strength at 90°C in oil kV/mm	25kV/inch	Confirm

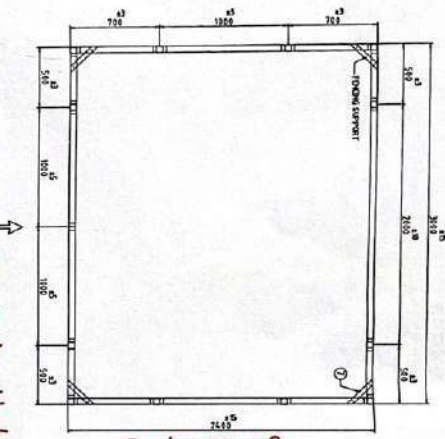
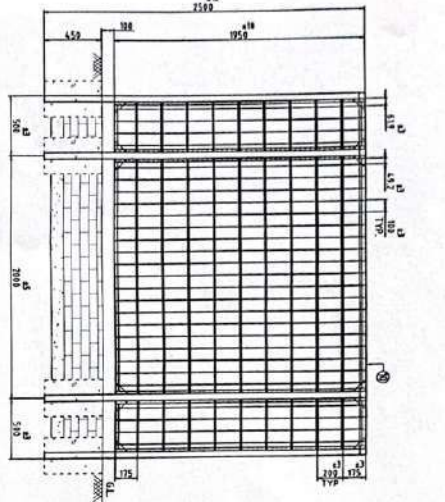
Confirm as per site
Confirm ✓
Required ✓
Confirm ✓

Note: Installation supervision to be provided for all fencing work/installation.

15	✓	Heat Distortion Temperature	125°C Min	Confirm
16	✓	Oxygen Index	23% Min	Confirm
17		Material type test certificate	* type test certificate should not be older than 5 years as on the date of tender opening	Confirm
18		Foundation drawing details	* Provided	Confirm
19		Name Plate	Name plate with P.O. no. & date to be provided on door	Confirm
20		Colour of Sections	Brilliant Blue (RAL 5007)	Confirm - Blue.
21		Sides Sections with 2.4 m length	Side of 2.4 m length should have three sections	Confirm
22		Grouting pipes	The grouting pipes load bearing should have stopper arrangement for fixing in the civil work	Confirm
23		Fluorescent tape permanent type	on all side of frame	Required.
Components of Fencing -				
1		FRP Picket	Flat 35 x 5 mm	Confirm
2		Box Section (Hollow Square Section)	50.8 x 50.8 x 3.175 mm	Confirm
3		Sub Frame Rec. Section	50.8 x 25.4 x 3.175 mm	Confirm
4		Rail - FRP Notch & Groove Bar	12 mm dia	Confirm
5		Hinges	SS304.	Confirm
6		Door Stopper	SS	Confirm
7		Name Plate	FRP	Confirm
8		TPCODL Logo	Painted on FRP surface	Confirm
9		Danger Board	MS plate of 250x200 mm	Confirm
10		Fasteners	SS304	Confirm

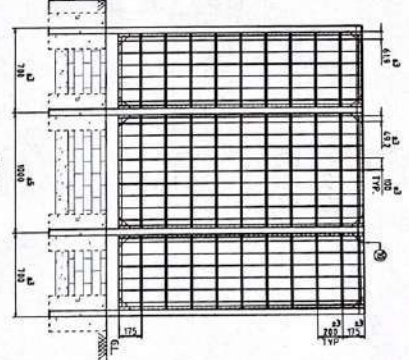
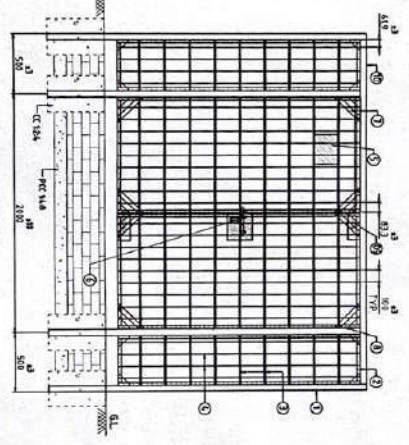
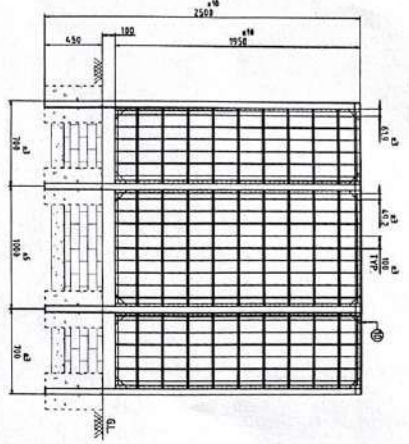
22/10/2020
 9 MEO
 S. S. Sam

One FRP Based fencing to be installed as prototype at TPCODL side, for after quality evaluation, further decision would be taken.



GATE No-1 (Double Lift)

GATE No-2 (Single Lift)



Note - Gate No-2 will be as per site location (Left, Right, Back side)

22/10/2020
S.S. Sahu
NER

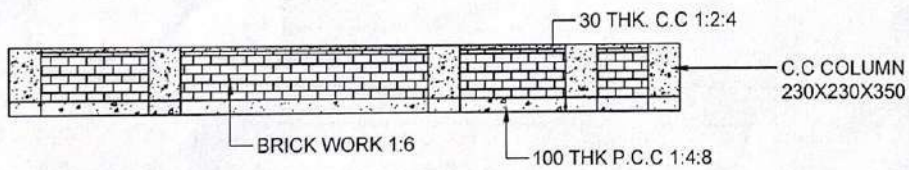
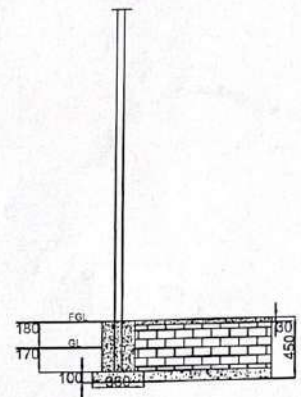
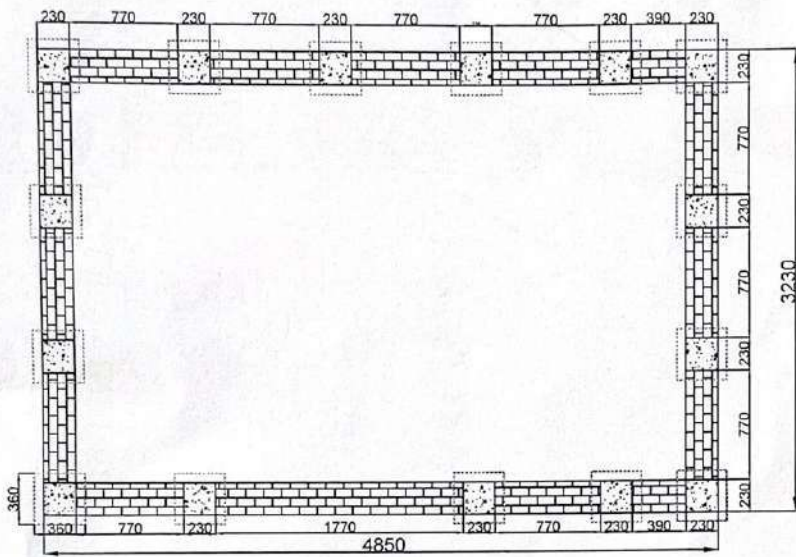
Dimensions are in mm unless otherwise specified

Color: Brilliant Blue (RAL-5007)

- COMPONENTS:-**
- 01) VERTICAL POST 50x80x6.3x1370mm SQ. HOLLOW FRP PULTRUDED SECTION
 - 02) SUB FRAME 50x80x6.3x1370mm SQ. HOLLOW FRP PULTRUDED SECTION
 - 03) PAL MADE OUT OF FRP NOTCH BARS & GROOVE BAR 910 Ø 200mm C/C
 - 04) FPOCKETS - FRP/SIC HOLLOW ROUND TUBE Ø 100mm C/C
 - 05) DANGER BOARD 125 PLATE 250x250x4mm THK.
 - 06) ALUMINUM - SS304 WIRE NET 100x100x1mm
 - 07) SUPPORTING SS304 JINGLES SIZE - 30mm LENGTH
 - 08) HOLLOW DOOR AND EXHAUSTIVE Ø 100mm 90 DEGREE HOODHEAT OF THE GATE FLAPS
 - 09) SS304 STOPPER 60x Ø 10mm AND 30mm LONG
 - 10) FRP PULTRUDED ANGLE 50x50x5mm
- TYPICAL SECTION FOR THE BENT DOUBLE LIFT WITH GRADE**
- 01) VERTICAL POST 12 NOS. WITH GROUTING 450 PH
 - 02) GATE 2 NOS. EACH 11000x 11000
 - 03) SUB FRAME WITH FPOCKETS & BARS 17 NOS. OF 11000 LENGTH
 - 04) SS304 ALUMINUM 2 NOS. ON LEFT SPOKETS OF GATE
 - 05) SS304 SUPPORTS BEARING AT TOP & BOTTOM AREA OF FRAME
 - 06) FRP ANGLE SECTION 10000x11000 SHOULD BE OPENABLE ACROSS GATE 50x50x5mm
 - 07) 18 NOS. SS304 HEX BOLT M12X110, WASHER & NUT
 - 08) 20 NOS. SS304 HEX BOLT M12X110, WASHER & NUT

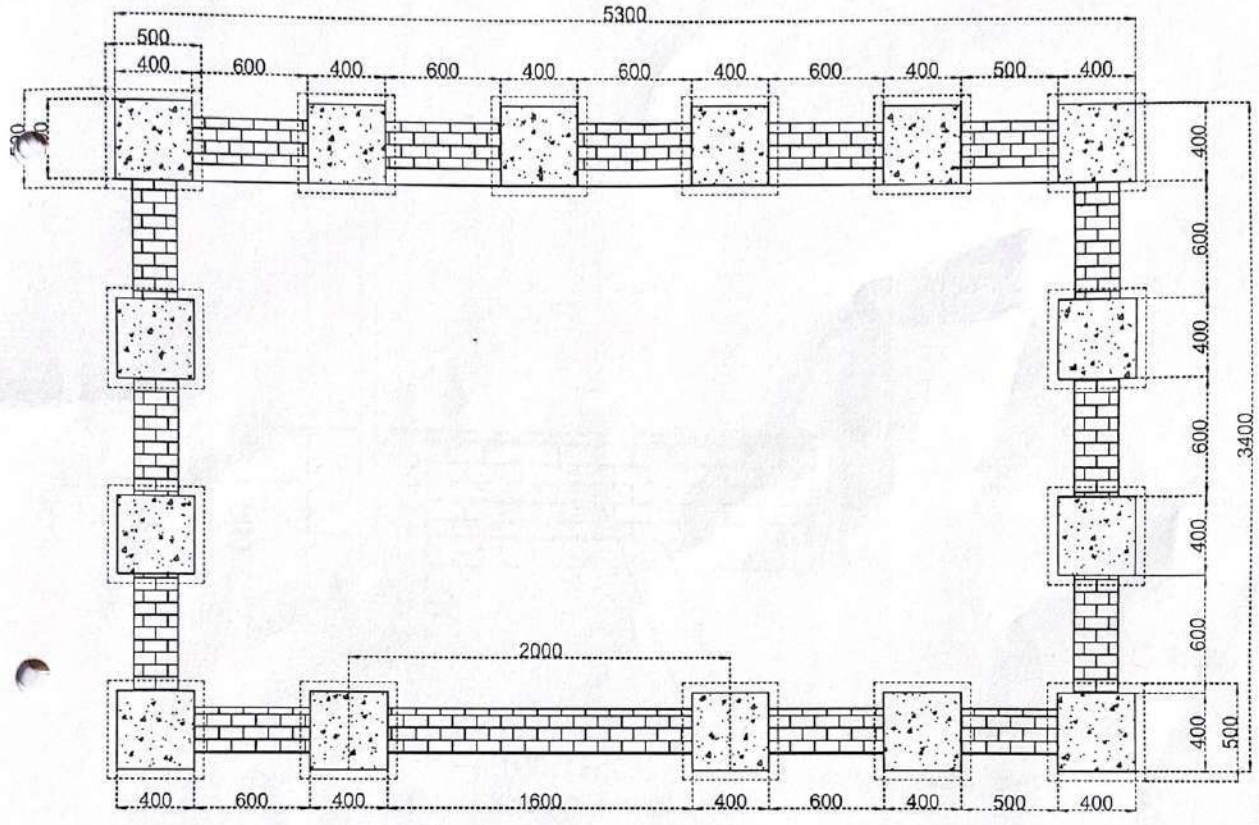
		EPP COMPOSITES PVT. LTD.	
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FOR NORMAL SOIL



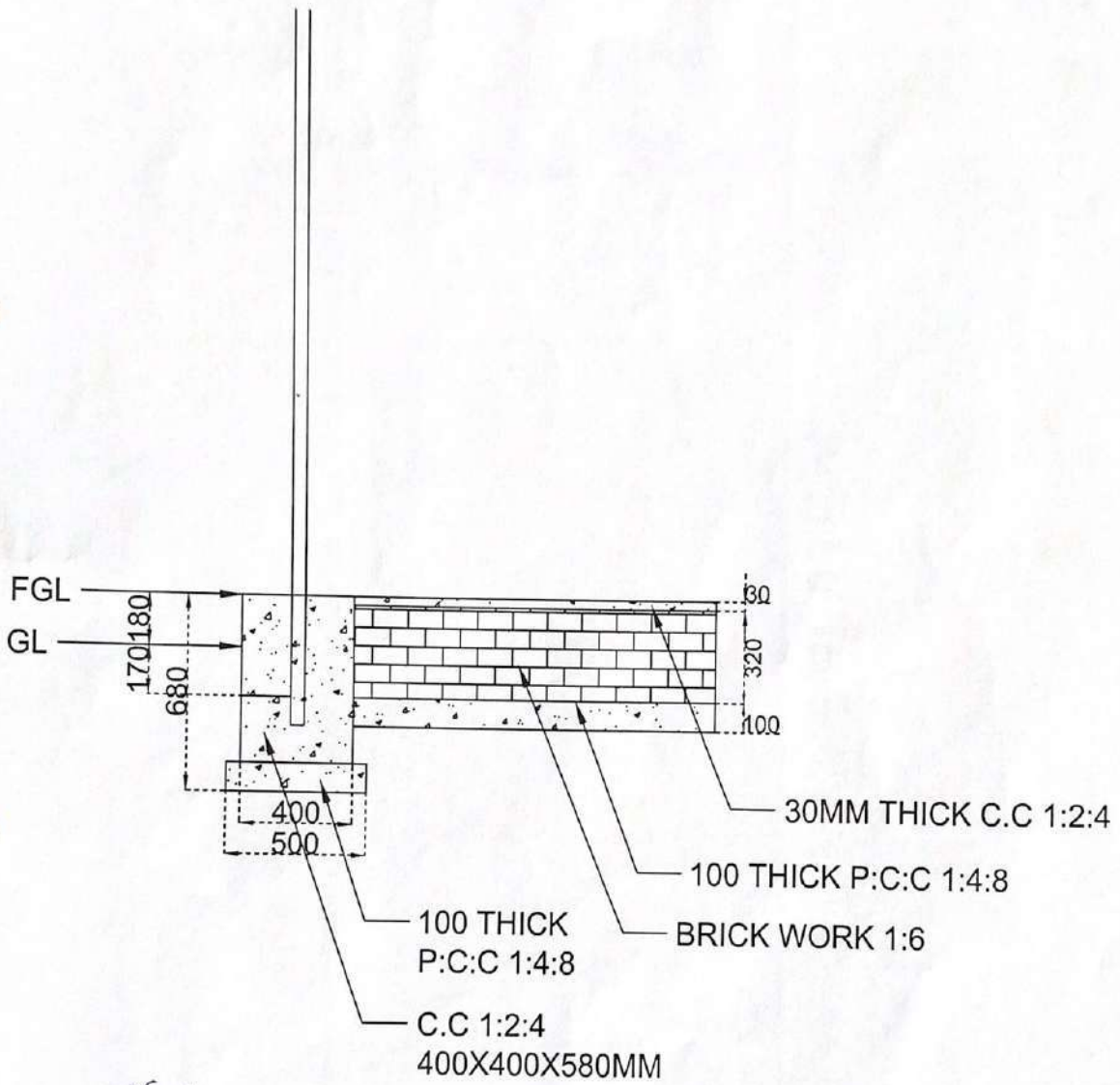
OK.
 G.B. Pradhan
 TPCDDL

FOR SANDY SOIL



OK.
[Signature]
G. B. Pradhan,
TPCODL

SECTION OF FOUNDATION PLAN
(SANDY SOIL)



OK.

[Signature]
G. B. Pradhan
TPCOOL

TPC/CODL/TP&S/54/2020-21/02

250

TPC/CODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

CUSTOMER NAME :-
~~CONTRACTOR NAME~~

LOI NO. :- TPCODL/P&S/54/2020-21/02

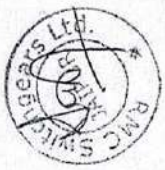
MANUFACTURER NAME :- RMC SWITCHGEARS LTD.

Property of T P COAL
(Restricted Area)

RMC
SWITCHGEARS LTD.

YOTI :- MONTH/YEAR

200



NAME PLATE

TOLERANCE: ± 0.25		PAGE NO. 05		TOTAL PAGE NO. 07	
PO. NO. : LOA NO. TPCODL/P&S/54/2020-21/02		UTILITY BOARD : TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.		SIGN & DATE	
TITLE : FRP FENCING FOR DISTRIBUTION SUBSTATION		PROJECT DETAILS : SUPPLY & INSTALLATION OF FRP FENCING		MATERIAL FRP	
DATE	SIGN.	REV. NO.	DATE	SCALE	N.T.S.
03.10.20	L.S.				
DND. BY.					
APPR. BY.					
MODEL: FRP FENCING		DRG. No.: RMC/FRP/FENCING/736-5		LAST INSTRUCTION	
CUSTOMER : TATA POWER		ITEM CODE:		RMC	
SIZE: A4		MODIFICATION: NEW		Regd. Off. : Gram - Berozoya, Taluk - Choudas, Dist - Bhubaneswar, Odisha. Tata Road - Bhubaneswar - 751029	

YOTI 7 YEAR OF INSTALLATION

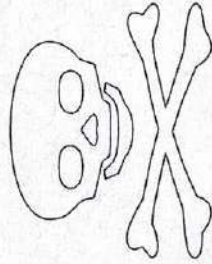
250

200

DANGER

415

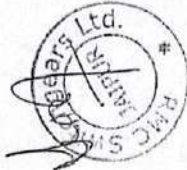
415



VOLTS

बोल्ट

खतरा



DANGER BOARD

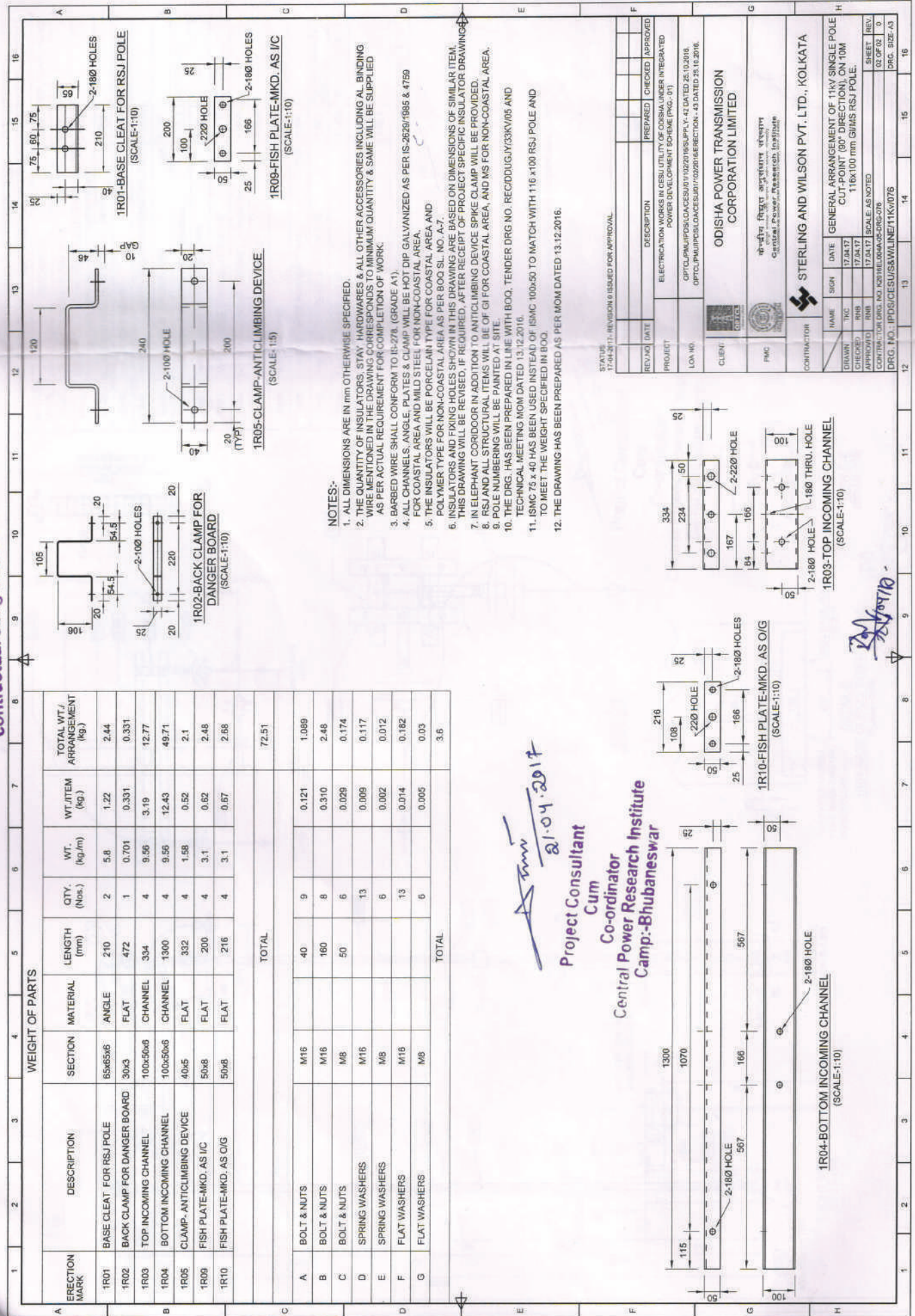
TOLERANCE: ± 5%
 PAGE NO. 06
 TOTAL PAGE NO. 07
 PO. NO. : LOA NO. TPOODL/P&S/5+/2020-21/02
 UTILITY BOARD : TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.
 TITLE : FRP FENCING FOR DISTRIBUTION SUBSTATION
 PROJECT DETAILS : SUPPLY & INSTALLATION OF FRP FENCING
 DRG No.: RMC/FRP/FENCING/736-6
 SIGN & DATE
 MATERIAL: FRP
 WT.
 REV. NO
 DATE
 SCALE
 KEY INSTRUCTION
 N.T.S.

DATE	SIGN.
DRN. BY: 03.10.20	L.S.
CRD. BY:	
APPD. BY:	

MODEL: FRP FENCING
 CUSTOMER : TATA POWER
 ITEM CODE:
 SIZE & MODIFICATION: NEW

RMC
 RMC Engineers Ltd.
 Block D-1, Green Building, Park Road, Chhatrapati
 Shivaji Maharaj, Bhubaneswar-751005, Odisha.
 Phone: 98680-71977, 202028

Approved without Prejudice to contractual obligation & liabilities



WEIGHT OF PARTS

ERECTOR MARK	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (Nos.)	WT. (kg/m)	WT. ITEM (kg.)	TOTAL WT./ ARRANGEMENT (kg.)
1R01	BASE CLEAT FOR RSJ POLE	65x65x6	ANGLE	210	2	5.8	1.22	2.44
1R02	BACK CLAMP FOR DANGER BOARD	30x3	FLAT	472	1	0.701	0.331	0.331
1R03	TOP INCOMING CHANNEL	100x50x6	CHANNEL	334	4	9.56	3.19	12.77
1R04	BOTTOM INCOMING CHANNEL	100x50x6	CHANNEL	1300	4	9.56	12.43	49.71
1R05	CLAMP- ANTIMILIMBING DEVICE	40x5	FLAT	332	4	1.58	0.52	2.1
1R09	FISH PLATE-MKD. AS I/C	50x8	FLAT	200	4	3.1	0.62	2.48
1R10	FISH PLATE-MKD. AS O/G	50x8	FLAT	216	4	3.1	0.57	2.68
TOTAL								72.51
A	BOLT & NUTS	M16		40	9		0.121	1.089
B	BOLT & NUTS	M16		160	8		0.310	2.48
C	BOLT & NUTS	M8		50	6		0.029	0.174
D	SPRING WASHERS	M16			13		0.009	0.117
E	SPRING WASHERS	M8			6		0.002	0.012
F	FLAT WASHERS	M16			13		0.014	0.182
G	FLAT WASHERS	M8			6		0.005	0.03
TOTAL								3.6

mm
21.04.2017
Project Consultant
Cum
Co-ordinator
Central Power Research Institute
Camp.-Bhubaneswar

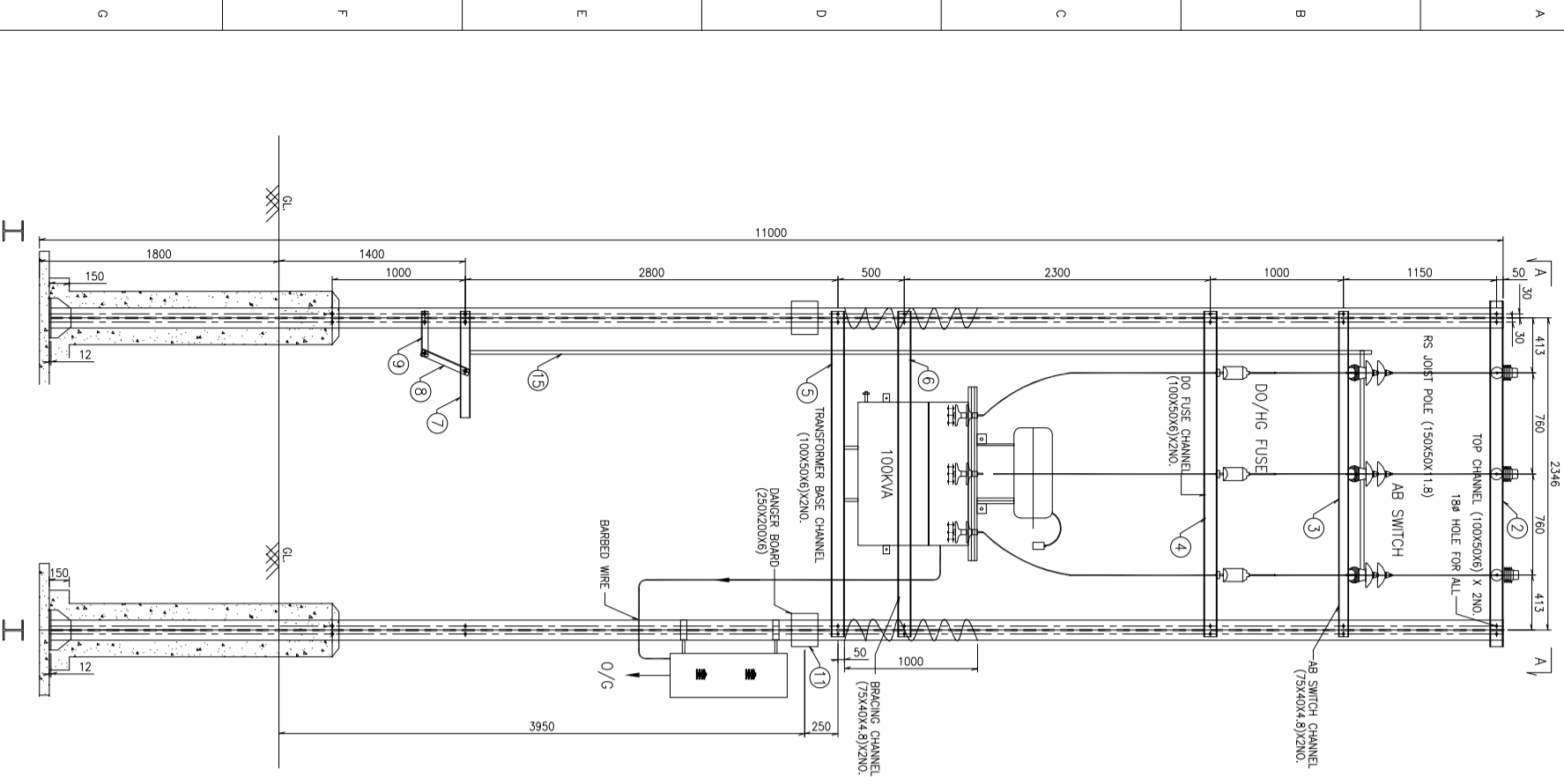
NOTES:-

- ALL DIMENSIONS ARE IN mm OTHERWISE SPECIFIED.
- THE QUANTITY OF INSULATORS, STAY HARDWARES & ALL OTHER ACCESSORIES INCLUDING AL BINDING WIRE MENTIONED IN THE DRAWING, CORRESPONDS TO MINIMUM QUANTITY & SAME WILL BE SUPPLIED AS PER ACTUAL REQUIREMENT FOR COMPLETION OF WORK.
- BARBED WIRE SHALL CONFORM TO IS-278. (GRADE A1).
- ALL CHANNELS, ANGLE, PLATES & CLAMP WILL BE HOT DIP GALVANIZED AS PER IS-2629/1986 & 4759 FOR COASTAL AREA AND MILD STEEL FOR NON-COASTAL AREA.
- THE INSULATORS WILL BE PORCELAIN TYPE FOR COASTAL AREA AND POLYMER TYPE FOR NON-COASTAL AREA AS PER BOQ SL. NO. A-7.
- INSULATORS AND FIXING HOLES SHOWN IN THIS DRAWING ARE BASED ON DIMENSIONS OF SIMILAR ITEM. THIS DRAWING WILL BE REVISED, IF REQUIRED, AFTER RECEIPT OF PROJECT SPECIFIC INSULATOR DRAWING.
- IN ELEPHANT CORRIDOR IN ADDITION TO ANTIMILIMBING DEVICE SPIKE CLAMP WILL BE PROVIDED.
- RSJ AND ALL STRUCTURAL ITEMS WILL BE OF GI FOR COASTAL AREA, AND MS FOR NON-COASTAL AREA.
- POLE NUMBERING WILL BE PAINTED AT SITE.
- THE DRG. HAS BEEN PREPARED IN LINE WITH BOQ, TENDER DRG NO. REC/DDUGJY/33KV/05 AND TECHNICAL MEETING MOM DATED 13.12.2016.
- ISMIC 75 x 40 HAS BEEN USED INSTEAD OF ISMC 100x50 TO MATCH WITH 116 x100 RSJ POLE AND TO MEET THE WEIGHT SPECIFIED IN BOQ.
- THE DRAWING HAS BEEN PREPARED AS PER MOM DATED 13.12.2016.

STATUS: 17.04.2017- REVISION 0 ISSUED FOR APPROVAL

REV. NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
01		ELECTRICATION WORK IN RESULTIVITY OF CORONA UNDER INTEGRATED POWER DEVELOPMENT SCHEME (PKC- 01)			
PROJECT: OPTICAL PIPES (O.P.S.) FOR 11KV/20KV SUPPLY - 42 DATED 25.10.2016.					
LOA NO: OPTCL/PIPS/O.P.S./01/10/2016/REVISION- 43 DATED 26.10.2016.					
CLIENT: ODISHA POWER TRANSMISSION CORPORATION LIMITED					
PMO: Central Power Research Institute					
CONTRACTOR: STERLING AND WILSON PVT. LTD., KOLKATA					
DRAWN: TNC 17.04.17					
CHECKED: RNB 17.04.17					
APPROVED: RNB 17.04.17					
SHEET: 02 OF 02					
CONTRACTOR DRG. NO. NTH/BE/00A/05-DRG-076					
DRG. NO.: IPDS/CESU/S&W/LINE/11KV/076					
DRG. SIZE: A3					

mm
21.04.2017



DTR MOUNTING DP STRUCTURE
(SCALE 1:50)

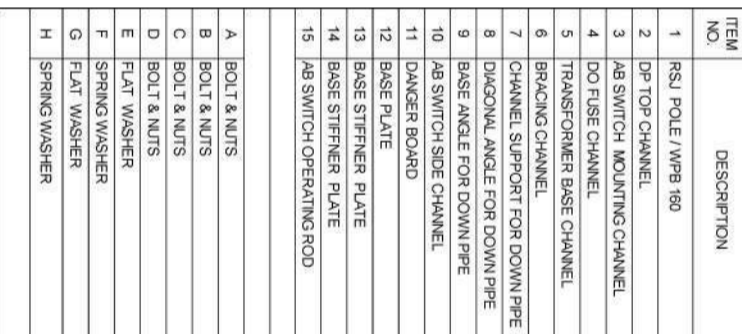
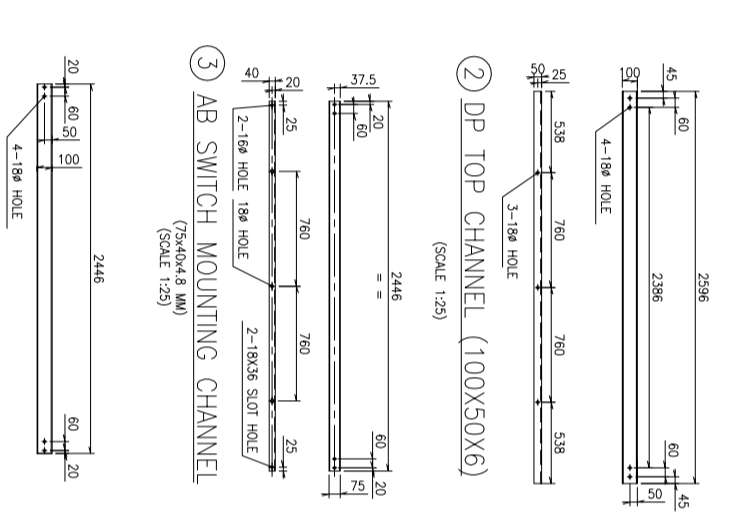
FOR RO ISSUE ONLY		ISSUE		REVISIONS	
CLEAR	DATE	NO.	DESCRIPTION	DATE	BY

CIVIL		ELEC		MECH	

CIVIL		ELEC		MECH	

CIVIL		ELEC		MECH	

DATE (RO ISSUE)	03/04/2021
DATE (DESIGN SIGN)	03/04/2021
DATE (CHECK SIGN)	
DATE (ISSUE SIGN)	



ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (NOS.)	WT (Kg/m)	WTITEM (Kg)	TOTAL WT./ARGMT (Kg)
1	RSJ TOP / WPB 160	150X150 MM	JOIST	11000	2	34.63044	380.653484	781.269988
2	DP TOP CHANNEL	100X50X6 MM	CHANNEL	2596	2	9.56	24.82	48.64
3	AB SWITCH MOUNTING CHANNEL	75X40X4.8 MM	CHANNEL	2446	2	7.14	17.48	34.93
4	DO FUSE CHANNEL	100X50X6 MM	CHANNEL	2446	2	9.56	23.38	46.77
5	TRANSFORMER BASE CHANNEL	100X50X6 MM	CHANNEL	2446	2	9.56	23.38	46.77
6	BRACING CHANNEL	75X40X4.8 MM	CHANNEL	800	2	7.14	17.484	34.93
7	CHANNEL SUPPORT FOR DOWN PIPE	75X40X4.8 MM	CHANNEL	800	1	7.14	5.712	5.71
8	DIAGONAL ANGLE FOR DOWN PIPE	50X50X8 MM	ANGLE	388	1	4.5	1.75	1.75
9	BASE ANGLE FOR DOWN PIPE	50X50X8 MM	ANGLE	340	1	4.5	1.53	1.53
10	AB SWITCH SIDE CHANNEL	100X50X6 MM	CHANNEL	500	2	9.56	4.78	9.56
11	DANGER BOARD	250X200X6 MM	CHANNEL	500	2	4.78	2.38	4.77
12	BASE PLATE	300X300X12 MM	PLATE	2	2	94.20	8.48	16.96
13	BASE STIFFENER PLATE	150X100X6MM	PLATE	4	4	47.10	0.83	2.83
14	BASE STIFFENER PLATE	150X60X6MM	PLATE	4	4	47.10	0.63	1.70
15	AB SWITCH OPERATING ROD	25 DIA	ROD	7000	1	3.85	26.95	26.95
TOTAL WEIGHT FOR RSJ STRUCTURE						1045.93		
TOTAL WEIGHT FOR WPB 160 STRUCTURE						954.41		

WEIGHT OF PARTS

- NOTES
- ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
 - ALL HOLES ARE Ø18 MM UNLESS OTHERWISE SPECIFIED.
 - REFERENCE STANDARD - IS 2062, & IS-808

DO NOT SCALE

PRELIMINARY

TP CENTRAL ODISHA DISTRIBUTION LIMITED

11KV DTR MOUNTING WITH RSJ 150X150/ WPB 160 DOUBLE POLE STRUCTURE

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

APPROVED

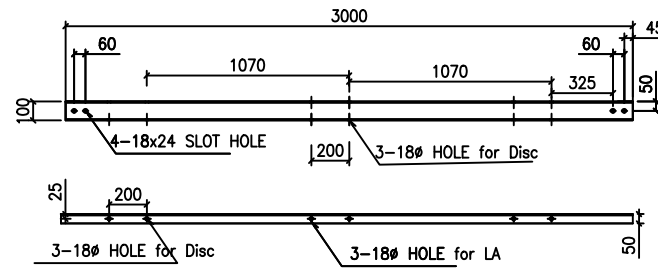
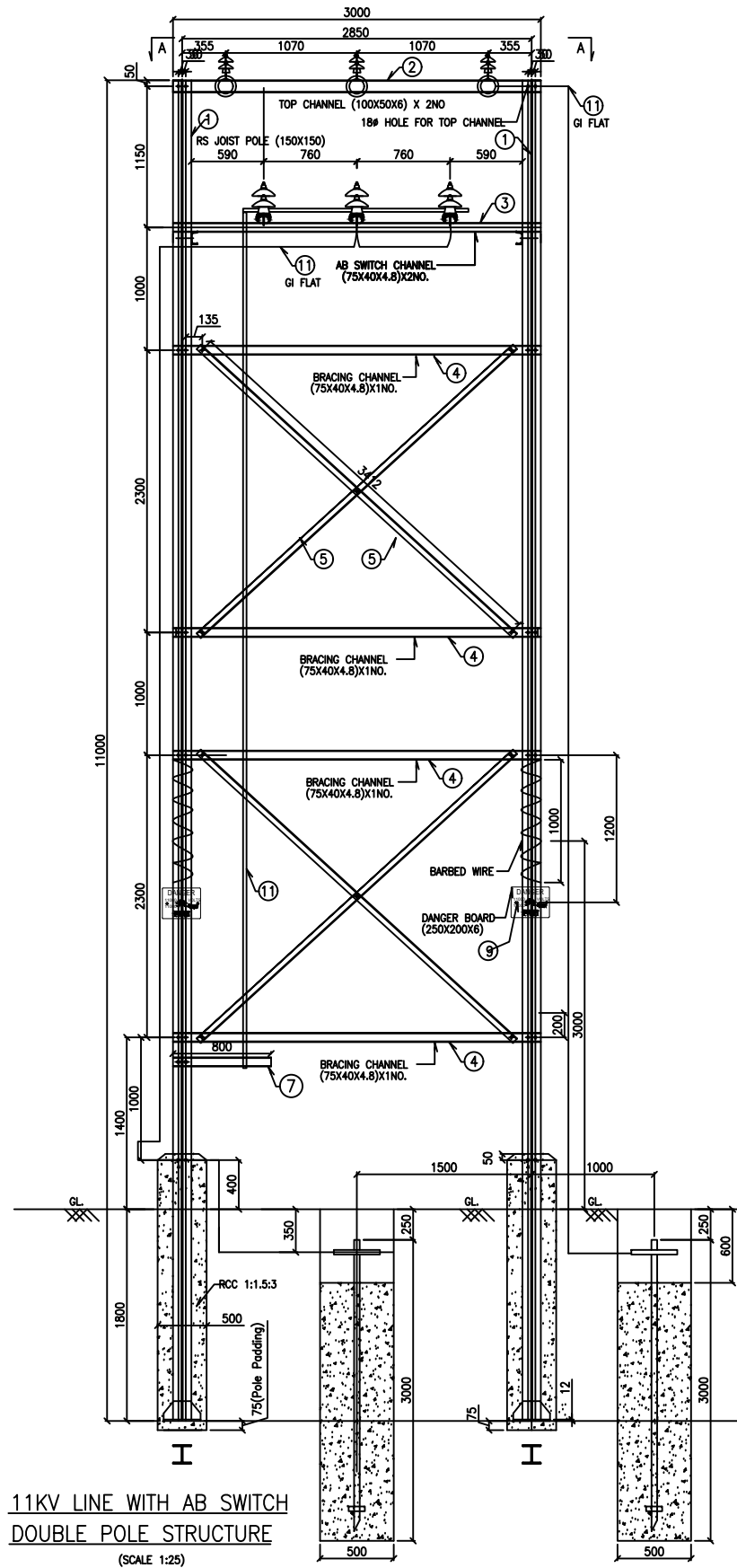
DATE (RO ISSUE)

DATE (DESIGN SIGN)

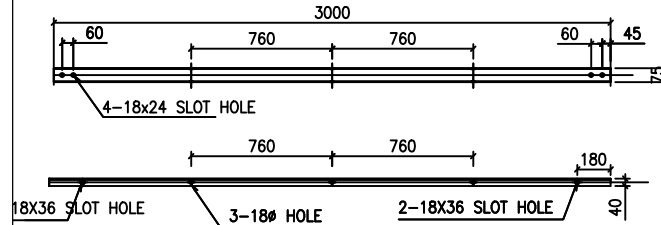
DATE (CHECK SIGN)

DATE (ISSUE SIGN)

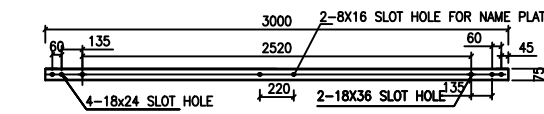
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per IS)



② DP TOP CHANNEL (100X50X6)



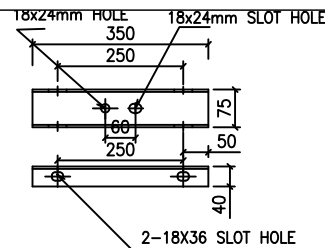
③ AB SWITCH MOUNTING CHANNEL (75x40x4.8 MM)



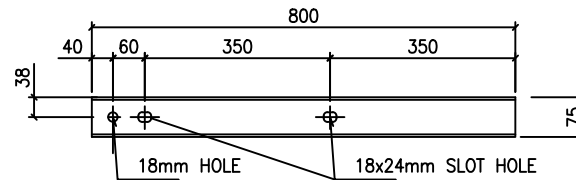
④ BRACING CHANNEL (75x40x4.8 MM)



⑤ BRACING ANGLE (50X50X6)

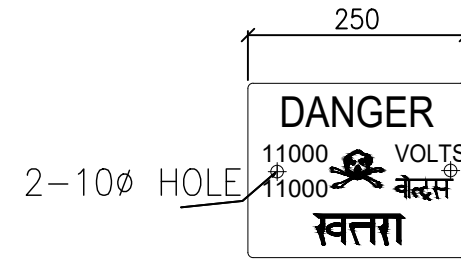


⑥ AB SWITCH SIDE CHANNEL (75x40x4.8 MM)

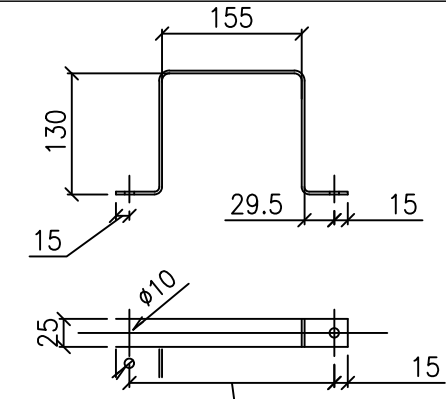


⑦ CHANNEL SUPPORT FOR DOWN PIPE (75x40x4.8 MM)

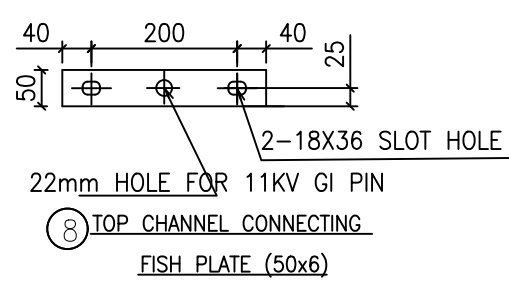
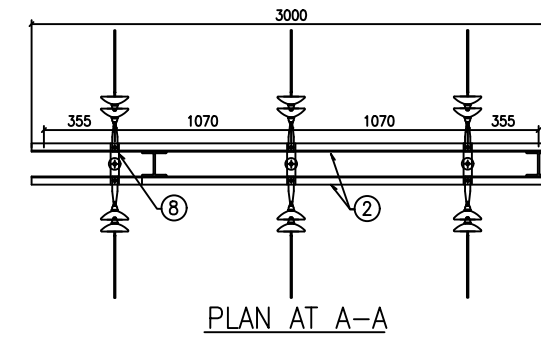
BOM OF GI ITEMS OF 11KV LINE DP WITH AB SWITCH								
ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (NOS.)	WT (Kg/m)	WT/ITEM(Kg)	TOTAL WT /ARGMT (Kg)
1	RSJ POLE / WPB 160	150X150 MM	JOIST	11000	2	34.6/30.44	380.6/334.84	761.2/669.68
2	DP TOP CHANNEL	100X50X6 MM	CHANNEL	3000	2	9.56	28.68	57.36
3	AB SWITCH CHANNEL	75X40X4.8 MM	CHANNEL	3000	2	7.14	21.42	42.84
4	BRACING CHANNEL	75X40X4.8 MM	CHANNEL	3000	4	7.14	21.42	85.68
5	BRACING ANGLE	50X50X6 MM	ANGLE	3512	4	4.50	15.80	63.216
6	AB SWITCH SIDE CHANNEL	100X50X6 MM	CHANNEL	350	2	9.56	3.35	6.692
7	CHANNEL SUPPORT FOR DOWN PIPE	75X40X4.8 MM	CHANNEL	800	1	7.14	5.71	5.712
8	FISH PLATE	50X6 MM	PLATE	280	6	2.36	0.66	3.96
9	DANGER BOARD	250X220X6 MM	PLATE	250	2	9.42	2.36	4.71
10	BACK CLAMP FOR DANGER BOARD	25X3 MM	FLAT	510	2	0.59	0.30	0.60
11	GI Flat	40x6 MM	FLAT	2800	1	1.90	5.32	5.32
12	PIPE EARTHING		PIPE	3000	2			
TOTAL WEIGHT FOR RSJ STRUCTURE								1037.30
TOTAL WEIGHT FOR WPB 160 STRUCTURE								888.42
A	BOLT & NUTS	M16		50	48		0.134	6.432
B	BOLT & NUTS	M16		120	8		0.229	1.832
C	BOLT & NUTS	M16		140	9		0.256	2.304
D	BOLT & NUTS	M17		200	0		0.331	0
E	BOLT & NUTS	M8		50	4		0.026	0.104
F	FLAT WASHER	M16		130			0.014	1.82
G	SPRING WASHER	M16		130			0.009	1.17
H	FLAT WASHER	M8		8			0.005	0.04
I	SPRING WASHER	M8		8			0.002	0.016
TOTAL WEIGHT								13.718



⑨ DANGER BOARD (250X220X3) X 2NO.



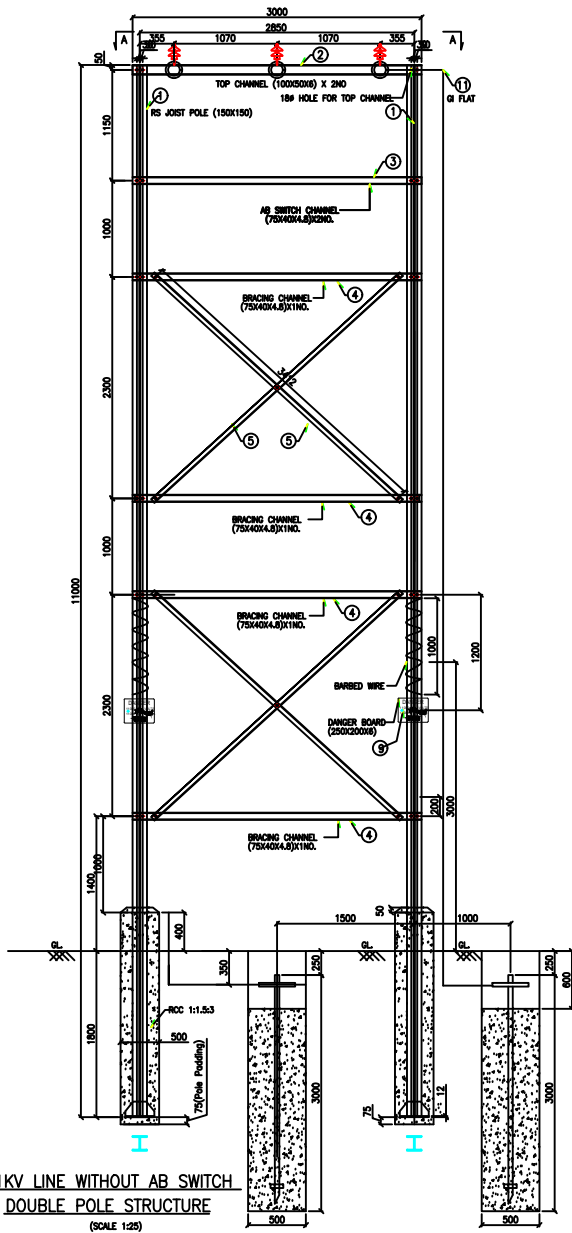
⑩ BACK CLAMP FOR DANGER BOARD (25X3)



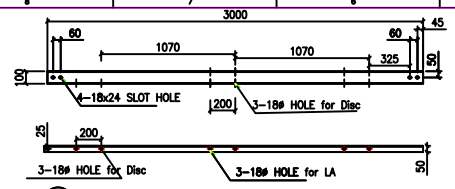
TPCODL TATA POWER
TP CENTRAL ODISHA DISTRIBUTION LIMITED CENTRAL ODISHA DISTRIBUTION LTD.

TITLE:- 11KV LINE DP WITH AB SWITCH (with 11mtr. 150x150 RSJ or WPB 160)	NAME
DESIGN: PHIROJ UTTARAY,E&Q	
DRAWN: J SANGRAM, E&Q	
CHECKED: K BHARDWAJ, E&Q	
APPROVED: P GARG, E&Q	
SCALE: NTS	DRAWING NO: TPCODL-MVD-0001 REV NO:
ISSUE DT: 31/05/2021	

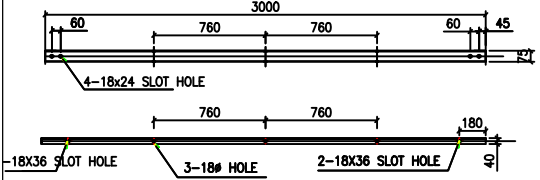
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



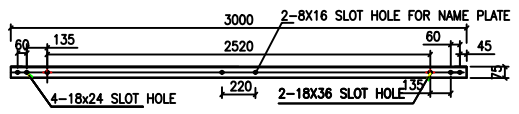
11KV LINE WITHOUT AB SWITCH
DOUBLE POLE STRUCTURE
(SCALE 1:25)



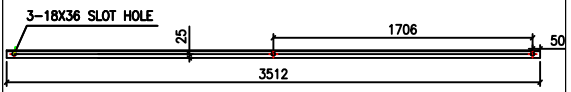
② DP TOP CHANNEL (100X50X6)



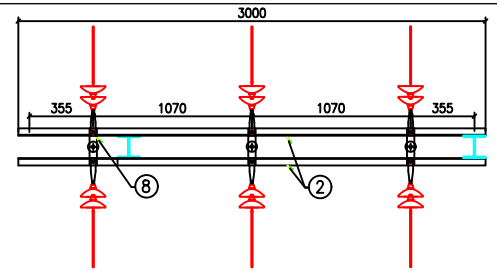
③ AB SWITCH MOUNTING CHANNEL
(75x40x4.8 MM)



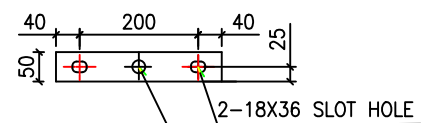
④ BRACING CHANNEL
(75x40x4.8 MM)



⑤ BRACING ANGLE (50X50X6)

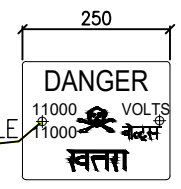


PLAN AT A-A

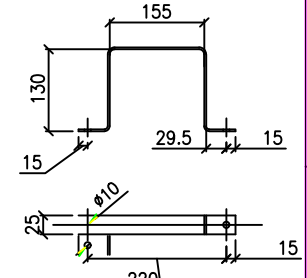


⑧ TOP CHANNEL CONNECTING
FISH PLATE (50x6)

BOM OF GI ITEMS OF 11KV LINE DP WITHOUT AB SWITCH								
ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (NOS.)	WT (Kg/m)	WT/ITEM(Kg)	TOTAL WT./ARGMT(Kg)
1	RSJ POLE /WPB 160	150X150 MM	JOIST	11000	2	34.6/30.44	390.6/334.84	761.2/693.68
2	DP TOP CHANNEL	100X50X6 MM	CHANNEL	3000	2	9.56	28.68	57.36
3	AB SWITCH CHANNEL	75X40X4.8 MM	CHANNEL	3000	2	7.14	21.42	42.84
4	BRACING CHANNEL	75X40X4.8 MM	CHANNEL	3000	4	7.14	21.42	85.68
5	BRACING ANGLE	50X50X6 MM	ANGLE	3512	4	4.50	15.80	63.216
8	FISH PLATE	50X6 MM	PLATE	280	6	2.36	0.66	3.96
9	DANGER BOARD	250X220X6 MM	PLATE	250	2	9.42	2.36	4.71
10	BACK CLAMP FOR DANGER BOARD	25x3 MM	FLAT	510	2	0.59	0.30	0.60
11	GI Flat	40x6 MM	FLAT	1400	1	1.90	5.32	2.66
12	PIPE EARTHING		PIPE	3000	2			
TOTAL WEIGHT FOR RSJ STRUCTURE							1022.23	
TOTAL WEIGHT FOR WPB 160 STRUCTURE							873.35	
A	BOLT & NUTS	M16		50	48		0.134	6.432
B	BOLT & NUTS	M16		140	12		0.256	3.072
C	BOLT & NUTS	M16		200	0		0.331	0
D	BOLT & NUTS	M8		50	4		0.026	0.104
E	FLAT WASHER	M16			120		0.014	1.68
F	SPRING WASHER	M16			120		0.009	1.08
G	FLAT WASHER	M8			8		0.005	0.04
					8		0.002	0.016
TOTAL WEIGHT							12.424	



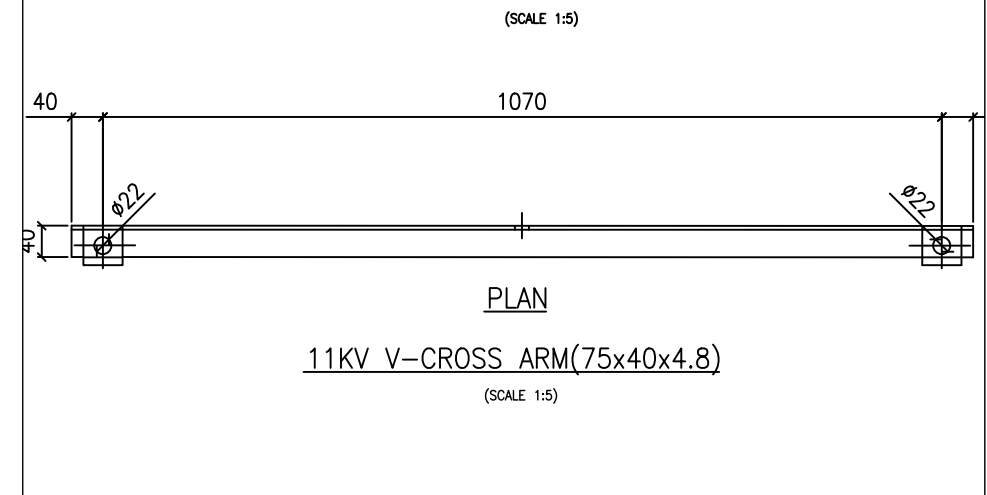
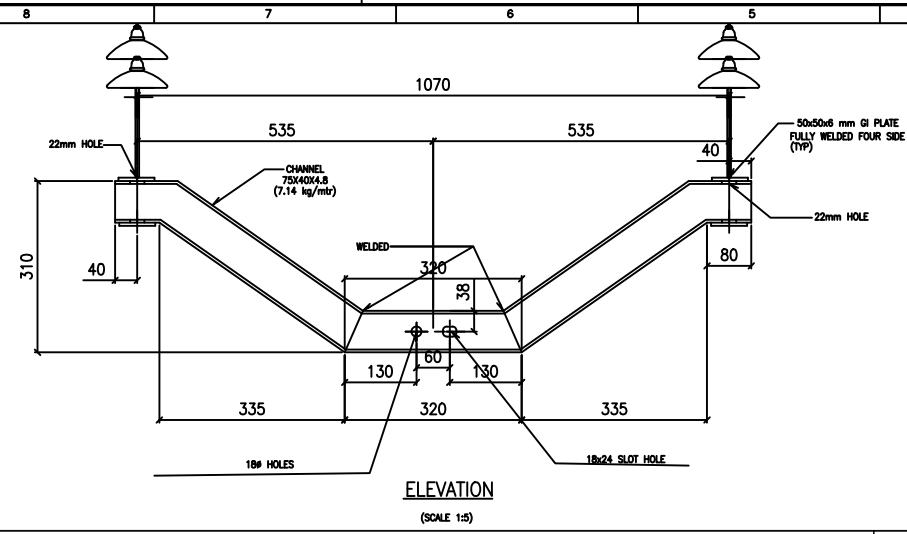
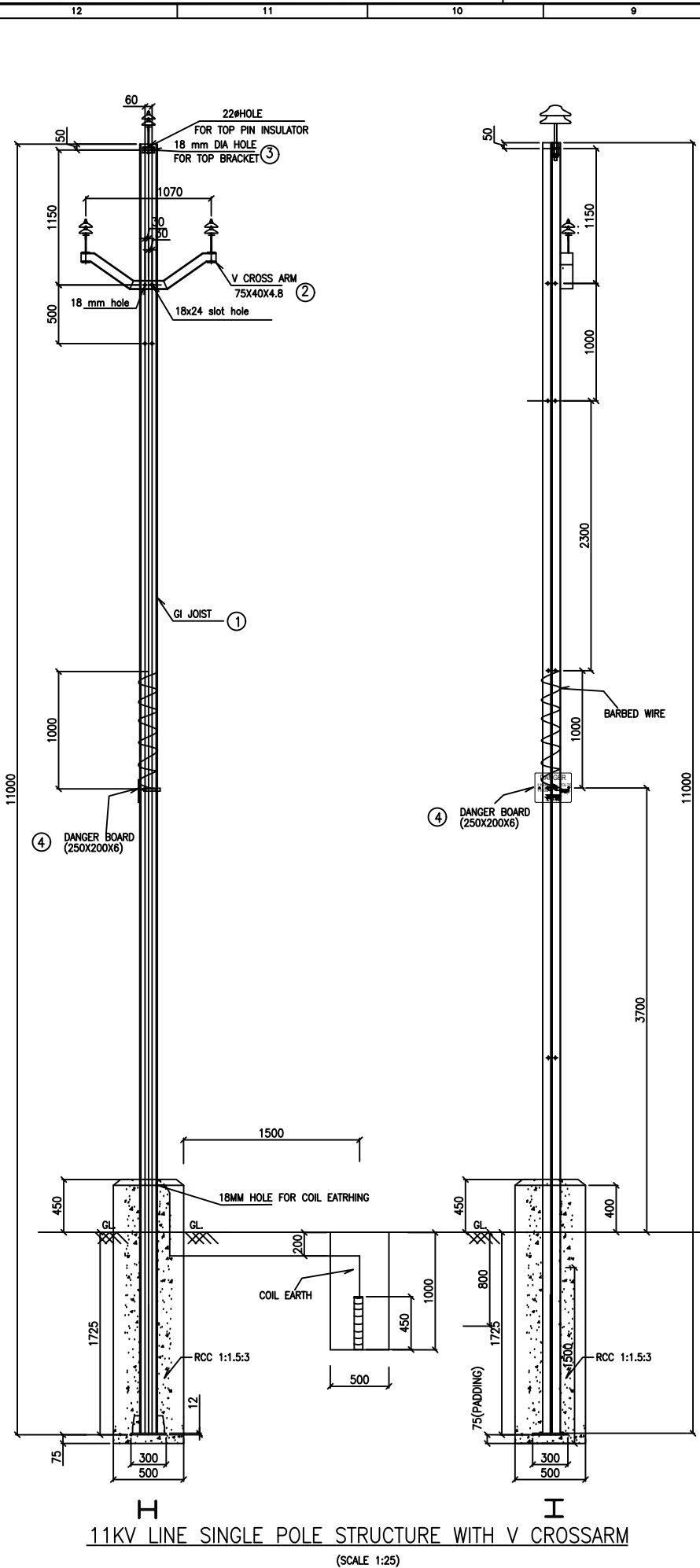
⑨ DANGER BOARD
(250X220X3)X2NO.



⑩ BACK CLAMP FOR
DANGER BOARD(25X3)

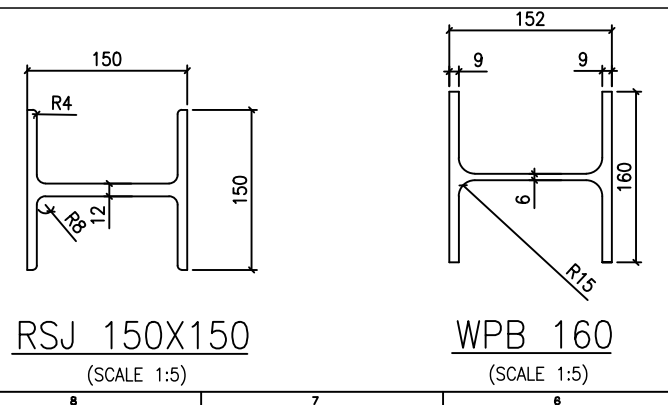
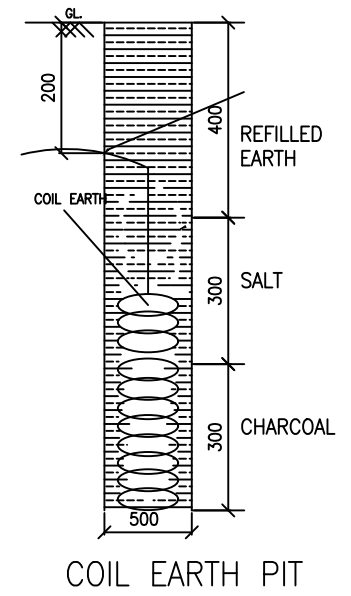
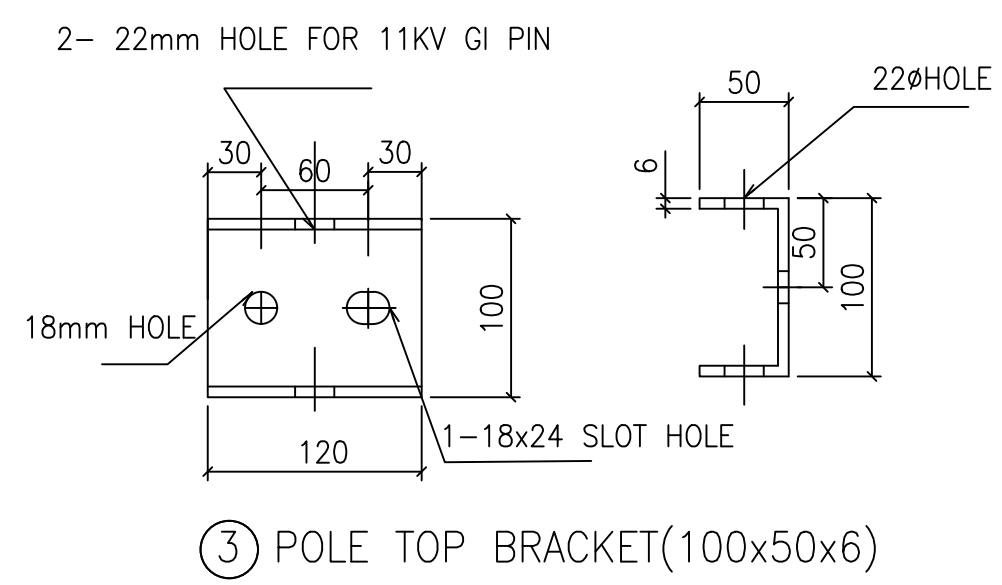
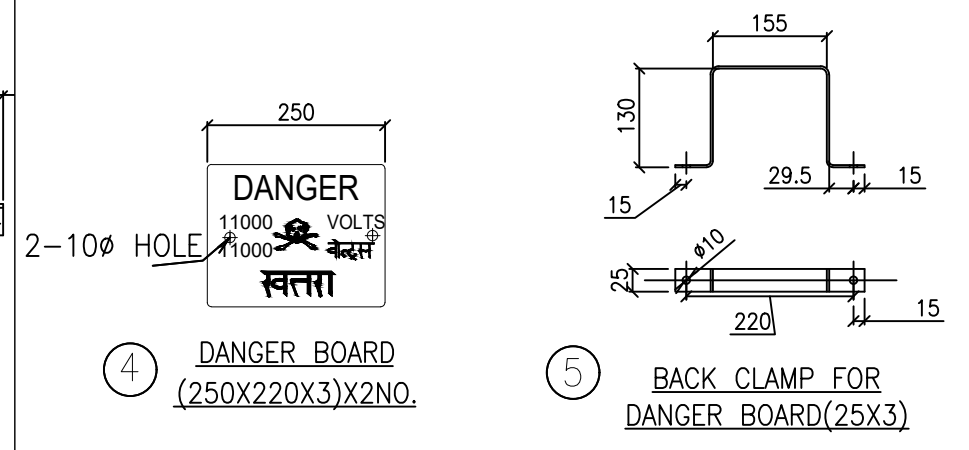
TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE DP WITHOUT AB SWITCH (with 11mtr. 150x150 RSJ or WPB 160)		NAME	
DESIGN:-		PHIROJ UTTARAY,E&Q	
DRAWN:-		J SANGRAM, E&Q	
CHECKED:-		K BHARDWAJ, E&Q	
APPROVED:-		P GARG, E&Q	
SCALE : NTS	ISSUE DT: 31/05/2021	DRAWING NO:TPCODL-MVD-0002 REV NO:	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



BOM OF GI ITEMS OF 11KV LINE SP WITH V CROSSARM

ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGT H (mm)	QTY (NOS)	WT (Kg/mtr)	WT/ITEM(Kg)	TOTAL WT IARGMT(Kg)
1	RSJ POLE / WPB 160	150X150 MM	JOIST	11000	1	34.6/3	380.6/334.84	380.6/334.84
2	11KV V CROSS ARM	75X40X4.8 MM	CHANNEL	1395	1	7.14	9.960	9.960
2A	50X6 FLAT FOR V	50X6 MM	FLAT	50	4	2.36	0.118	0.472
3	POLE TOP BRACKET	100X50X6 MM	CHANNEL	120	1	9.56	1.147	1.147
4	DANGER BOARD	250X200X6 MM	PLATE	250	2	9.42	2.355	4.710
5	BACK CLAMP FOR DANGER BOARD	25X3 MM	FLAT	510	2	0.59	0.300	0.601
TOTAL WEIGHT FOR RSJ STRUCTURE								397.49
TOTAL WEIGHT FOR WPB 160 STRUCTURE								351.73
A	BOLT & NUTS	M16		50	3		0.134	0.402
B	BOLT & NUTS	M16		120	2		0.229	0.458
C	BOLT & NUTS	M8		50	2		0.02	0.04
D	FLAT WASHER	M16		10			0.014	0.14
E	SPRING WASHER	M16		10			0.009	0.09
F	FLAT WASHER	M8		4			0.005	0.02
G	SPRING WASHER	M8		4			0.002	0.008
TOTAL WEIGHT								1.158



TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

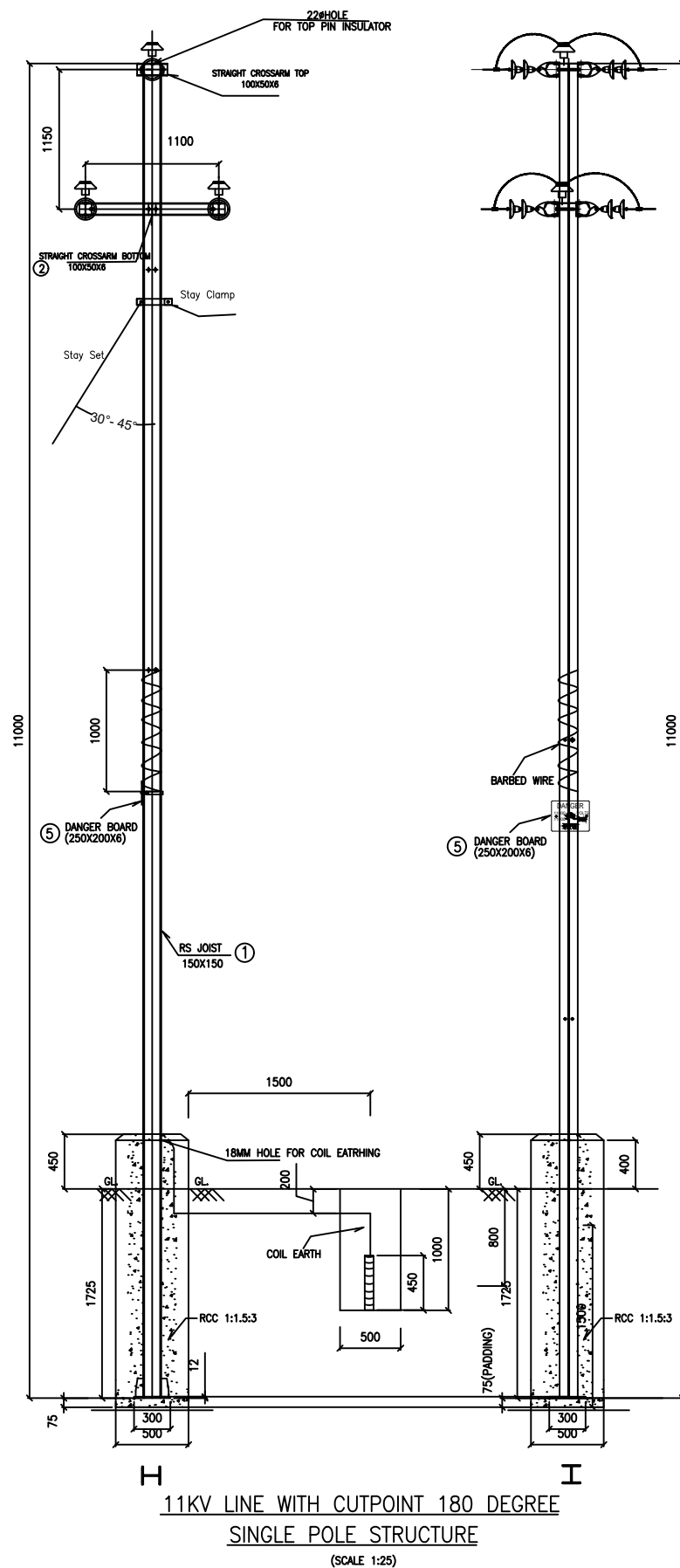
TATA POWER
CENTRAL ODISHA DISTRIBUTION LTD.

TITLE:-
11KV LINE SINGLE POLE WITH V CROSS ARM (with 11mtr. 150x150 RSJ or WPB 160)

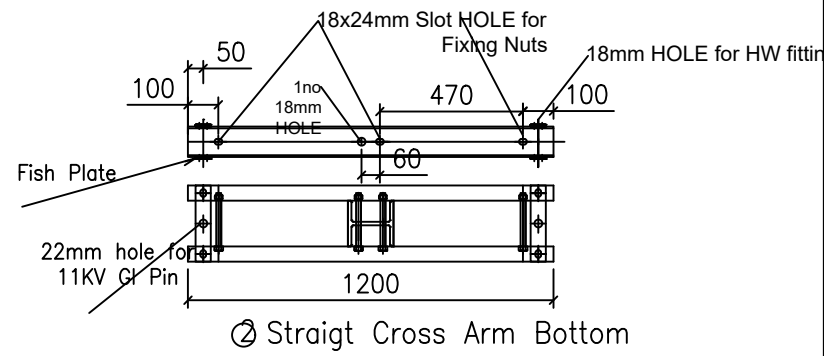
DESIGN:	PHIROJ UTTARAY,E&Q
DRAWN:	J SANGRAM, E&Q
CHECKED:	K BHARDWAJ, E&Q
APPROVED:	P GARG, E&Q

SCALE : NTS ISSUE DT: 31/05/2021 DRAWING NO:TPCODL-MVD-0003 REV NO:

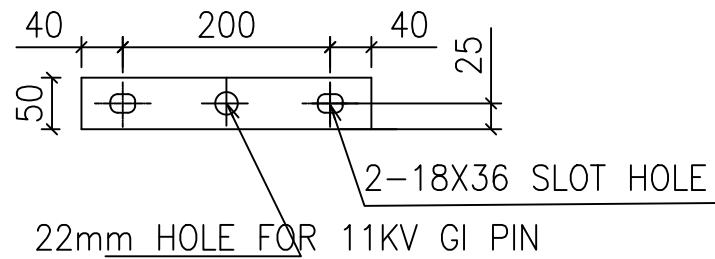
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



11KV LINE WITH CUTPOINT 180 DEGREE
SINGLE POLE STRUCTURE
(SCALE 1:25)

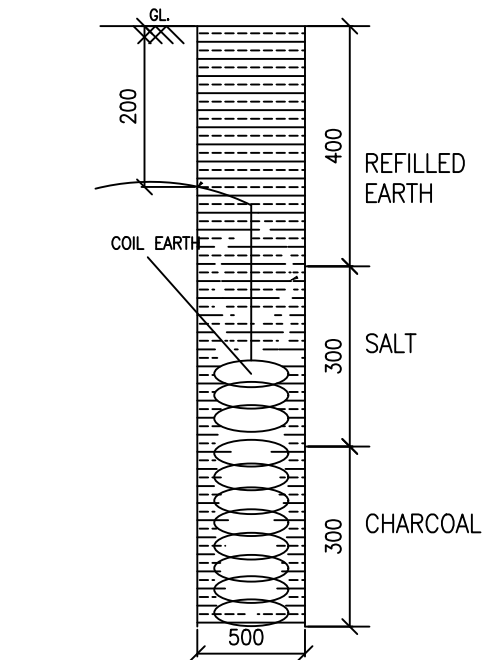


2 Straight Cross Arm Bottom

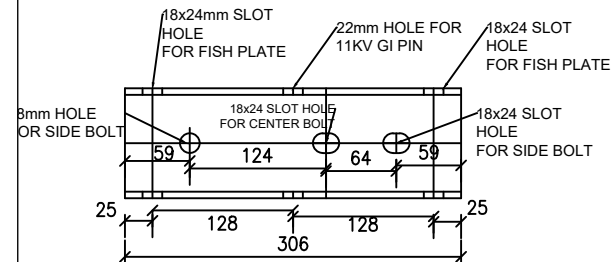


3 FISH PLATE(50x6)

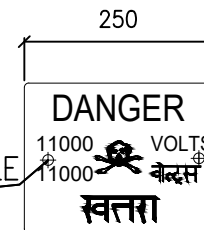
BOM OF GI ITEMS OF 11KV LINE CUT POINT 180 DEGREE							
ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (NOS.)	WT (Kg/m)	TOTAL WT./ARGMT(Kg)
1	RSJ POLE / WPB 160	150X150 MM	JOIST	11000	1	34.6/30.44	380.6/334.84
2	STRAIGHT CROSSARM BOTTOM	100X50X6 MM	CHANNEL	1200	2	9.56	11.472
3	FISH PLATE	50X6 MM	FLAT	280	8	2.36	0.661
4	STRAIGHT CROSSARM TOP	100X50X6 MM	CHANNEL	306	2	9.56	2.925
5	DANGER BOARD	250X200X6 MM	PLATE	250	2	9.42	2.355
6	BACK CLAMP FOR DANGER BOARD	25x3 MM	FLAT	510	2	0.59	0.300
7	STAY CLAMP	50x8M	FLAT	551	2	3.14	1.730
TOTAL WEIGHT FOR RSJ STRUCTURE							423.45
TOTAL WEIGHT FOR WPB 160 STRUCTURE							377.69
A	BOLT & NUTS	M16		50	1	0.134	0.134
B	BOLT & NUTS	M16		90	3	0.187	0.561
C	BOLT & NUTS	M16		200	7	0.331	2.317
D	BOLT & NUTS	M8		50	2	0.002	0.004
E	FLAT WASHER	M16			22	0.014	0.308
F	SPRING WASHER	M16			22	0.009	0.198
G	FLAT WASHER	M8			4	0.005	0.02
H	SPRING WASHER	M8			4	0.002	0.008
TOTAL WEIGHT							3.55



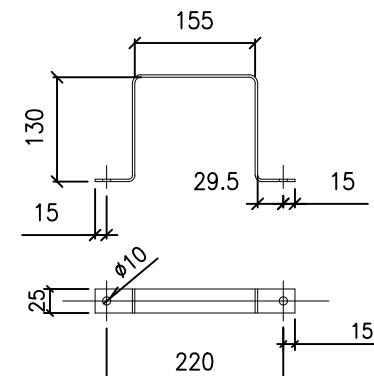
COIL EARTH PIT



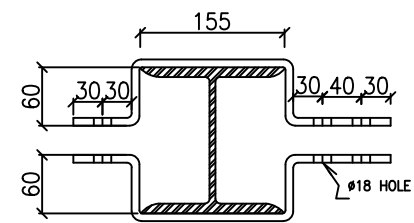
4 STRAIGHT CROSSARM TOP
(100x50x6)



5 DANGER BOARD
(250X220X3)X2NO.



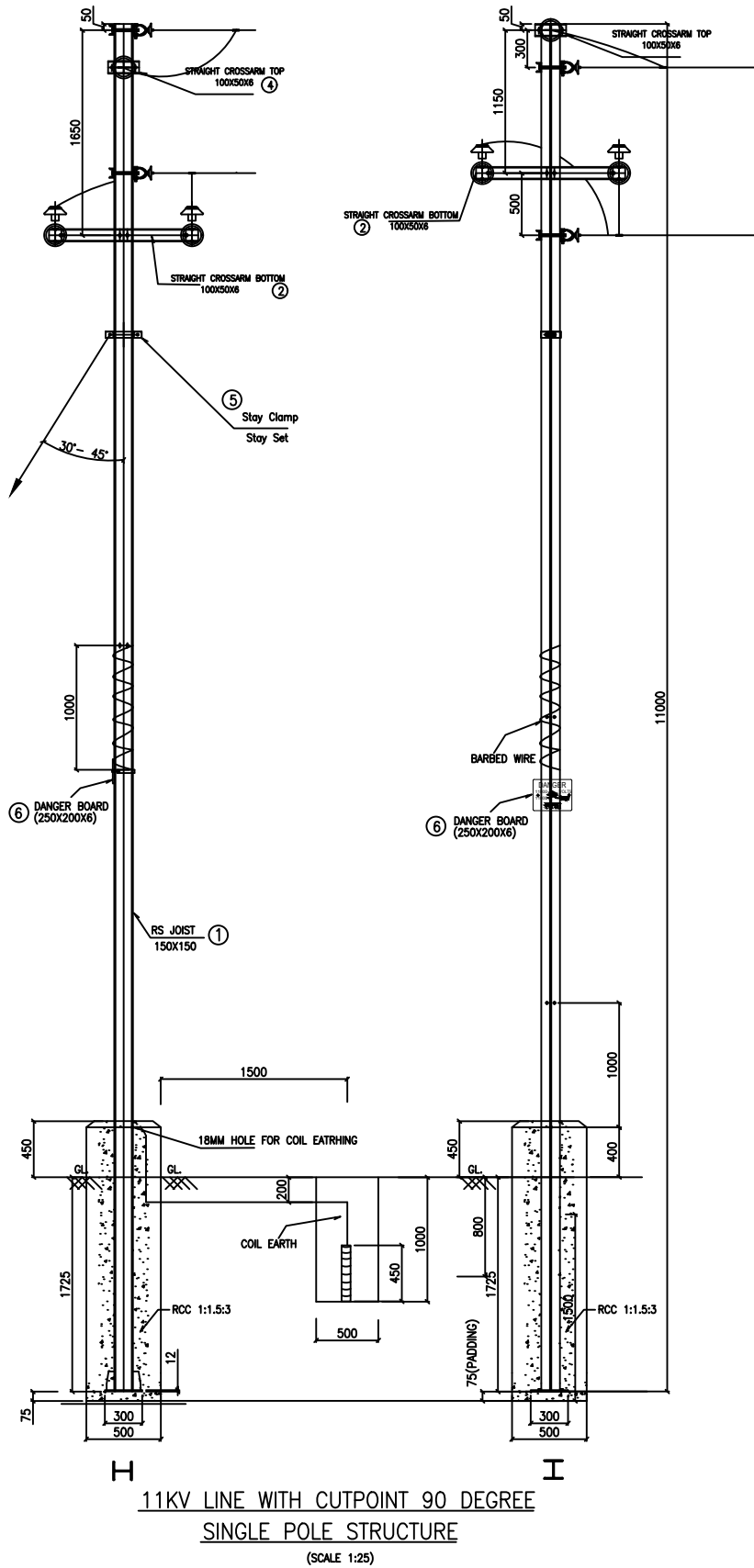
6 3R02-BACK CLAMP FOR
DANGER BOARD(25X3)



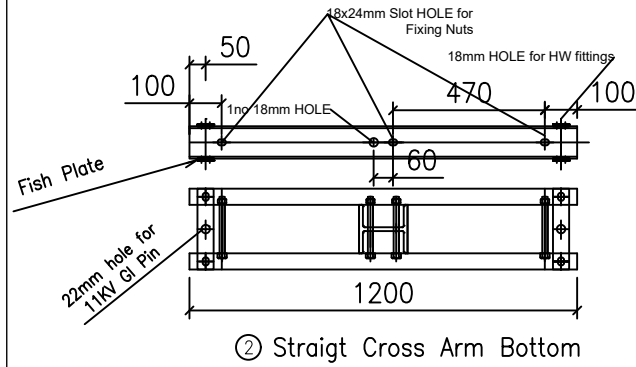
7 Stay
Clamp(50X8)

		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE SINGLE POLE CUT POINT 180 DEGREE(with 11mtr. 150x150 RSJ or WPB 160)		NAME	
SCALE : NTS		DESIGN: PHIROJ UTTARAY,E&Q	
ISSUE DT: 31/05/2021		DRAWN: J SANGRAM, E&Q	
DRAWING NO:TPCODL-MVD-0004		CHECKED: K BHARDWAJ, E&Q	
REV NO:		APPROVED: P GARG, E&Q	

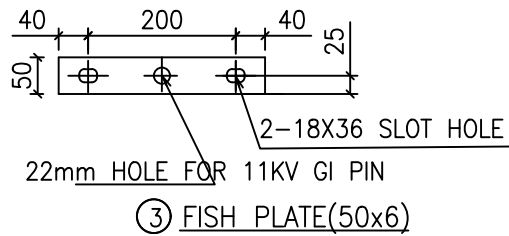
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



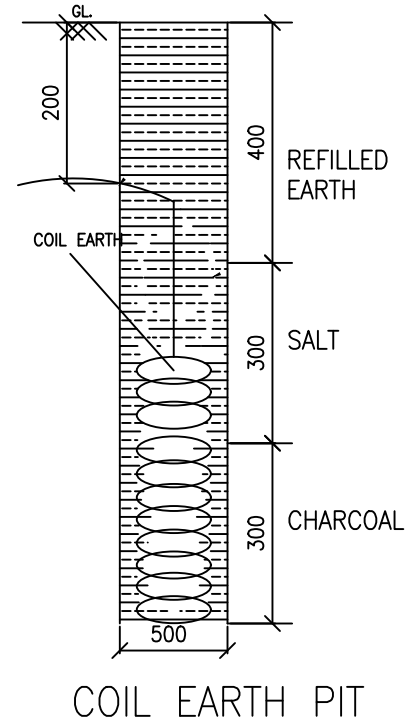
11KV LINE WITH CUTPOINT 90 DEGREE
SINGLE POLE STRUCTURE
(SCALE 1:25)



② Straight Cross Arm Bottom

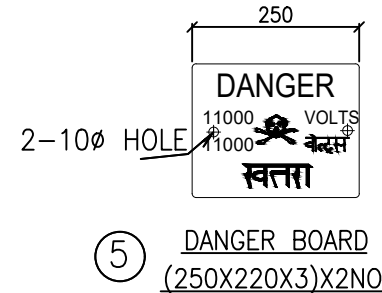


③ FISH PLATE(50x6)

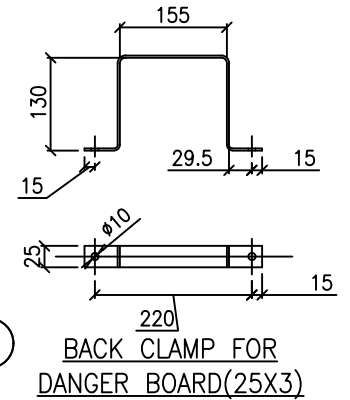


COIL EARTH PIT

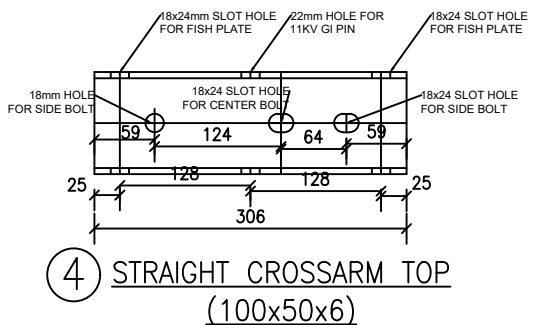
BOM OF GI ITEMS OF 11KV LINE CUT POINT 90 DEGREE								
ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGT H (mm)	QTY. (NOS.)	WT (Kg/m)	WT/ITEM(Kg)	TOTAL WT /ARGMT(Kg)
1	RSJ POLE / WPB 160	150X150 MM	JOIST	11000	1	34.6/30.44	380.6/334.84	380.6/334.84
2	STRAIGHT CROSSARM BOTTOM	100X50X6 MM	CHANNEL	1200	4	9.56	11.472	45.888
3	FISH PLATE	50X6 MM	FLAT	280	8	2.36	0.661	5.286
4	STRAIGHT CROSSARM TOP	100X50X6 MM	CHANNEL	306	4	9.56	2.925	11.701
5	DANGER BOARD	250X200X6 MM	PLATE	250	2	9.42	2.355	4.710
6	BACK CLAMP FOR DANGER BOARD	25x3 MM	FLAT	510	2	0.59	0.300	0.601
7	STAY CLAMP	50x8M	FLAT	551	2	3.14	1.730	3.460
TOTAL WEIGHT FOR RSJ STRUCTURE								452.25
TOTAL WEIGHT FOR WPB 160 STRUCTURE								406.49
A	BOLT & NUTS	M16		50	1		0.134	0.134
B	BOLT & NUTS	M16		90	3		0.187	0.561
B	BOLT & NUTS	M16		140	4		0.256	1.024
C	BOLT & NUTS	M16		200	14		0.331	4.634
D	BOLT & NUTS	M8		50	2		0.02	0.04
E	FLAT WASHER	M16		44			0.014	0.616
F	SPRING WASHER	M16		44			0.009	0.396
G	FLAT WASHER	M 8		4			0.005	0.02
H	SPRING WASHER	M 8		4			0.002	0.008
TOTAL WEIGHT								7.433



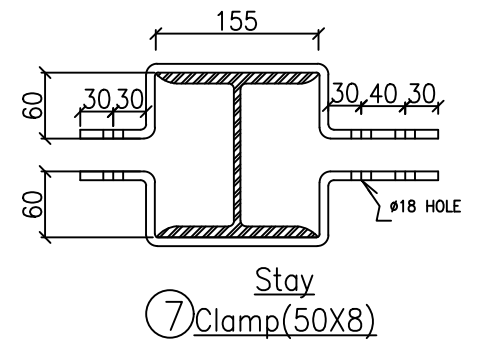
⑤ DANGER BOARD (250X220X3)X2NO.



⑥ BACK CLAMP FOR DANGER BOARD(25X3)



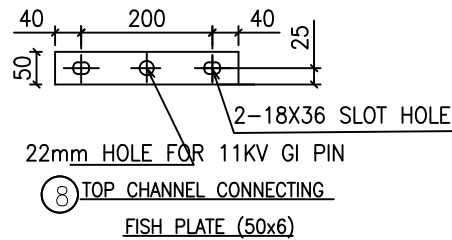
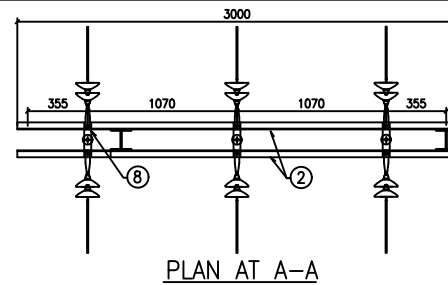
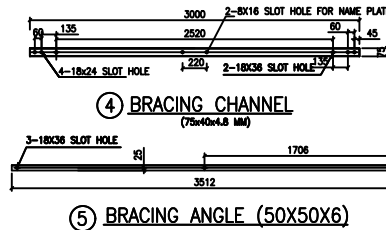
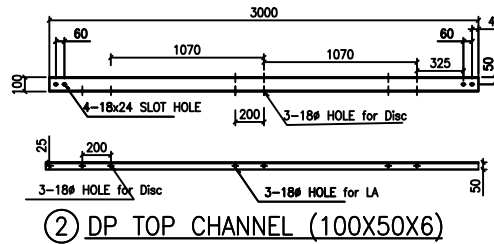
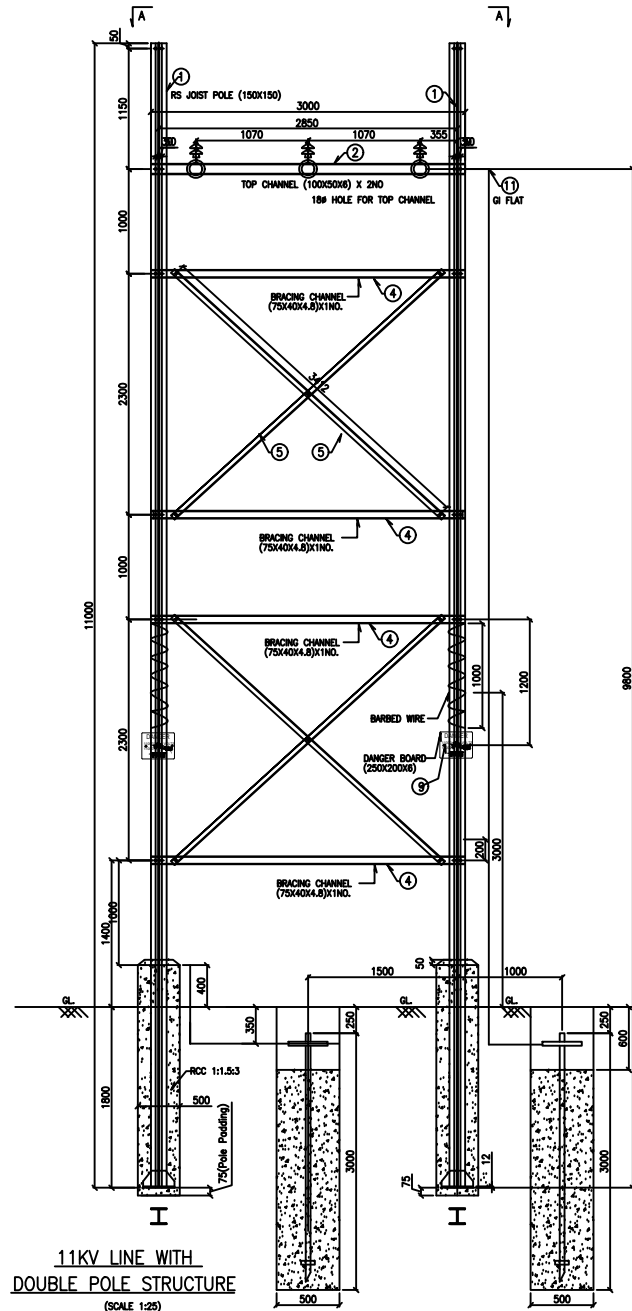
④ STRAIGHT CROSSARM TOP (100x50x6)



⑦ Stay Clamp(50X8)

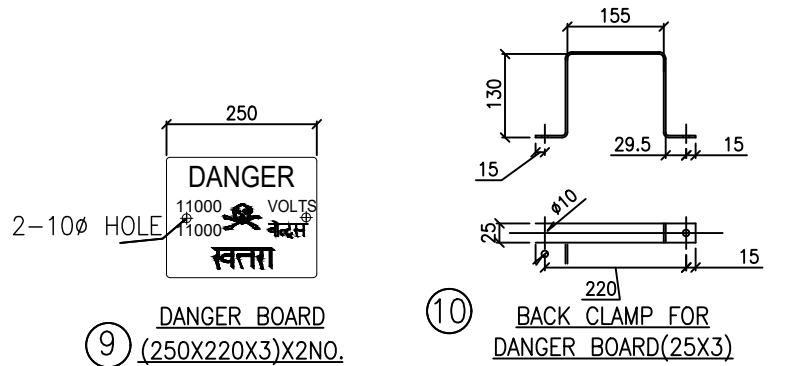
TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE SINGLE POLE CUT POINT 90 DEGREE(with 11mtr. 150x150 RSJ or WPB 160)		NAME PHIROJ UTTARAY,E&Q	
SCALE : NTS		DESIGN: J SANGRAM, E&Q	
ISSUE DT: 31/05/2021		DRAWN: K BHARDWAJ, E&Q	
DRAWING NO:TPCODL-MVD-0005 REV NO:		CHECKED: P GARG, E&Q	
APPROVED:		APPROVED:	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



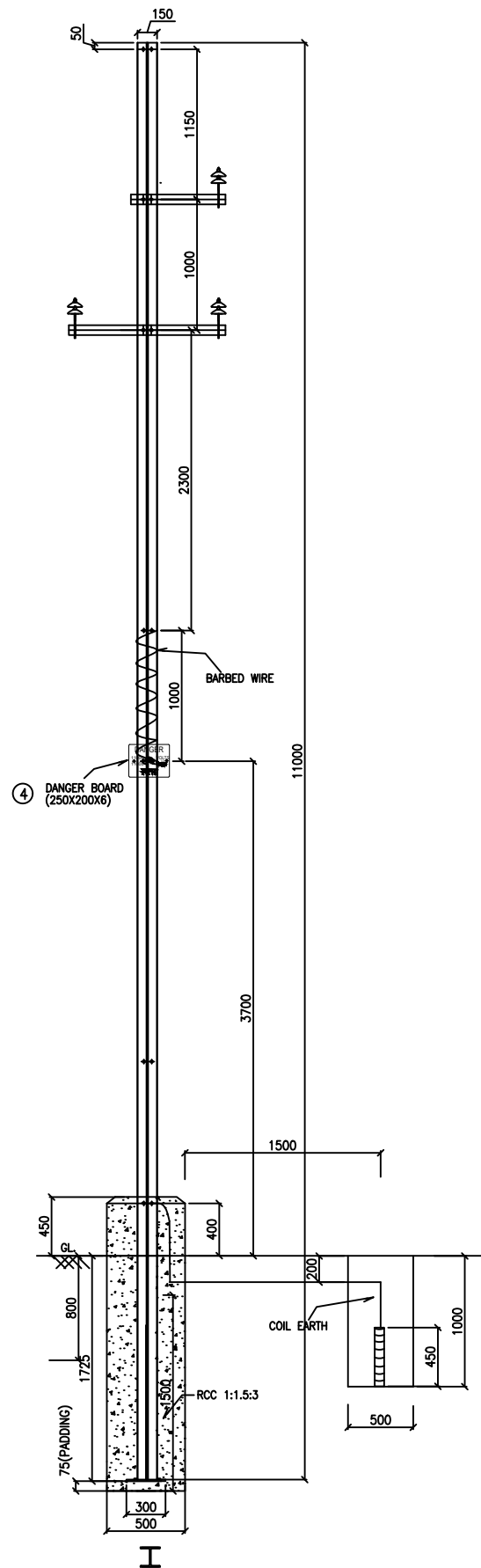
BOM OF GI ITEMS OF 11KV INTERPOSING LINE DP FOR EXISTING 9 MTR 11KV LINE

ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (NOS.)	WT (Kg/m)	WT/ITEM(Kg)	TOTAL WT /ARGMT(Kg)
1	RSJ POLE / WPB 160	150X150 MM	JOIST	11000	2	34.6/30.44	380.6/334.84	761.2/669.68
2	DP TOP CHANNEL	100X50X6 MM	CHANNEL	3000	2	9.56	28.68	57.36
4	BRACNG CHANNEL	75X40X4.8 MM	CHANNEL	3000	4	7.14	21.42	85.68
5	BRACING ANGLE	50X50X6 MM	ANGLE	3512	4	4.50	15.80	63.216
8	FISH PLATE	50X6 MM	PLATE	280	6	2.36	0.66	3.96
9	DANGER BOARD	250X200X6 MM	PLATE	250	2	9.42	2.36	4.71
10	BACK CLAMP FOR DANGER BOARD	25x3 MM	FLAT	510	2	0.59	0.30	0.60
11	GI Flat	40x6 MM	FLAT	13000	1	1.90	5.32	24.70
12	PIPE EARTH		PIPE	3000	2			
TOTAL WEIGHT FOR RSJ STRUCTURE								1001.43
TOTAL WEIGHT FOR WPB 160 STRUCTURE								852.55
A	BOLT & NUTS	M16		50	40		0.134	5.36
B	BOLT & NUTS	M16		140	6		0.256	1.536
C	BOLT & NUTS	M16		200	0		0.331	0
D	BOLT & NUTS	M8		50	4		0.026	0.104
E	FLAT WASHER	M16			84		0.014	1.176
F	SPRING WASHER	M16			84		0.009	0.756
G	FLAT WASHER	M8			12		0.005	0.06
H	SPRING WASHER	M8			12		0.002	0.024
TOTAL WEIGHT								9.016



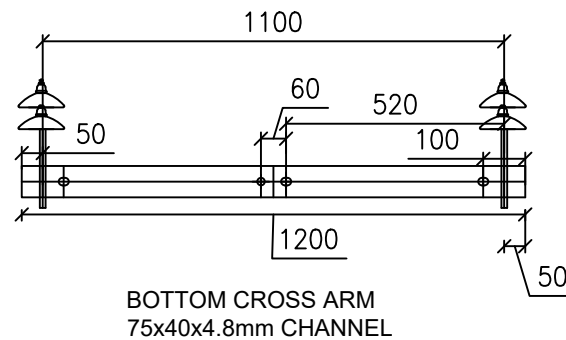
TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV INTERPOSING LINE DP FOR EXISTING 9MTR 11KV LINE		NAME	
		DESIGN:	PHIROJ UTTARAY,E&Q
		DRAWN:	J SANGRAM, E&Q
		CHECKED:	K BHARDWAJ, E&Q
		APPROVED:	P GARG, E&Q
SCALE :	NTS	ISSUE DT:	31/05/2021
		DRAWING NO:TPCODL-MVD-0007 REV NO:	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)

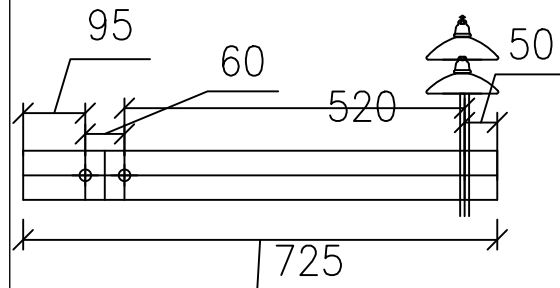


11KV SINGLE POLE CANTELEVER ARRANGEMENT FOR EXST. 9 MTR CKT LINE

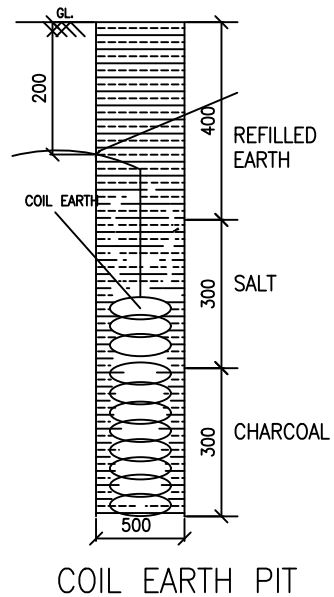
(SCALE 1:25)



BOTTOM CROSS ARM
75x40x4.8mm CHANNEL

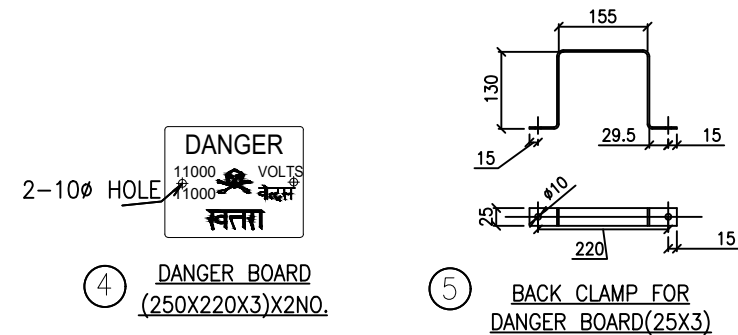


TOP CROSS ARM
75x40x4.8mm CHANNEL



COIL EARTH PIT

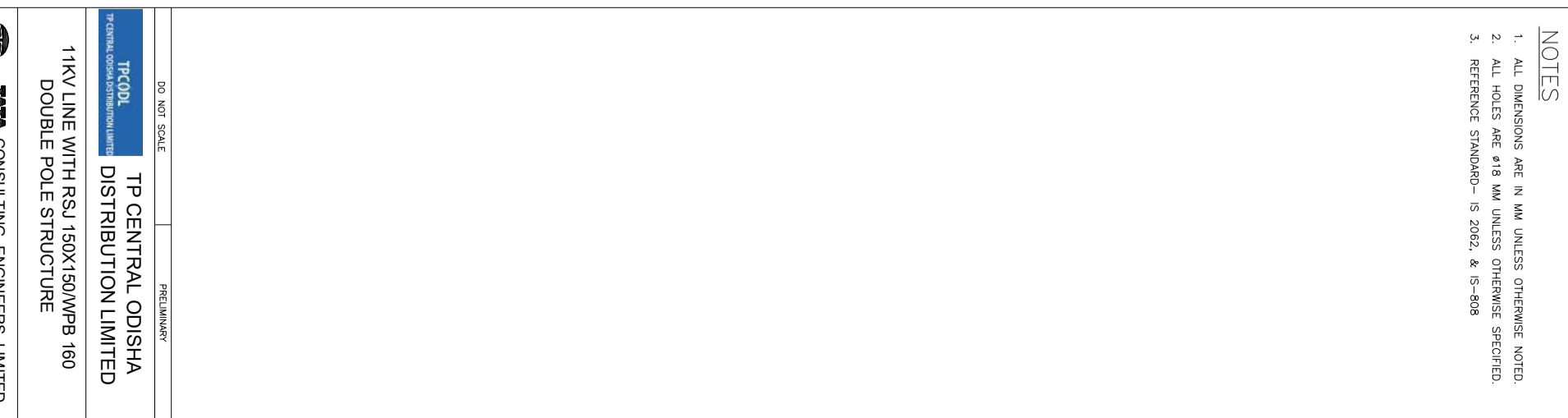
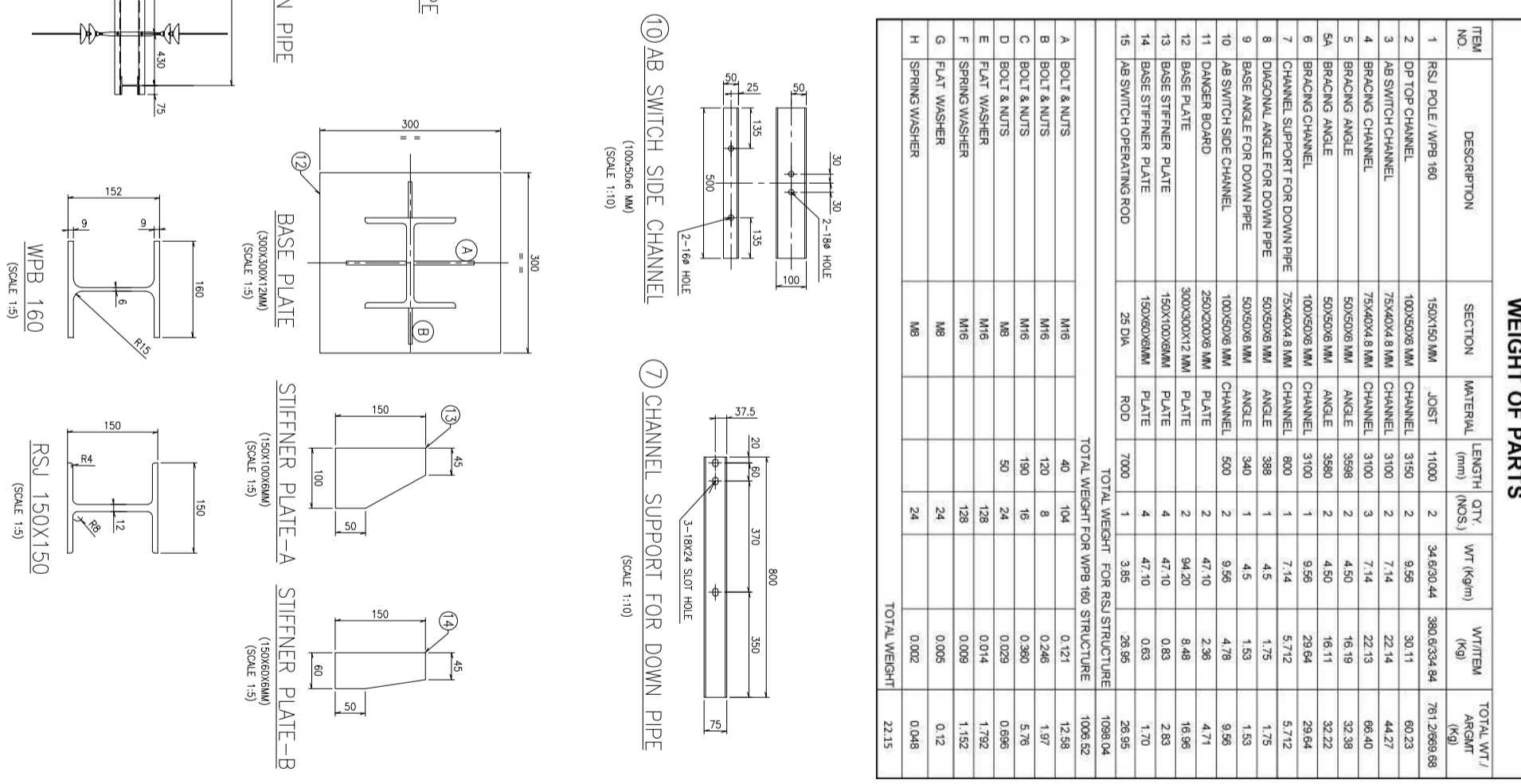
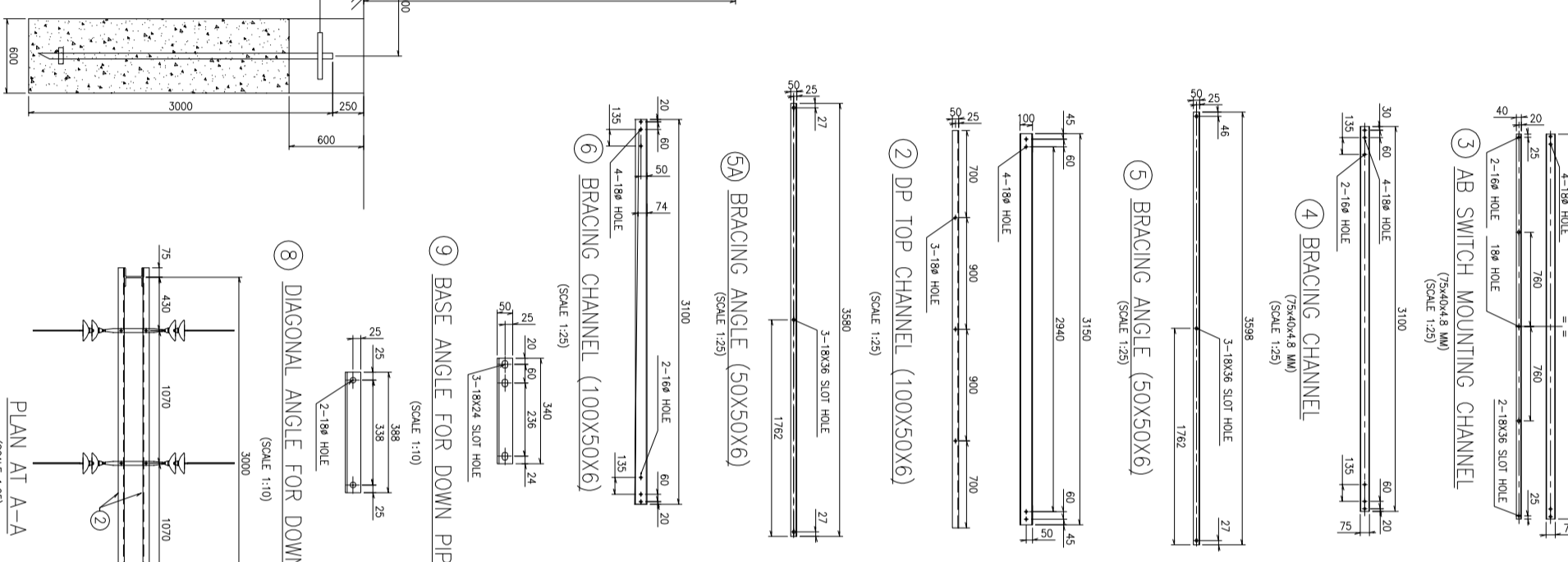
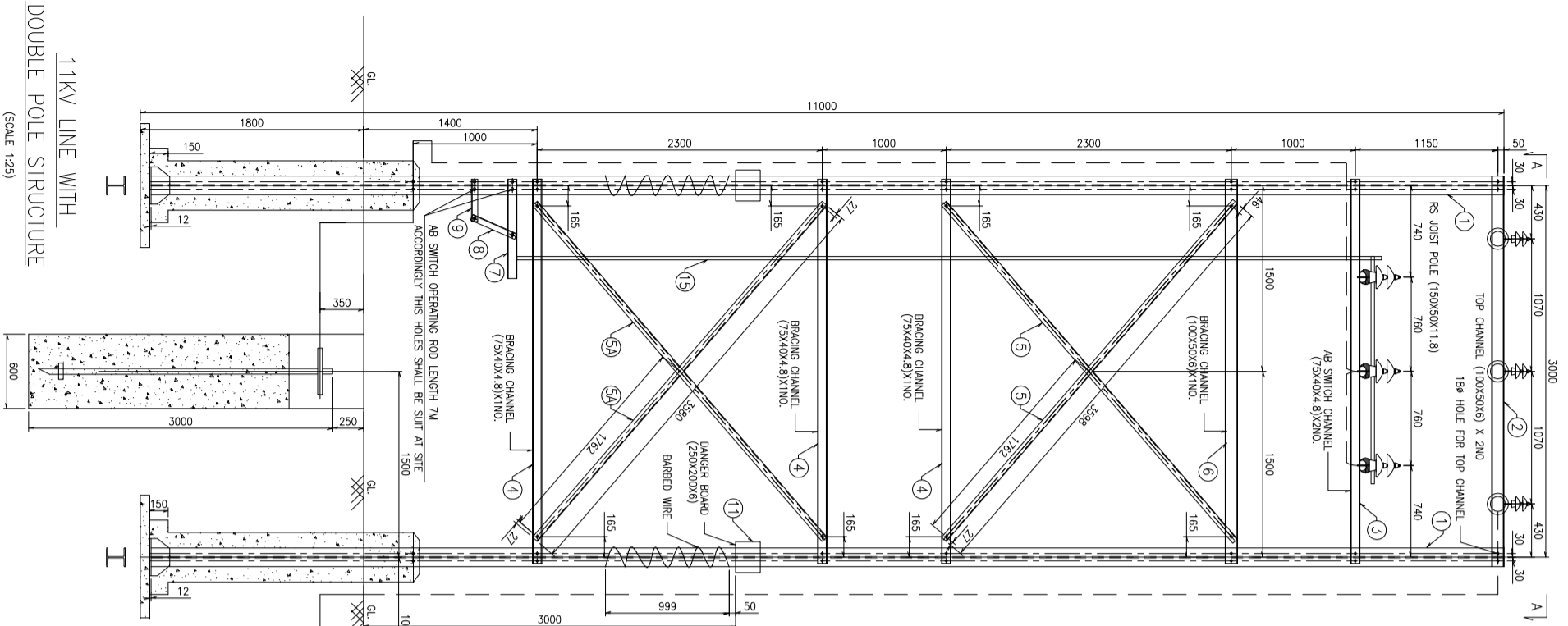
BOM OF GI ITEMS FOR LINE POLE ON EXISTING 9MTR 11KV LINE								
ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (NOS.)	WT (Kg/m)	WT/ITEM(Kg)	TOTAL WT./ARGMT(Kg)
1	RSJ POLE / WPB 160	150X150 MM	JOIST	11000	1	34.6/30.44	380.6/334.84	380.6/334.84
2	BOTTOM CROSSARM	75X40X4.8 MM	CHANNEL	1200	1	7.14	8.568	8.568
3	TOP CROSS ARM	75X40X4.8 MM	CHANNEL	725	1	7.14	5.177	5.177
4	DANGER BOARD	250X200X6 MM	PLATE	250	1	9.42	2.355	2.355
5	BACK CLAMP FOR DANGER BOARD	25x3 MM	FLAT	510	1	0.59	0.300	0.300
TOTAL WEIGHT FOR RSJ STRUCTURE								397.00
TOTAL WEIGHT FOR WPB 160 STRUCTURE								351.24
A	BOLT & NUTS	M16		50	5		0.134	0.67
B	BOLT & NUTS	M16		120	0		0.229	0
C	BOLT & NUTS	M8		50	2		0.02	0.04
D	FLAT WASHER	M16			10		0.014	0.14
E	SPRING WASHER	M16			10		0.009	0.09
F	FLAT WASHER	M8			4		0.005	0.02
G	SPRING WASHER	M8			4		0.002	0.008
TOTAL WEIGHT								0.968



④ DANGER BOARD
(250X220X3)X2NO.

⑤ BACK CLAMP FOR
DANGER BOARD(25X3)

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV INTERPOSING POLE HAVING CANTELEVER ARRANGEMENT FOR 9MTR EXISTING 11KV LINE		NAME	
SCALE : NTS		DESIGN:	PHIROJ UTTARAY,E&Q
ISSUE DT: 31/05/2021		DRAWN:	J SANGRAM, E&Q
		CHECKED:	K BHARDWAJ, E&Q
		APPROVED:	P GARG, E&Q
		DRAWING NO:TPCODL-MVD-0006 REV NO:	

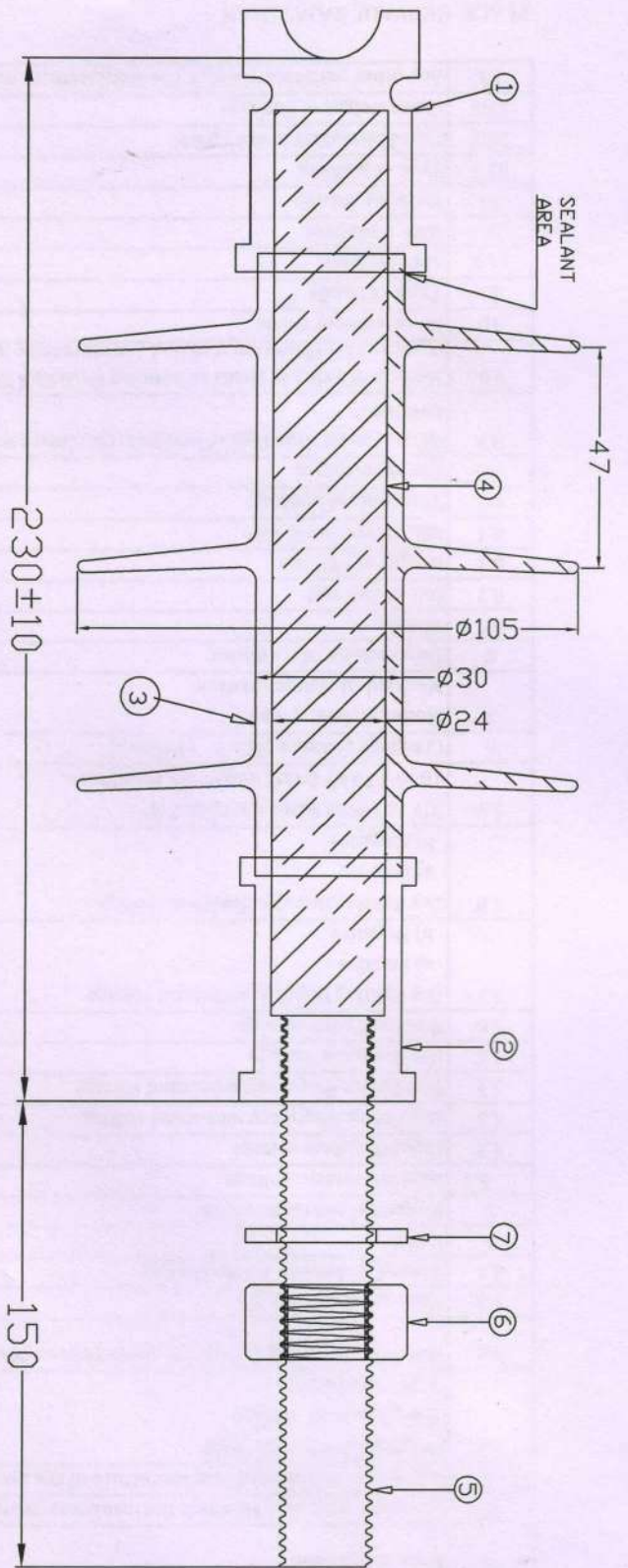


NOTES
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
2. ALL HOLES ARE Ø18 MM UNLESS OTHERWISE SPECIFIED.
3. REFERENCE STANDARD— IS 2062, & IS-808

ITEM NO.	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY (NOS.)	WT (kg/m)	WT/ITEM (kg)	TOTAL WT./ASGMT (kg)
1	RSJ POLE / WPB 160	150X150 MM	JOIST	11000	2	34.6/30.44	380.6/334.94	761.2/699.68
2	DP TOP CHANNEL	100X50X6 MM	CHANNEL	3150	2	9.56	30.11	60.23
3	AB SWITCH CHANNEL	75X40X4.8 MM	CHANNEL	3100	2	7.14	22.14	44.27
4	BRACING CHANNEL	75X40X4.8 MM	CHANNEL	3100	3	7.14	22.13	66.40
5	BRACING ANGLE	50X50X6 MM	ANGLE	3598	2	4.50	16.19	32.38
5A	BRACING ANGLE	50X50X6 MM	ANGLE	3598	2	4.50	16.11	32.22
6	BRACING CHANNEL	75X40X4.8 MM	CHANNEL	3100	1	9.56	29.64	29.64
7	CHANNEL SUPPORT FOR DOWN PIPE	100X50X6 MM	CHANNEL	800	1	7.14	5.712	5.712
8	DIAGONAL ANGLE FOR DOWN PIPE	50X50X6 MM	ANGLE	388	1	4.5	1.75	1.75
9	BASE ANGLE FOR DOWN PIPE	50X50X6 MM	ANGLE	340	1	4.5	1.53	1.53
10	AB SWITCH SIDE CHANNEL	100X50X6 MM	CHANNEL	500	2	9.56	4.78	9.56
11	DANGER BOARD	250X200X6 MM	PLATE	2	47.10	2.36	4.71	4.71
12	BASE STIFFENER PLATE	300X300X12 MM	PLATE	2	94.20	8.48	16.96	16.96
13	BASE STIFFENER PLATE	150X100X6MM	PLATE	4	47.10	0.83	2.83	2.83
14	DIAGONAL ANGLE FOR DOWN PIPE	150X50X6MM	PLATE	4	47.10	0.63	1.70	1.70
15	AB SWITCH OPERATING ROD	25 DIA	ROD	7000	1	3.85	26.95	26.95
TOTAL WEIGHT FOR WPB 160 STRUCTURE							1098.04	
TOTAL WEIGHT FOR RSJ STRUCTURE							26.95	

DO NOT SCALE
PRELIMINARY
TP CENTRAL ODISHA DISTRIBUTION LIMITED
11KV LINE WITH RSJ 150X150/WPB 160 DOUBLE POLE STRUCTURE
MUMBAI
TATA CONSULTING ENGINEERS LIMITED

FOR RO ISSUE ONLY	CLEAR	ISSUE	REVISIONS	DRN	CLEAR	APPD	DATE	ISSUE	REVISIONS	DRN	CLEAR	APPD	DATE	ISSUE	FILE NAME :
DISC	SIGNATURE	DATE			CIVIL/ELEC	I&C	MECH				CIVIL/ELEC	I&C	MECH		TP CENTRAL ODISHA DISTRIBUTION LIMITED
CIVIL															TP CENTRAL ODISHA DISTRIBUTION LIMITED
ELEC															TP CENTRAL ODISHA DISTRIBUTION LIMITED
I&C															TP CENTRAL ODISHA DISTRIBUTION LIMITED
MECH															TP CENTRAL ODISHA DISTRIBUTION LIMITED



TECHNICAL CHARACTERISTICS

DIMENSIONS :

1. CREEPAGE DISTANCE (Minimum)	320 mm
2. ARcing DISTANCE	165 mm
3. No of $\phi 105$ mm SHEDS	3 SHEDS

MECHANICAL CHARACTERISTICS :

1. SPECIFIED MECHANICAL LOAD	5KN
------------------------------	-----

ELECTRICAL CHARACTERISTICS :

1. NORMAL SYSTEM VOLTAGE	11KV
2. HIGHEST SYSTEM VOLTAGE	12KV
3. SYSTEM FREQUENCY	50HZ
4. WET 1 MINUTE POWER FREQUENCY WITHSTAND VOLTAGE(MIN)	35KV(rms)
5. DRY 1 MINUTE POWER FREQUENCY WITHSTAND VOLTAGE(MIN)	50KV(rms)
6. DRY LIGHTNING IMPULSE WITHSTAND VOLTAGE(MIN)	75KVP
7. VISIBLE DISCHARGE TEST VOLTAGE	9KV(rms)

NOTES :

- 1. INSULATORS CONFORMS TO IEC61109
- 2. GALVANISATION CONFORMS TO IS2633
- 3. DIMENSION TOLERANCE : AS PER IEC 61109/SPECIFICATION

ALL DIMENSIONS ARE IN 'mm'

ITEM	DESCRIPTION	MATERIAL	QTY	REMARKS
1	UPPER FITTING	SGCI	1	
2	LOWER FITTING	SGCI	1	
3	HOUSING	SILICONE RUBBER	--	
4	CORE	FRP ROD	1	
5	STUD	M.S.	1	
6	NUT M-20	M.S./FORGED	1	
7	WASHER M-20	M.S./FORGED	1	

Drawn by	NAME	SIGNATURE	ADINATH INDUSTRIES
Checked by			
App'd by			
QA			

PROJECTION:	
DRG NO.	AD-11KV-SKN-PIN-24
SCALE:	1:1
DATE:	09/04/2019
SHEET	1 OF 1



ADINATH INDUSTRIES
 ADDRESS: E-45 (G-2), RITOD INDUSTRIAL AREA, KHUSHKHERA, BHILWADI, ALWAR (Raj.), RAJASTHAN
 TITLE: 11KV SKN COMPOSITE POLYMER PIN INSULATOR
 A4

GUARANTEED TECHNICAL PARTICULARS.

COMPOSITE INSULATOR UNIT

11KV(5KN)

Sr.No	Parameter Name	Parameter type
1	Type of insulator	11KV 5KN Composite Polymer Pin Insulator
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	
3.1	Material of core (FRP rod) i) E-glass or ECR-glass ii) Boron content	ECR Glass Boron free
3.2	Material of housing & weather sheds (Silicon content by weight)	Silicone rubber. Minimum 30 % silicone Content by weight.
3.3	Material of end fittings	SGCI
3.4	Sealing compound for end fitting	Silicone sealant
4	Colour	Grey
5	Electrical characteristics	
5.1	Nominal system voltage KV (rms)	11
5.2	Highest system voltage KV (rms)	12
5.3	Dry Power frequency withstand voltage KV (rms)	70
5.4	Wet Power frequency withstand voltage KV (rms)	35
5.5	Dry flashover voltage KV (rms)	>70
5.6	Wet flash over voltage KV (rms)	>35
5.7	Dry lighting impulse withstand voltage a) Positive KV (peak) b) Negative KV (peak)	75 75
5.8	Dry lighting impulse flashover voltage a) Positive KV (peak) b) Negative KV (peak)	95 95
5.9	RIV at 1 MHz when energized at 10 kV/ 30 kV (rms) under dry condition Micro volts	Less than 100
6	Creepage distance (Min.) (320mm) (mm)	320
7	Minimum failing load Mechanical characteristics: KN	5
8	Dimensions of insulator	
8.1	Weight Kg	0.95(Approx)
8.2	Dia. of FRP rod: mm	24
8.3	Length of FRP rod mm	198
8.4	Dia. of weather sheds mm	105
8.5	Thickness of housing mm	3
8.6	Dry arc distance mm	165
8.7	Dimensioned drawings of insulator (including weight with tolerances in weight) enclosed.	Yes
9.0.	Method of fixing of sheds to housing (Specify): Single mould or Modular construction (Injection molding / compression molding)	Single mould./Injection molding
10	No of weather sheds	3
11	Type of sheds	
11.1	Aerodynamic	Yes
11.2	With underribs	No
12	Packing details	
12.1	Type of packing	Corrugated box.
12.2	No. of insulators in each pack	24
12.3	Gross weight of package Kg	23 (Approx)
13	Any other particulars which the Manufacturer may like to give	No

PLACE: BHIWADI, RAJASTHAN

SIGNATURE

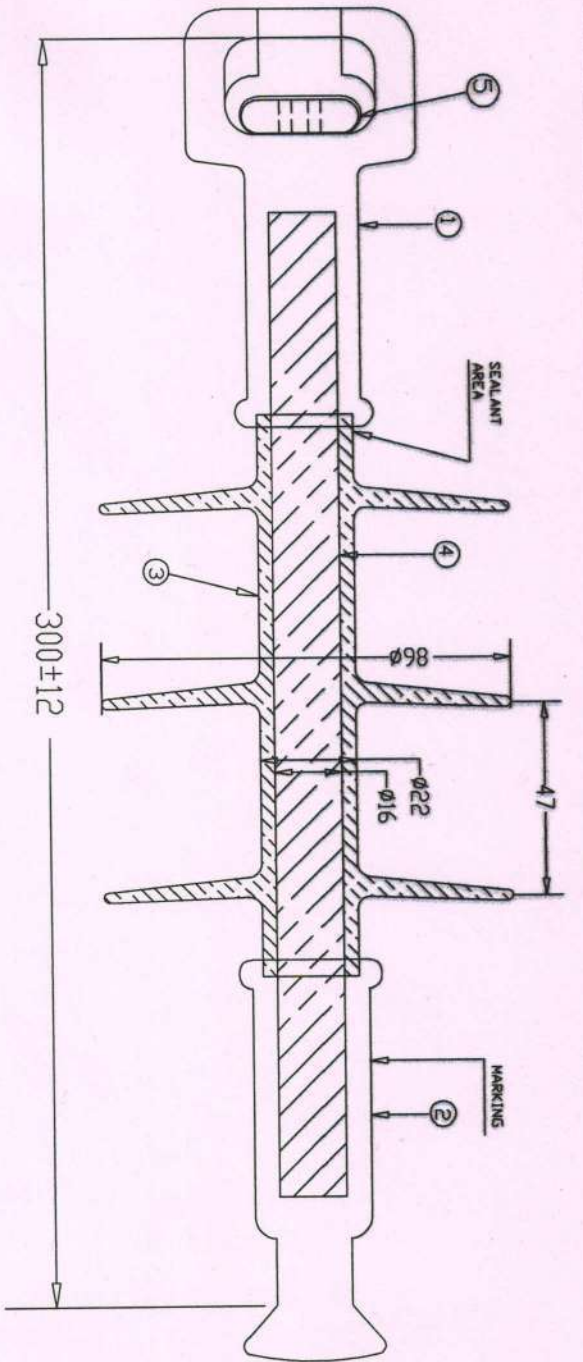
NAME IN FULL : KAMALESH SARKAR

DESIGNATION/ STATUS IN THE FIRM
TECHNICAL MANAGER

COMPANY SEAL

Kamalesh Sarkar





ALL DIMENSIONS ARE IN 'mm'

TECHNICAL CHARACTERISTICS

DIMENSIONS :

1. CREEPAGE DISTANCE (Minimum)	320 mm
2. ARcing DISTANCE (Minimum)	165 mm
3. No of Ø98mm SHEDS	3 SHEDS

MACHANICAL CHARACTERISTICS :

1. SPECIFIED MECHANICAL LOAD	70KN
2. ROUTINE TEST LOAD	35KN

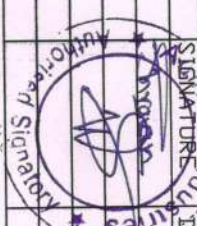
ELECTRICAL CHARACTERISTICS :

1. NORMAL SYSTEM VOLTAGE	11kV
2. HIGHEST SYSTEM VOLTAGE	12kV
3. SYSTEM FREQUENCY	50HZ
4. WET 1 MINUTE POWER FREQUENCY WITHSTAND VOLTAGE(MIN)	35kV(rms)
5. DRY 1 MINUTE POWER FREQUENCY WITHSTAND VOLTAGE(MIN)	50kV(rms)
6. DRY LIGHTNING IMPULSE WITHSTAND VOLTAGE(MIN)	75kV
7. VISIBLE DISCHARGE TEST VOLTAGE	9kV(rms)

NOTES :

- INSULATORS CONFORMS TO IEC:61109
- GALVANISATION CONFORMS TO IS:2633
- DIMENSION TOLERANCE : AS PER IEC 61109

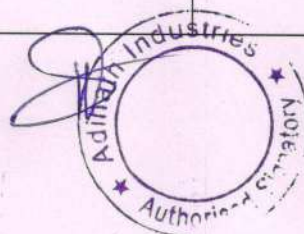
ITEM	DESCRIPTION	MATERIAL	QTY	REMARKS
1	SOCKET FITTING	SGCI/MCI/FORGED	1	
2	BALL FITTING	SGCI/MCI/FORGED	1	
3	HOUSING	SILICONE RUBBER	--	
4	CORE	FRP ROD	1	
5	W-CLIP	S.S	1	

Drawn by	Checked by	App'd by	QA
			
NAME	SIGNATURE	DATE	
ADINATH INDUSTRIES			
ADDRESS	E-45 (G-2), RITCO INDUSTRIAL AREA, KHUSHKHERA, BHIVADI, ALVAROIS, RAJASTHAN		
TITLE	11 kV 70KN COMPOSITE POLYMER INSULATOR (GRS)		
DRG NO.	AD-11KV-70KN-INS	Rev: No	0
SCALE: 01	DATE: 01/08/2015		SHEET 1 OF 1



**GUARANTEED TECHNICAL PARTICULARS OF 11 KV
POLYMER DISC INSULATORS B&S TYPE**

Sl. No.	Description	11KV(70 kN)
1.	Name of Manufacturer:.	Adinath Industries
2.	Address:	
	(a) registered Office:	31 Rajendra Park, New Delhi
	(b) Factory:	E-45(G2), RIICO Industrial Area, Khushkhera, Bhiwadi – 301019, Dist.Alwar (Rajasthan)
3.	Type of Insulators	Polymeric Disc(B&S)
4.	Standard specification to which the Insulators manufactured	IEC:61109
5.	Name of material used in manufacture of the Insulator (with class / grade)	
(a)	Material of core rod	ECR Glass Boron free
(b)	Material of Housing & weather sheds (silicon content by weight)	Silicone rubber. Minimum 30 % silicone Content by weight.
(c)	Material of end fittings	SGCI
(d)	Sealing compound for end fitting	Silicone sealant
6.	Colour of Insulator	Gray
7.	Electrical Characteristics:	
(a)	Nominal system Voltage (KV rms)	11
(b)	Highest System Voltage (KV rms)	12
(c)	Dry power frequency withstand (KV rms)	50
(d)	Wet power frequency withstand (KV rms)	35
(e)	Dry flash over voltage (KV rms)	>50
(f)	Wet flash over voltage (KV rms)	>35
(g)	Dry lighting impulse withstand voltage	
	(a) Positive	75
	(b) Negative	75
(h)	Dry lighting impulse flashover voltage	
	(a) Positive (KV peak)	>75
	(b) Negative (KV peak)	>75
(i)	RIV at 1 MHz when energized at 10kV /30 kV(rms) under dry condition (microvolt)	Less than 100



(j)	Creepage distance (min) mm	320
8.	Mechanical Characteristics:	
	Minimum failing load (KN)	70
9.	Dimensions of Insulator:	
i.	Weight (Kg.)	1.0(Approx.)
ii.	Dia of FRP rod (mm)	16
iii.	Length of FRP rod (mm)	232
iv.	Dia of weather sheds (mm)	98
v.	Thickness of housing (mm)	3
vi.	Dry arc distance (mm)	165
10.	Dimensioned drawings of Insulator (including weight with	Yes
11.	Method of fixing of sheds to housing specify):- single mould or	Single mould.
12.	No. of weather sheds	3
13.	Type of sheds	
	(i) Aerodynamic	Yes
	(ii) With under ribs	No
14.	Packing details	
	(a) Type of packing.	Corrugated box.
	(b) No. of Insulators in each pack	24
	(c) Gross weight of package	24.0 Kgs(Approx.)
15.	Any other particulars which the bidder may like to give.	No

PLACE: NEW DELHI

DATE : 14.09.2016



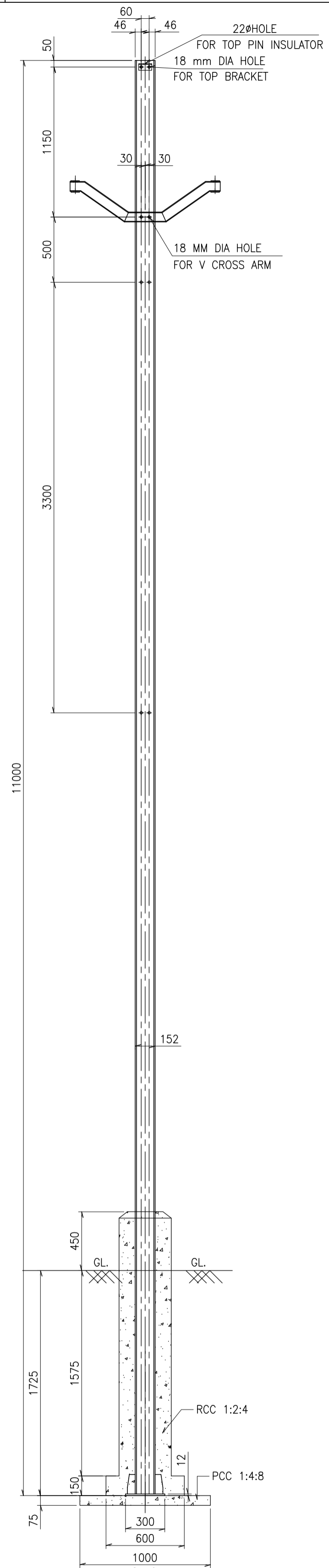
SIGNATURE OF TENDERER

NAME IN FULL : PARDEEP KUMAR

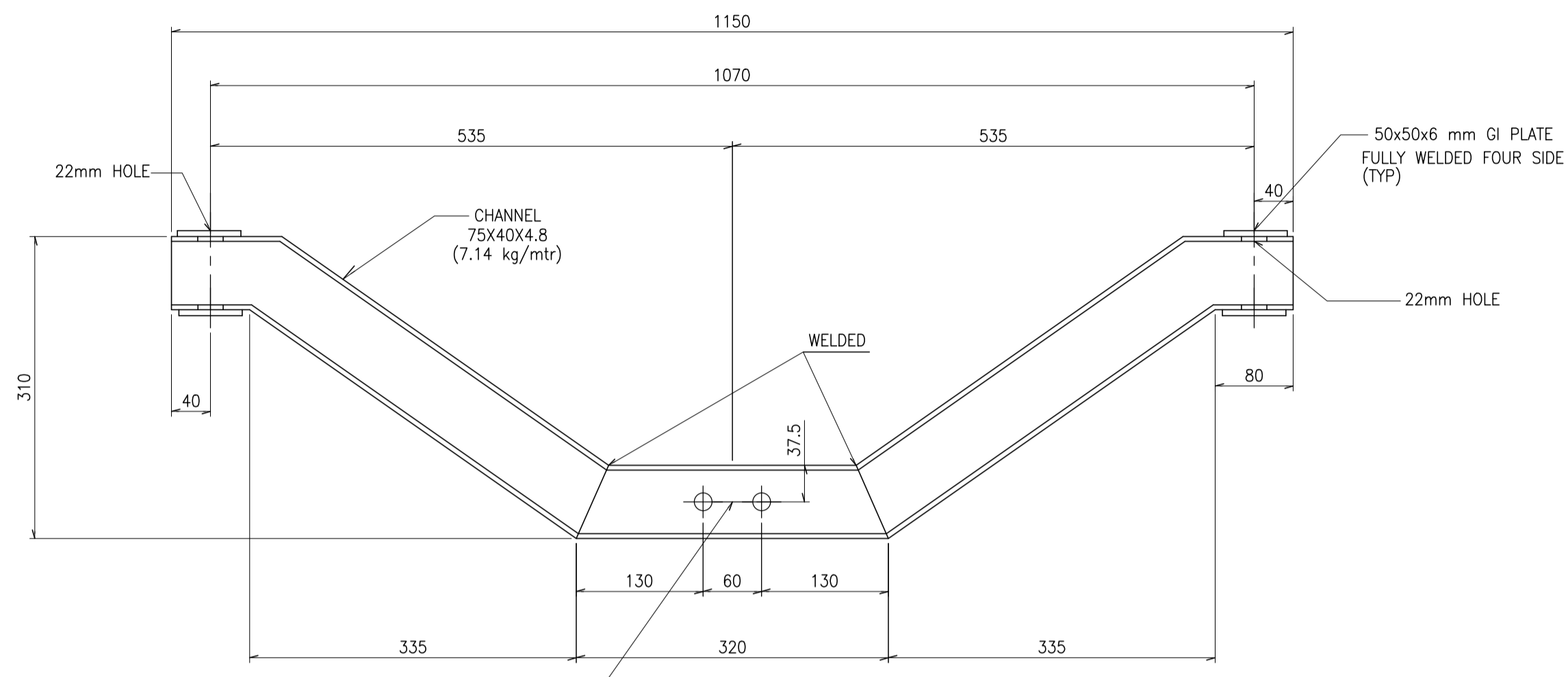
DESIGNATION/ STATUS IN THE FIRM

SR. MANAGER (TENDER DEPT.)

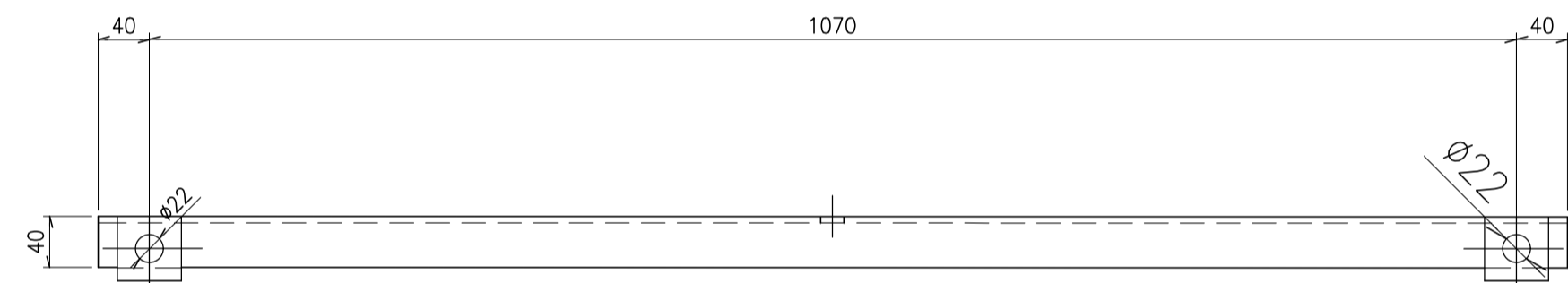
COMPANY SEAL



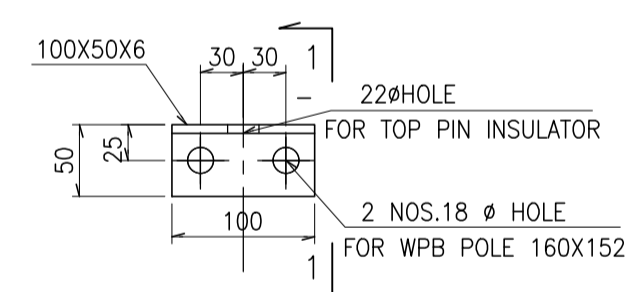
11KV LINE WITH WPB 160X152 SINGLE POLE STRUCTURE (SCALE 1:25)



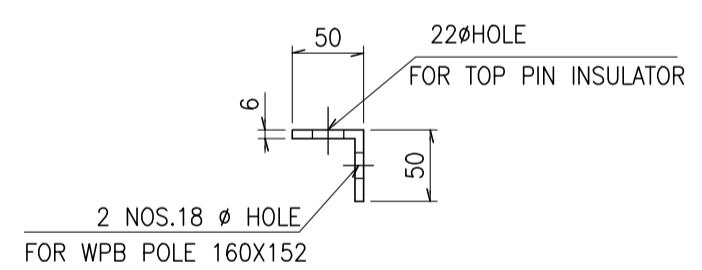
ELEVATION (SCALE 1:5)



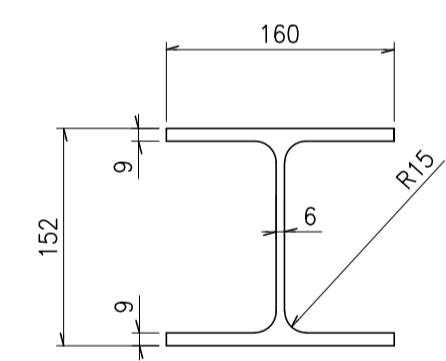
PLAN 11KV V-CROSS ARM(75x40x4.8) (SCALE 1:5)



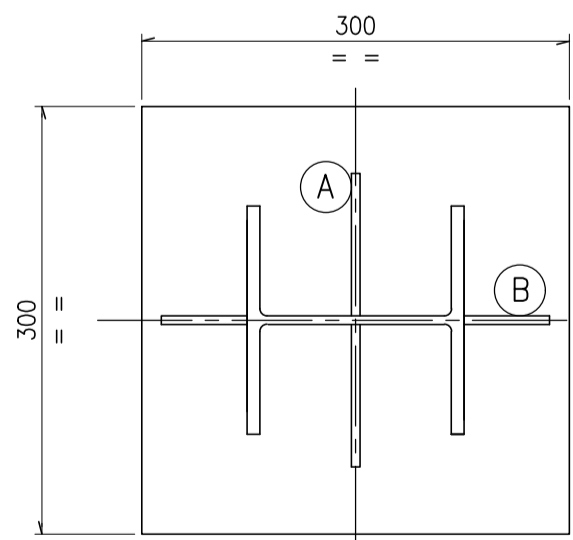
POLE TOP BRACKET (SCALE 1:5)



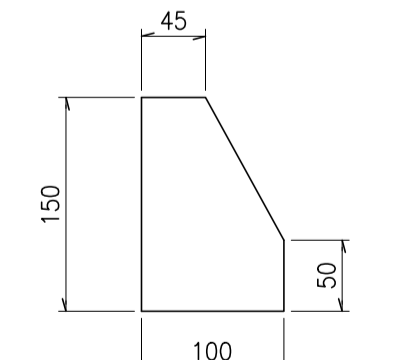
SECTION 1-1 (SCALE 1:5)



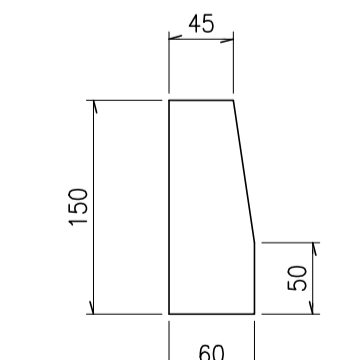
WPB 160 (SCALE 1:5)



BASE PLATE (300X300X12MM) (SCALE 1:5)



STIFFENER PLATE-A (150X100X6MM) (SCALE 1:5)



STIFFENER PLATE-B (150X60X6MM) (SCALE 1:5)

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
2. ALL HOLES ARE ϕ 18 MM UNLESS OTHERWISE SPECIFIED.
3. REFERENCE STANDARD- IS 2062, & IS-808

DO NOT SCALE PRELIMINARY
 TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED

11KV LINE WITH WPB 160X152 SINGLE POLE STRUCTURE

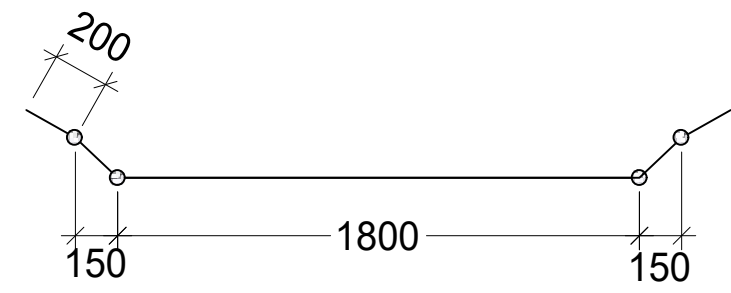
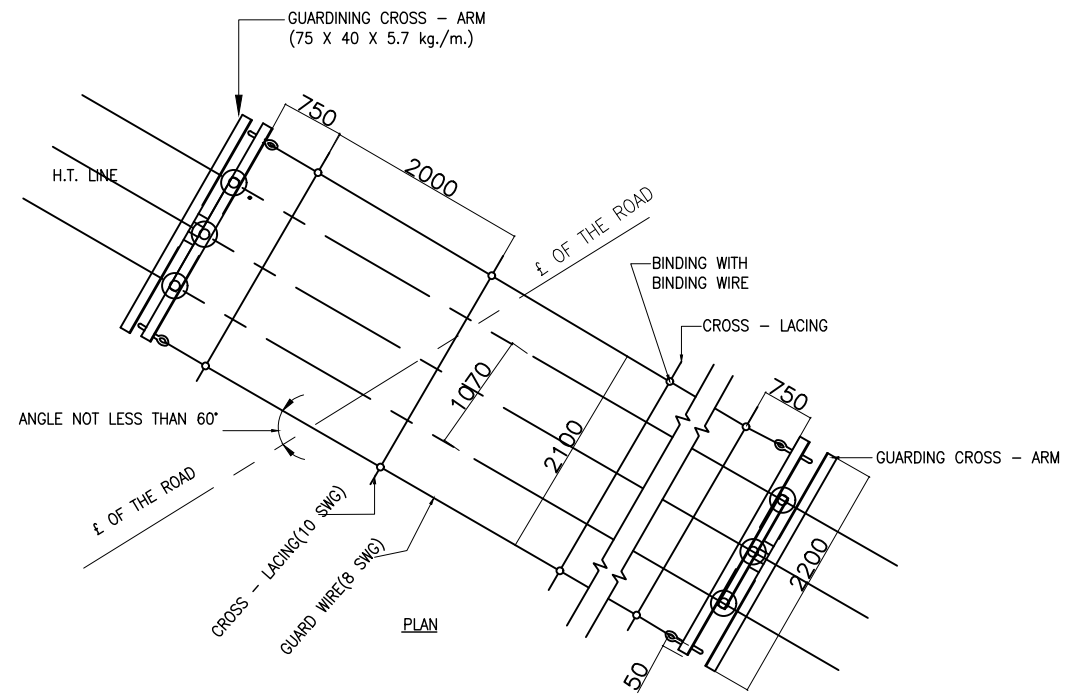
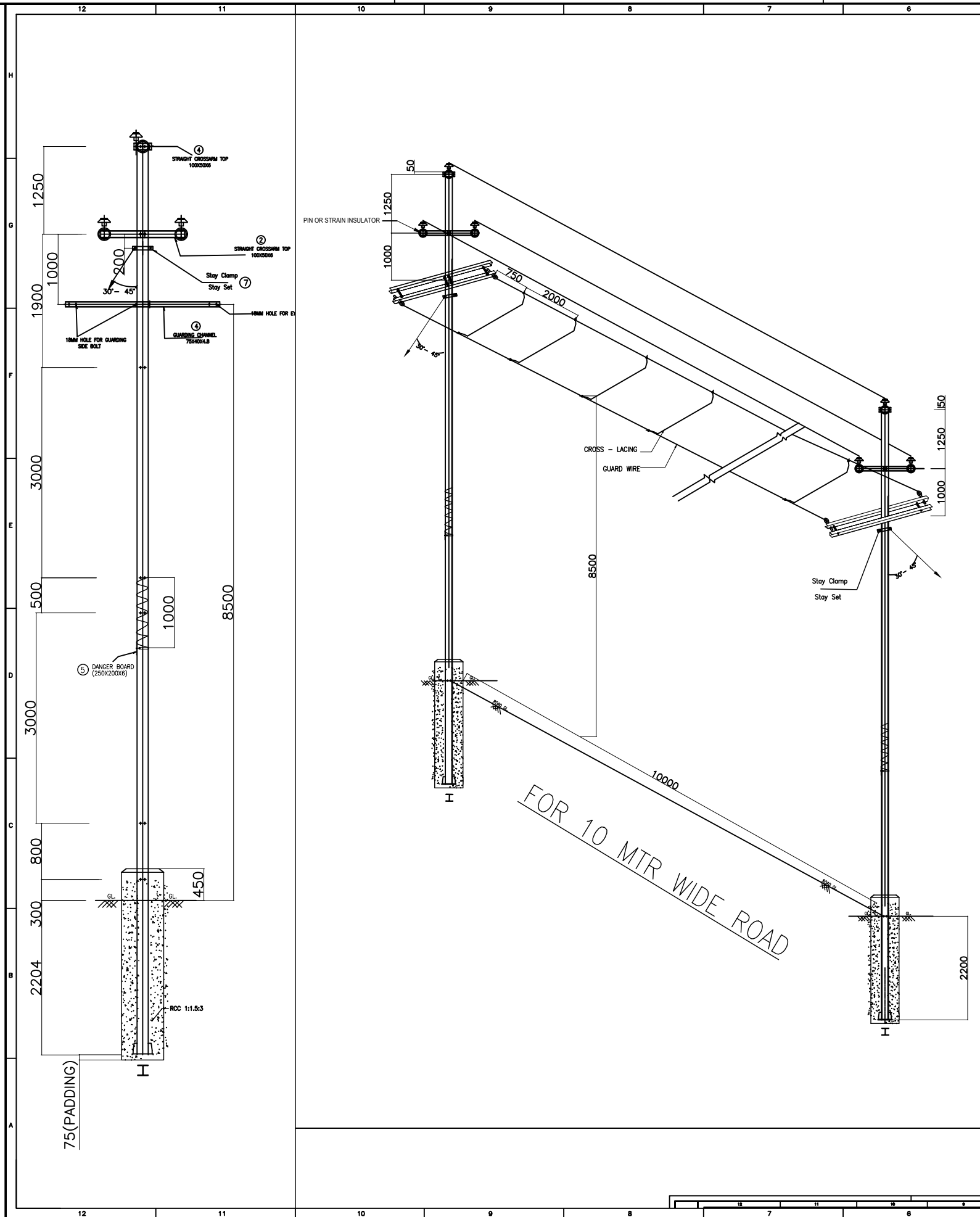
TATA CONSULTING ENGINEERS LIMITED MUMBAI

FOR RO ISSUE ONLY			ISSUE	REVISIONS										DRN	REVISIONS										DRN	FILE NAME :
DISC.	SIGNATURE	DATE		CIVIL	ELEC	I&C	MECH	APPD	DATE	ISSUE	CIVIL	ELEC	I&C		MECH	APPD	DATE	ISSUE	CIVIL	ELEC	I&C	MECH	APPD	DATE		

TP (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK THE TOP RIGHT HAND CORNER OF THE TITLE BLOCK.
 CONSTRUCTION / FABRICATION WORK IS PERMITTED ON "R" (RELEASED) ISSUES ONLY.
 INFORMATION CONTAINED WITHIN "HOLD" IS NOT RELEASED FOR CONSTRUCTION/FABRICATION. FIELD MUST GET DESIGN OFFICE TO "CLEAR" HOLES IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION/FABRICATION WORK RELATED TO "HOLDS".

SCALE: AS SHOWN	APPROVED	DATE (RO ISSUE) 31/03/2021
DEL.CENTRE-DISC.EI		DATE (DRN ISSUE) 31/03/2021
DRN: RF		
CHD: SS	DWG NO: TCE-11-275	ISSUE: -

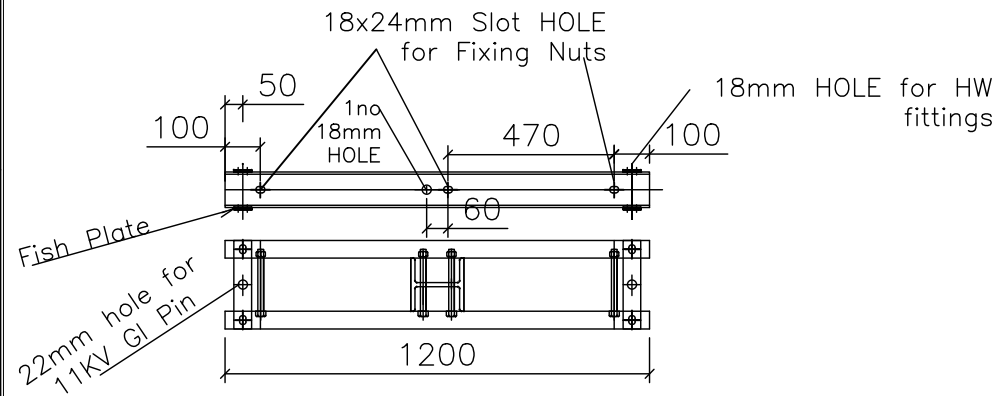
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



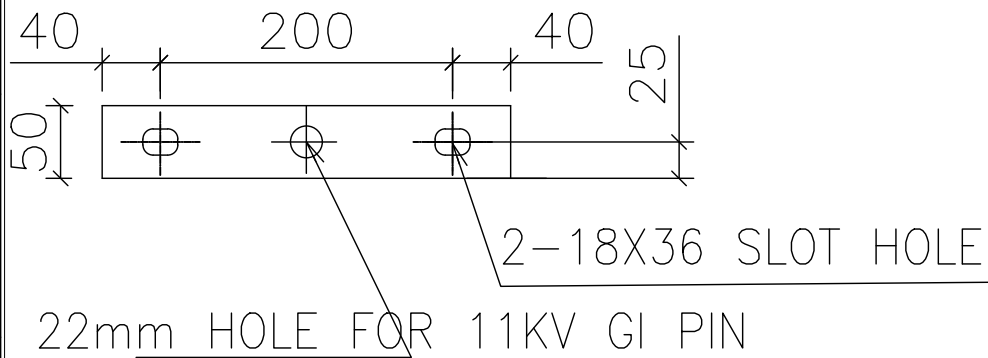
SECTION OF CROSS LACINGS

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON SINGLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME	
SCALE : NTS		DRAWN BY: J SANGRAM, E&Q	
ISSUE DT: 05/07/2021		CHECKED BY: PHIROJ UTTARAY, E&Q K.C.BHARDWAJ, E&Q	
		APPROVED BY: P GARG, E&Q	
		ISSUED BY: PARVEEN VERMA,COS	
		DRAWING NO: TPCODL-MVD-0009 REV NO: Sheet: 1 of 2	

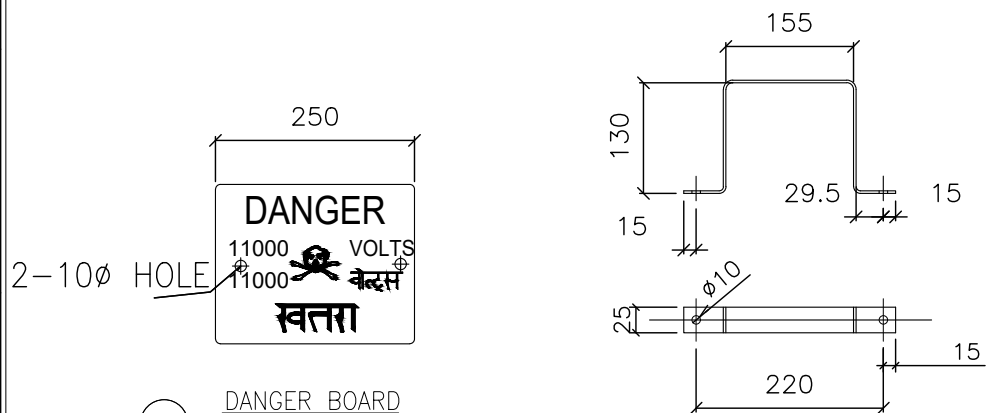
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



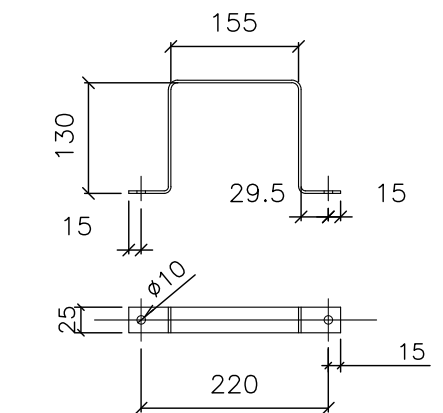
② Straight Cross Arm Bottom



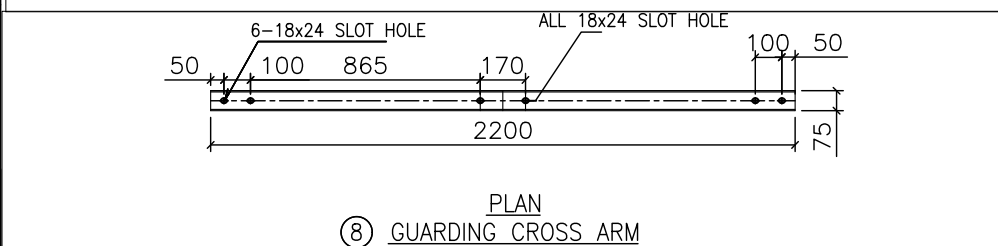
③ FISH PLATE(50x6)



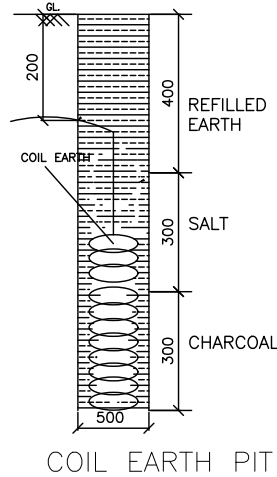
⑤ DANGER BOARD (250X220X3)X1N0.



⑥ BACK CLAMP FOR DANGER BOARD(25X3)



⑧ PLAN GUARDING CROSS ARM



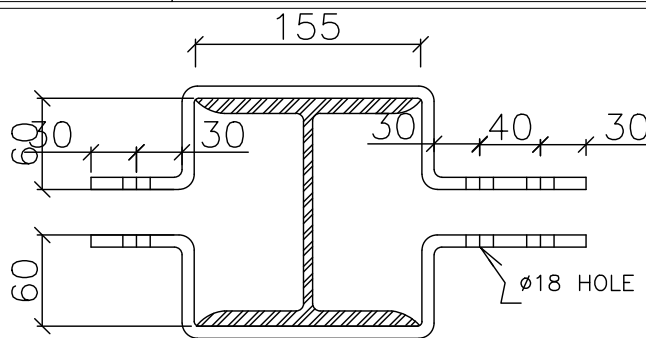
COIL EARTH PIT

BOM OF GI ITEMS OF 11KV ROAD CROSSING ON SINGLE POLE

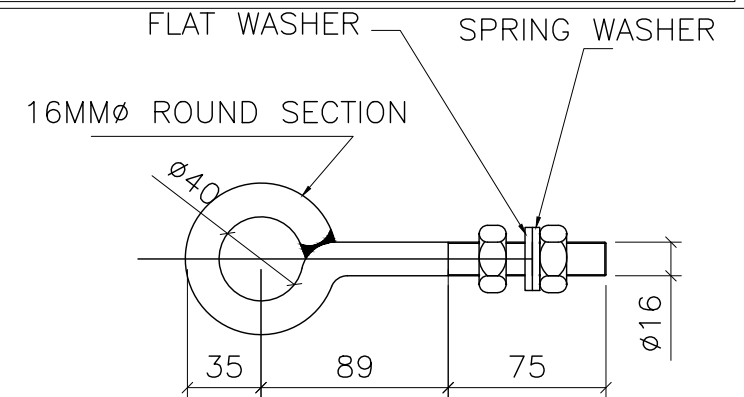
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	2	34.6 / 30.44	449.8 / 395.72	899.6 / 791.44
2	STRAIGHT CROSS ARM BOTTOM	100x50x6	CHANNEL	1200	4	9.5600	11.472	45.888
3	FISH PLATE	50x6	FLAT	280	16	2.3600	0.661	10.573
4	STRAIGHT CROSS ARM TOP	100x50x6	CHANNEL	306	4	9.5600	2.925	11.701
5	DANGER BOARD	200x6	FLAT	250	2	9.4200	2.355	4.710
6	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	2	0.5900	0.301	0.602
7	STAY CLAMP	50x8	FLAT	551	2	3.1400	1.730	3.460
8	CHANNEL FOR GUARDING	75x40x4.8	CHANNEL	2200	4	7.1400	15.708	62.832
9	EYE HOOK(Along with 2nuts,1 flat & spring washer each)		M16 ROD	305	4	1.5700	0.479	1.915
10	8 SWG		WIRE	42000	1	0.1310	5.502	5.502
11	10 SWG		WIRE	15000	1	0.0820	1.230	1.230
TOTAL WT EXCEPT POLE								148.414

NUT & BOLTS REQUIRED

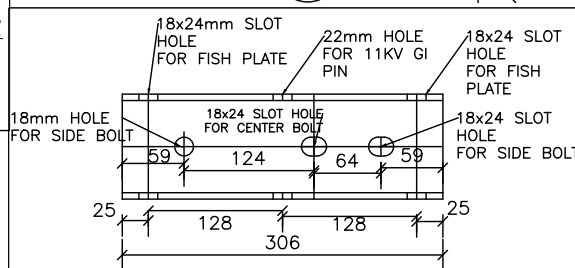
NUT & BOLTS	LENGTH (mm)	STRAIGHT CROSS ARM BOTTOM	FISH PLATE	STRAIGHT CROSS ARM TOP	DANGER BOARD	STAY CLAMP	GUARDING CROSS ARM	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50							2	2	0.134	0.268
M16	90					6			6	0.161	0.966
M16	200	8	8	6			8		30	0.331	9.930
M8	70				4				4	0.033	0.132
M16	FLAT WASHER								76	0.014	1.064
M16	SPRING WASHER								76	0.009	0.684
M8	FLAT WASHER								8	0.005	0.040
M8	SPRING WASHER								8	0.002	0.016
TOTAL WEIGHT											13.100



⑦ Stay Clamp(50X8)



⑨ EYE HOOK



④ STRAIGHT CROSSARM TOP (100x50x6)

TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

TATA POWER
CENTRAL ODISHA DISTRIBUTION LTD.

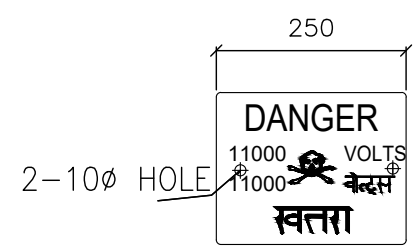
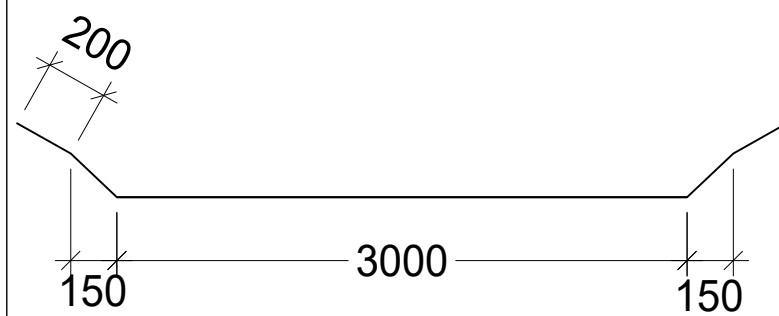
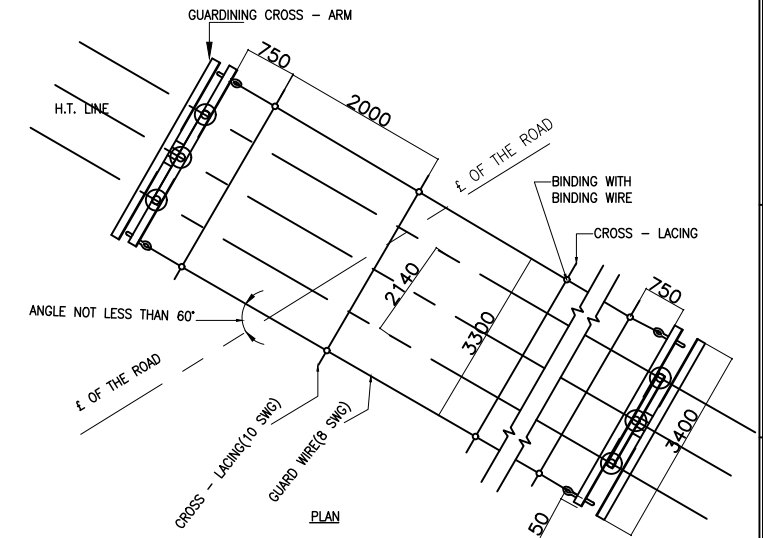
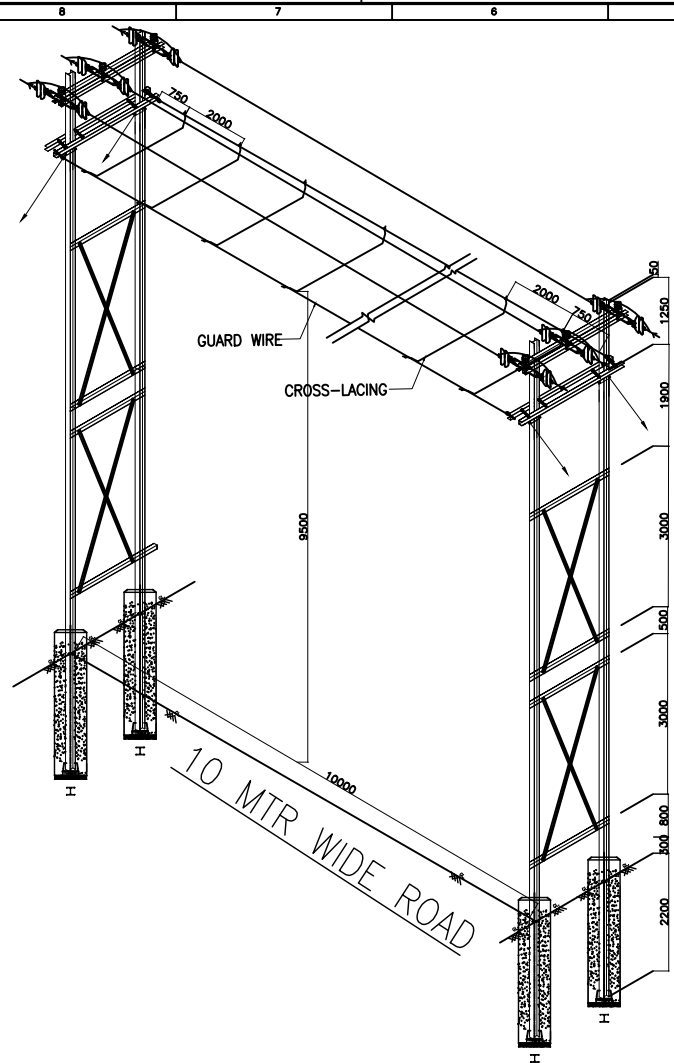
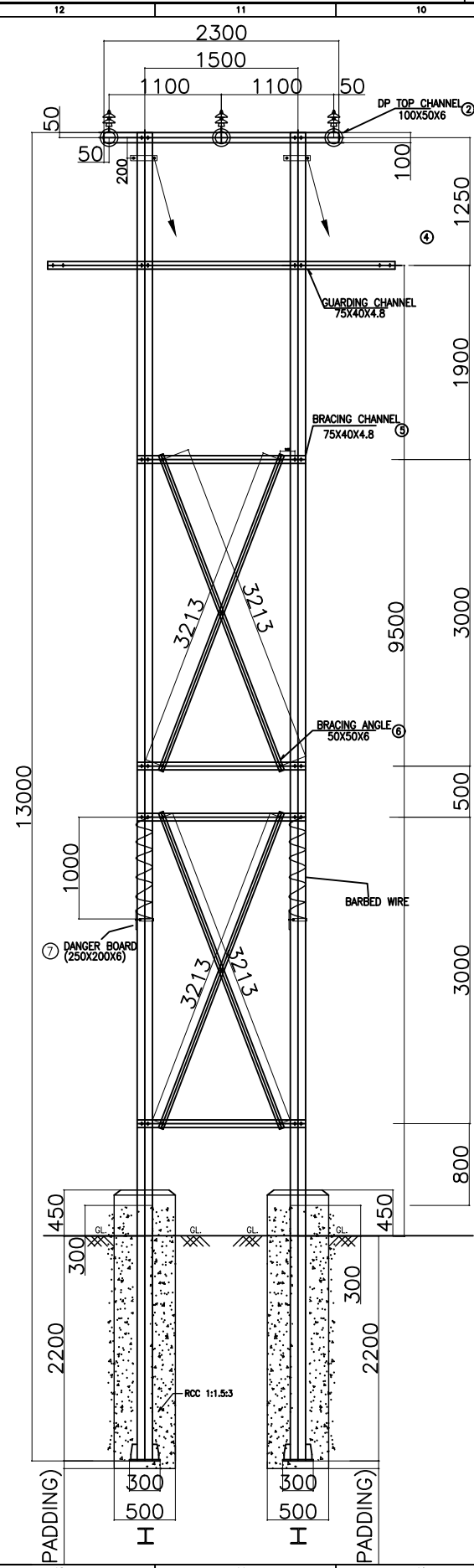
TITLE:-
11KV LINE PROTECTIVE GUARDING
ACROSS MAJOR ROAD CROSSINGS ON
SINGLE POLE(USING 13MTR
150RSJ/WPB 160)

SCALE : NTS

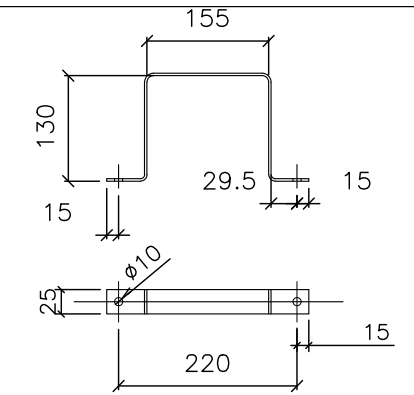
ISSUE DT: 05/07/2021

NAME	
DRAWN BY:	J SANGRAM, E&Q
CHECKED BY:	PHIROJ UTTARAY, E&Q K.C.BHARDWAJ, E&Q
APPROVED BY:	P GARG, E&Q
ISSUED BY:	PARVEEN VERMA,COS
DRAWING NO: TPCODL-MVD-0009 REV NO: Sheet: 2 of 2	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



7 DANGER BOARD (250X220X3)X1N0.

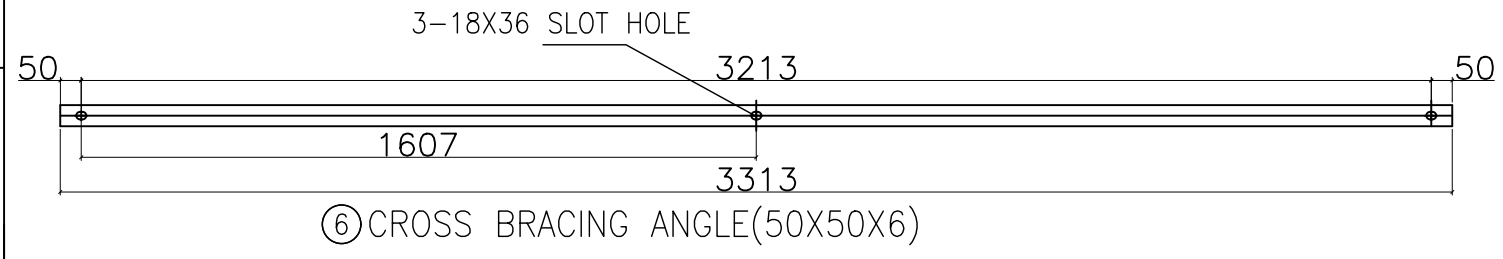
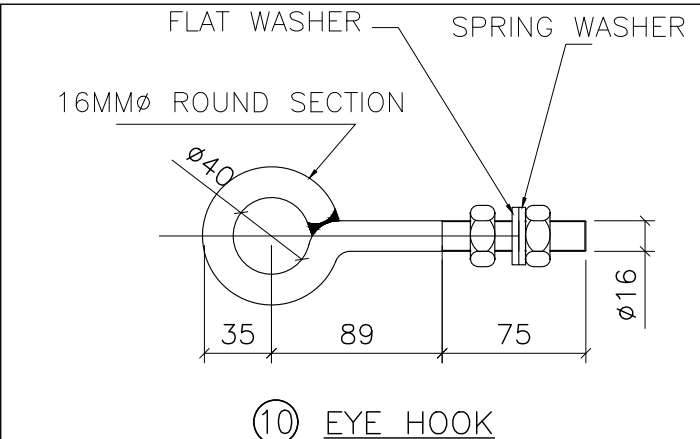
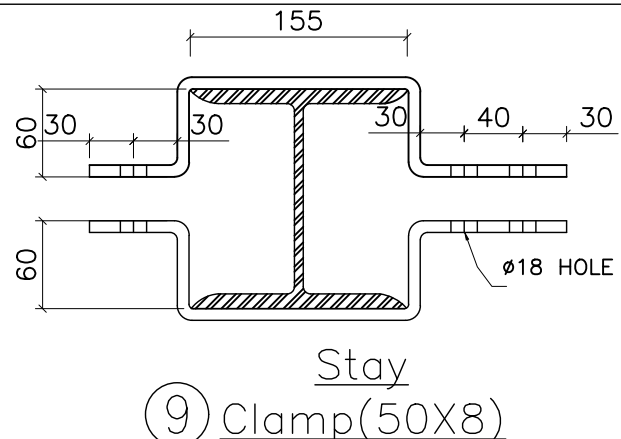
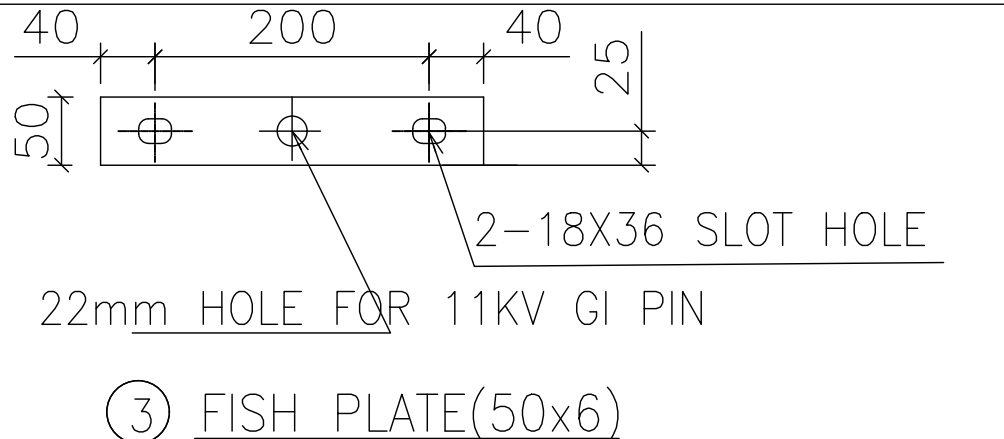
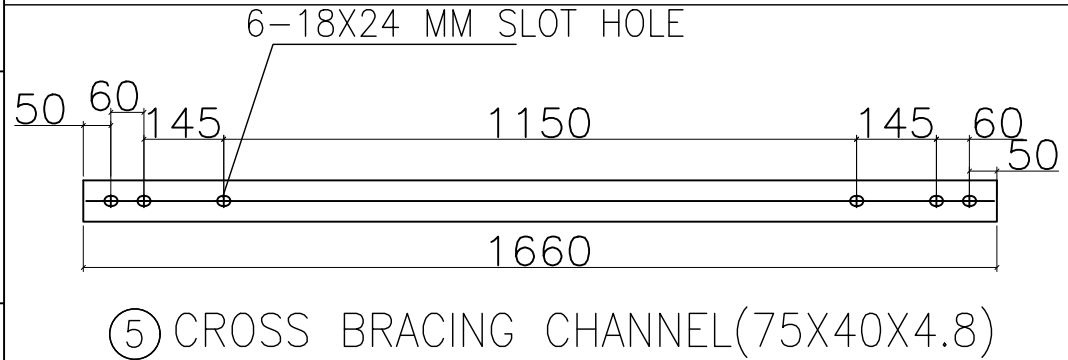
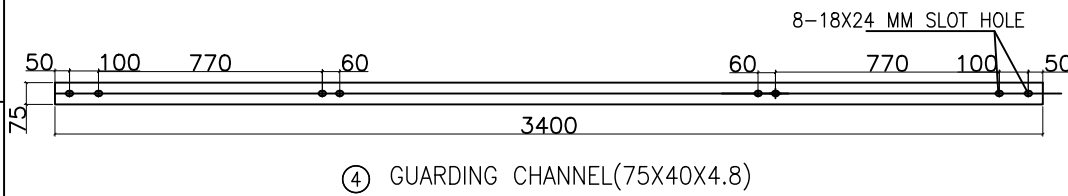
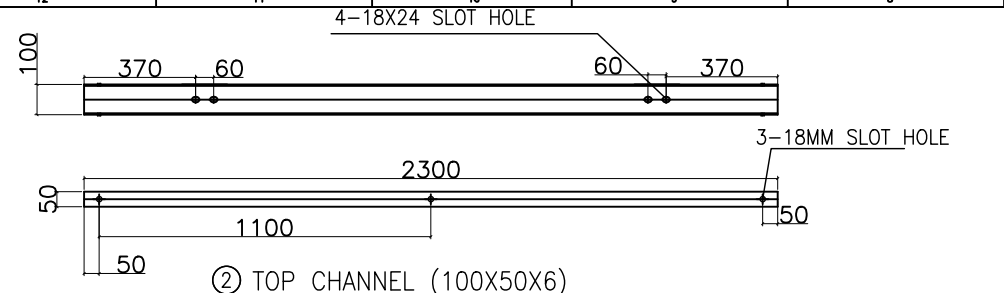


8 BACK CLAMP FOR DANGER BOARD(25X3)

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON DOUBLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME	
		DRAWN BY: J SANGRAM, E&Q	
		CHECKED BY: PHIROJ UTTARAY, E&Q K.C.BHARDWAJ, E&Q	
		APPROVED BY: P GARG, E&Q	
ISSUED BY: PARVEEN VERMA, COS		DRAWING NO: TPCODL-MVD-0010 REV NO:	
SCALE : NTS	ISSUE DT: 05/07/2021	Sheet: 1 of 2	

FLAT WASHER SPRING WASHER

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)

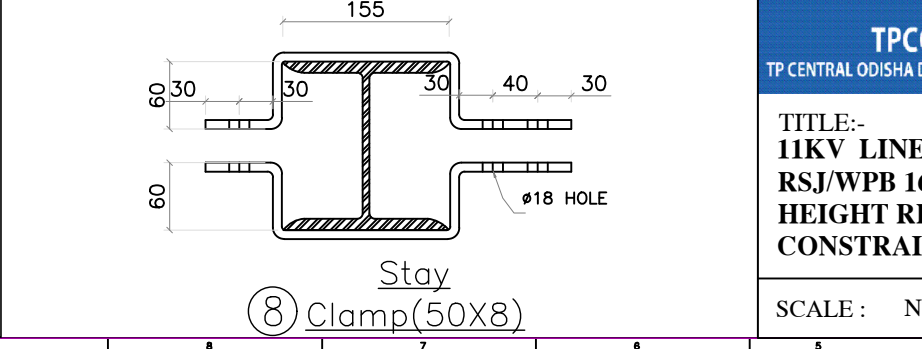
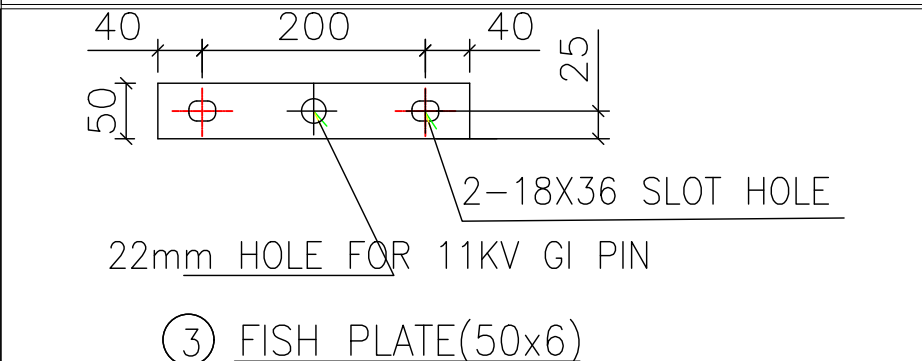
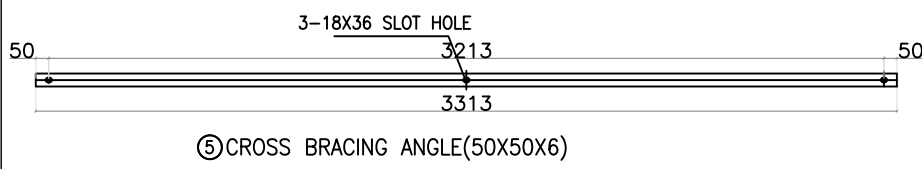
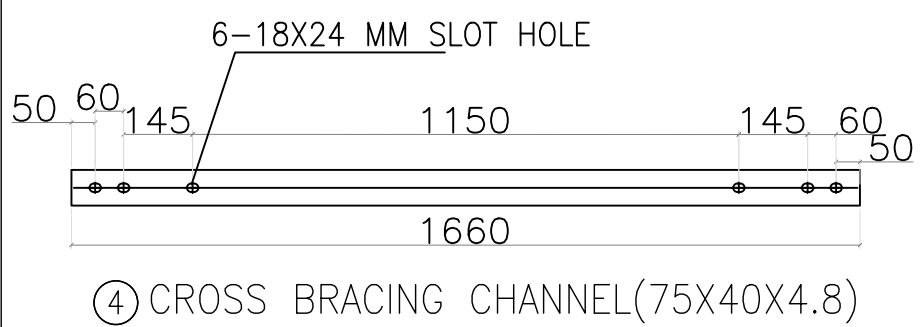
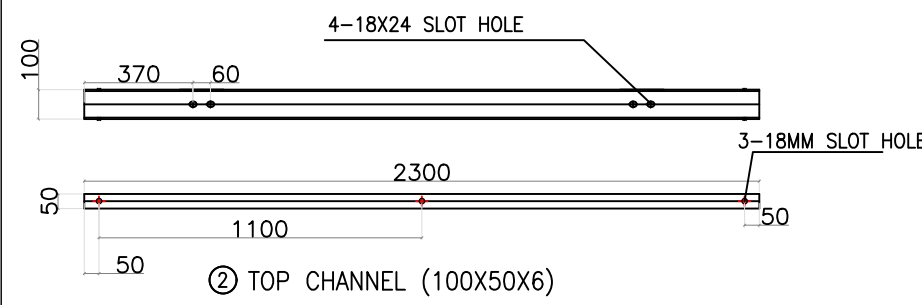
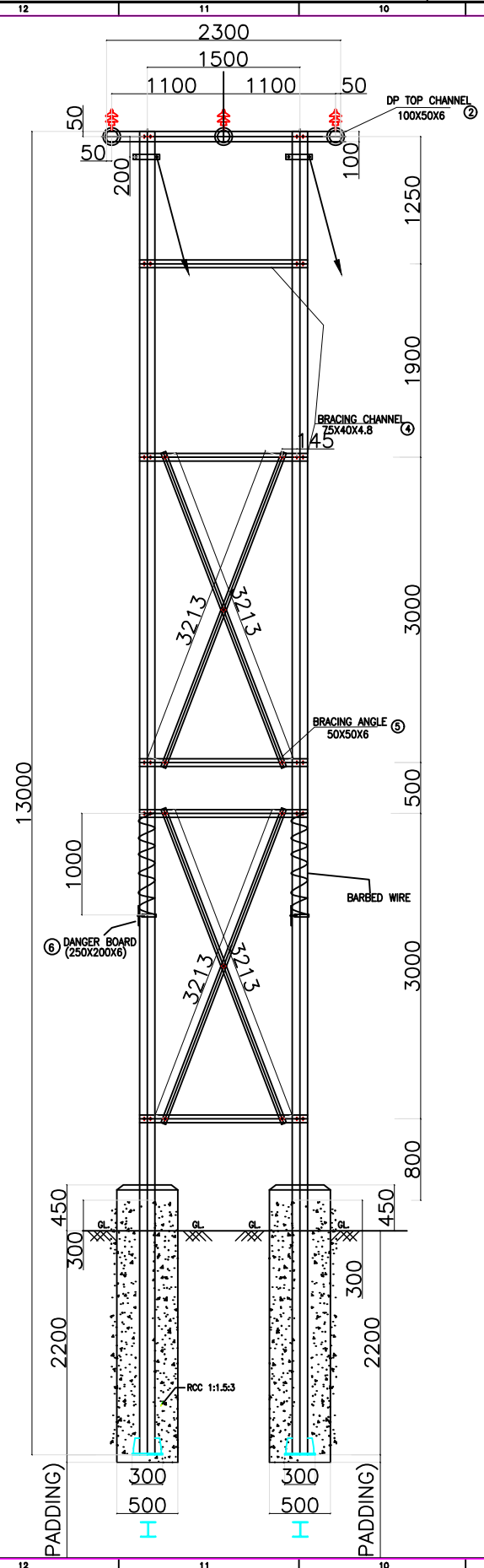


BOM OF GI ITEMS OF 11KV ROAD CROSSING ON DOUBLE POLE								
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	4	34.6 / 30.44	449.8/ 395.72	1799.2/ 1582.88
2	DP TOP CHANNEL	100x50x6	CHANNEL	2300	4	9.5600	21.988	87.952
3	FISH PLATE	50x6	FLAT	280	12	2.3600	0.661	7.930
4	CHANNEL FOR GUARDING	75x40x4.8	CHANNEL	3400	4	7.1400	24.276	97.104
5	CROSS BRACING	75x40x4.8	CHANNEL	1660	8	7.1400	11.852	94.819
6	CROSS BRACING	50x50x6	ANGLE	3313	8	4.5000	14.909	119.268
7	DANGER BOARD	200x6	FLAT	250	4	9.4200	2.355	9.420
8	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	4	0.5900	0.301	1.204
9	STAY CLAMP	50x8	FLAT	551	4	3.1400	1.730	6.921
10	EYE HOOK(Along with 2nuts,1 flat & spring washer each)		M16 ROD	305	4	1.5700	0.479	1.915
10	8 SWG		WIRE	42000	1	0.1310	5.502	5.502
11	10 SWG		WIRE	22200	1	0.0820	1.820	1.820
12	PIPE EARTHING		PIPE	3000	4	0.0000	0.000	0.000
TOTAL WT EXCEPT POLE								433.855

NUT & BOLTS REQUIRED												
NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	GUARDING CROSS ARM	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				20				4	24	0.134	3.216
M16	90						12			12	0.161	1.932
M16	200	8		32				8		48	0.331	15.888
M8	70				0	8				8	0.033	0.264
M16	FLAT WASHER									168	0.014	2.352
M16	SPRING WASHER									168	0.009	1.512
M8	FLAT WASHER									16	0.005	0.080
M8	SPRING WASHER									16	0.002	0.032
TOTAL WEIGHT											25.276	

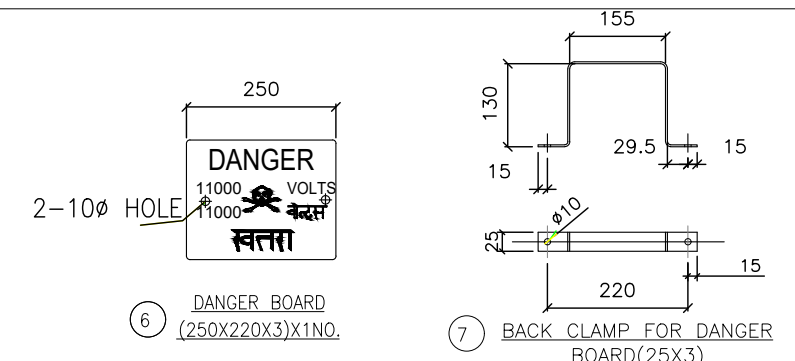
TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON DOUBLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME	
DRAWN BY:		J SANGRAM, E&Q	
CHECKED BY:		PHIROJ UTTARAY, E&Q K.C.BHARDWAJ, E&Q	
APPROVED BY:		P GARG, E&Q	
ISSUED BY:		PARVEEN VERMA,COS	
SCALE : NTS	ISSUE DT: 05/07/2021	DRAWING NO: TPCODL-MVD-0010 REV NO: Sheet: 2 of 2	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



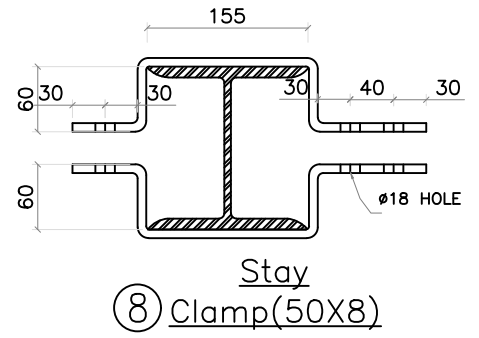
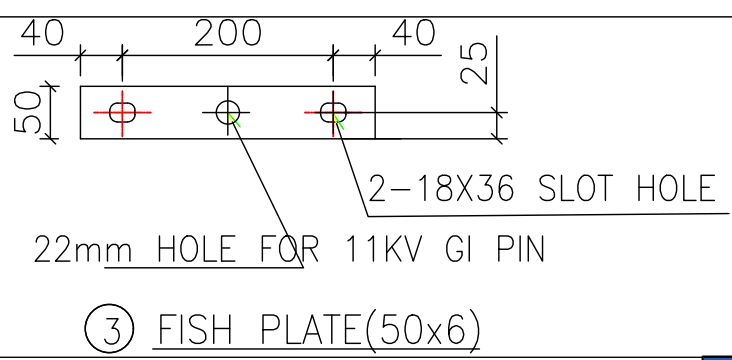
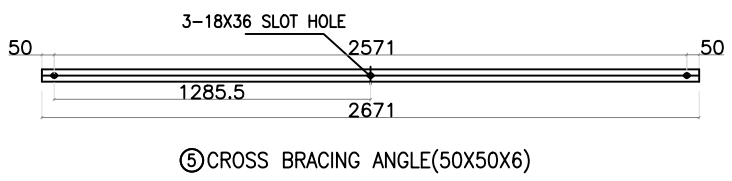
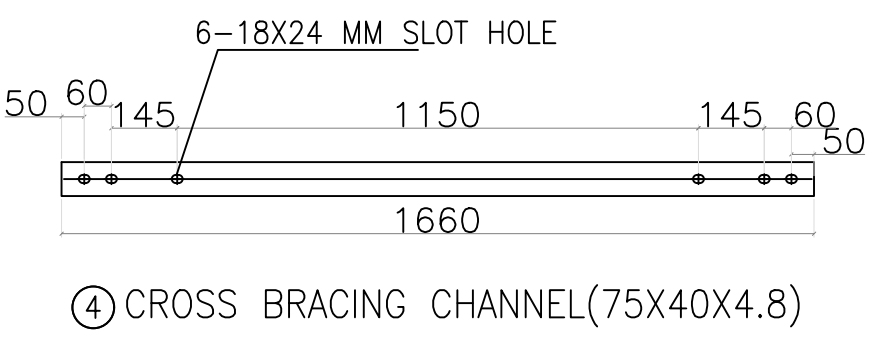
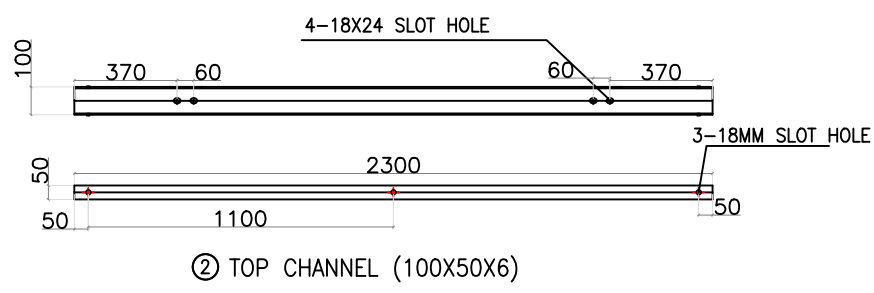
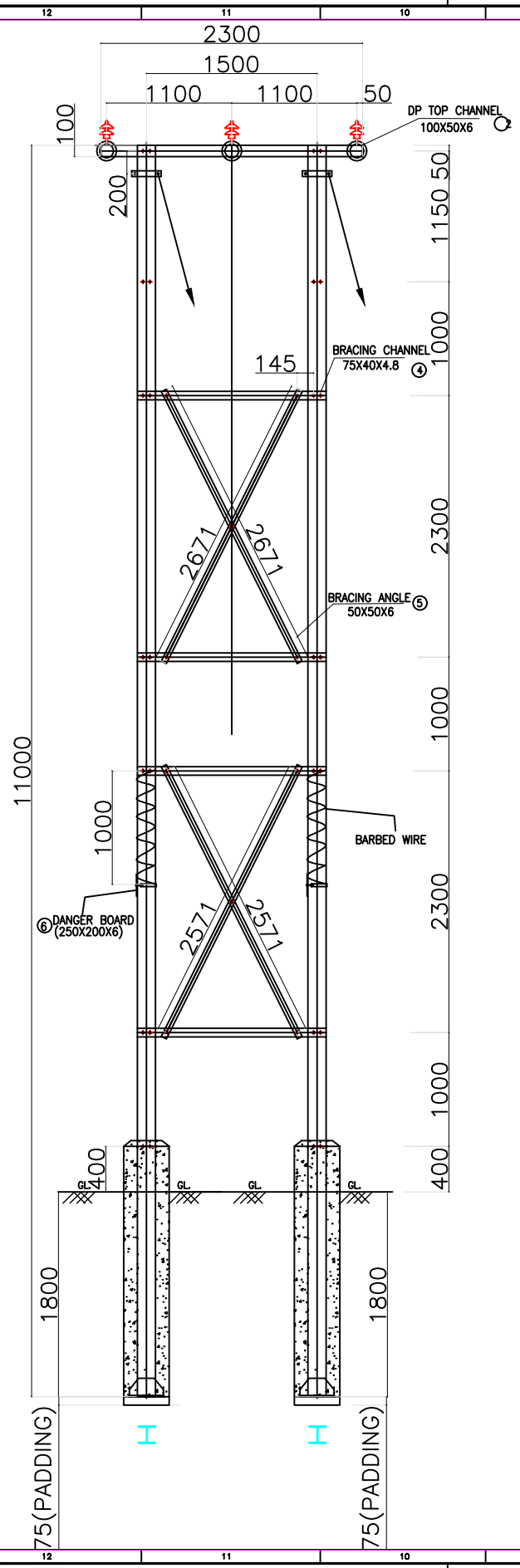
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	2	34.6 / 30.44	449.8 / 395.72	899.6 / 791.44
2	DP TOP CHANNEL	100x50x6	CHANNEL	2300	2	9.5600	21.988	43.976
3	FISH PLATE	50x6	FLAT	280	6	2.3600	0.661	3.965
4	CROSS BRACING	75x40x4.8	CHANNEL	1660	5	7.1400	11.852	59.262
5	CROSS BRACING	50x50x6	ANGLE	3313	4	4.5000	14.909	59.634
6	DANGER BOARD	250x6	FLAT	250	2	9.4200	2.355	4.710
7	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	2	0.5900	0.301	0.602
8	STAY CLAMP	50x8	FLAT	551	2	3.1400	1.730	3.460
9	PIPE EARTHING		PIPE	3000	2	0.0000	0.000	0.000
							TOTAL WT EXCEPT POLE	175.609

NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				10			2	12	0.134	1.608
M16	90						6		6	0.161	0.966
M16	200	4	3	16					23	0.331	7.613
M8	70				0	4			4	0.033	0.132
M16									82	0.014	1.148
M16									82	0.009	0.738
M8									8	0.005	0.040
M8									8	0.002	0.016
									TOTAL WEIGHT		12.261



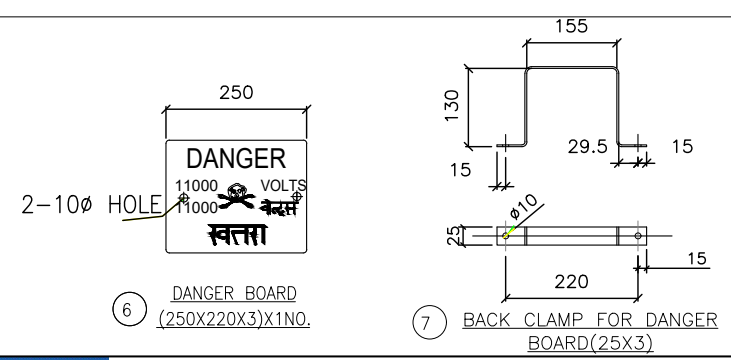
TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE DP USING 13 MTR 150X150 RSJ/WPB 160(FOR SPECIAL CASE OF HEIGHT REQUIREMENT AND SPACE CONSTRAINT)		NAME J SANGRAM, E&Q	
CHECKED BY: PHIROJ UTTARAY, E&Q		DRAWN BY: PHIROJ UTTARAY, E&Q	
APPROVED BY: P GARG, E&Q		ISSUED BY: PARVEEN VERMA,COS	
SCALE : NTS	ISSUE DT: 05/07/2021	DRAWING NO: TPCODL-MVD-0011 REV NO:	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



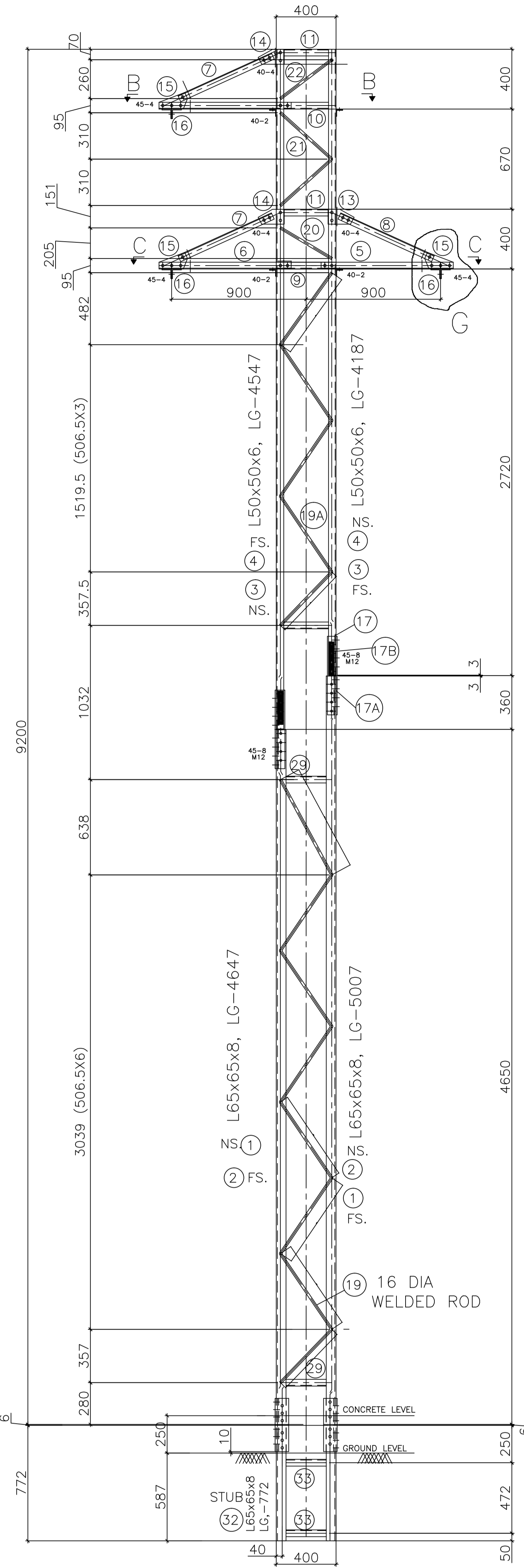
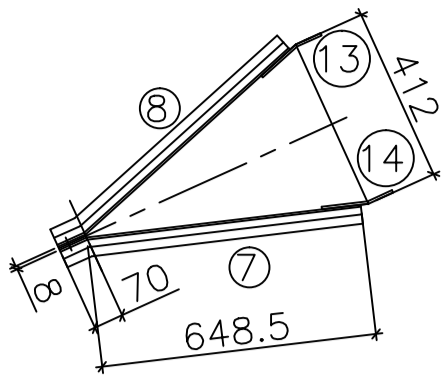
BOM OF GI ITEMS OF 11KV 11MTR INLINE DOUBLE POLE(FOR SPACE CONSTRAINT)									
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ ITEM (KG)	TOTAL WT. (KG)	
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	2	34.6 / 30.44	449.8 / 395.72	899.6 / 791.44	
2	DP TOP CHANNEL	100x50x6	CHANNEL	2300	2	9.5600	21.988	43.976	
3	FISH PLATE	50x6	FLAT	280	6	2.3600	0.661	3.965	
4	CROSS BRACING	75x40x4.8	CHANNEL	1660	4	7.1400	11.852	47.410	
5	CROSS BRACING	50x50x6	ANGLE	2671	4	4.5000	12.020	48.078	
6	DANGER BOARD	200x6	FLAT	250	2	9.4200	2.355	4.710	
7	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	2	0.5900	0.301	0.602	
8	STAY CLAMP	50x8	FLAT	551	2	3.1400	1.730	3.460	
9	PIPE EARTHING		PIPE	3000	2	0.0000	0.000	0.000	
TOTAL WT EXCEPT POLE								152.200	

NUT & BOLTS REQUIRED											
NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				10			2	12	0.134	1.608
M16	90						6		6	0.161	0.966
M16	200	4	3	16					23	0.331	7.613
M8	70				0	4			4	0.033	0.132
M16	FLAT WASHER								82	0.014	1.148
M16	SPRING WASHER								82	0.009	0.738
M8	FLAT WASHER								8	0.005	0.040
M8	SPRING WASHER								8	0.002	0.016
TOTAL WEIGHT										12.261	

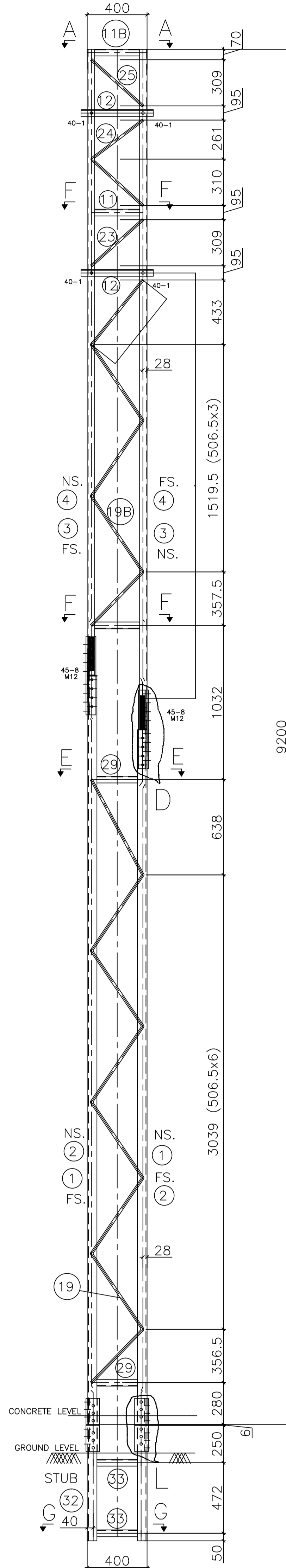


TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE DP USING 11 MTR 150X150 RSJ/WPB 160(FOR SPACE CONSTRAINT CASES)		NAME J. SANGRAM, E&Q PHIROJ UTTARAY, E&Q K.C.BHARDWAJ, E&Q P GARG, E&Q PARVEEN VERMA, COS	
SCALE : NTS	ISSUE DT: 05/07/2021	DRAWING NO: TPCODL-MVD-0012 REV NO:	

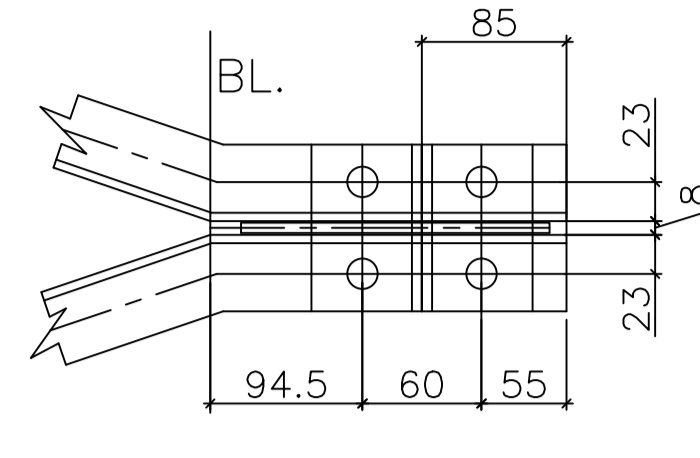
11KV S/C REBAR LACED POLE WEIGHT TOLERANCE - 2.5% TENDER PURPOSE ONLY



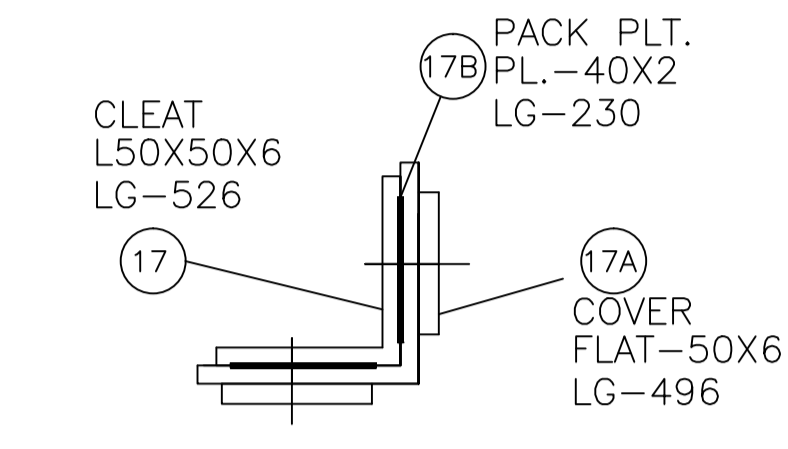
ELEVATION



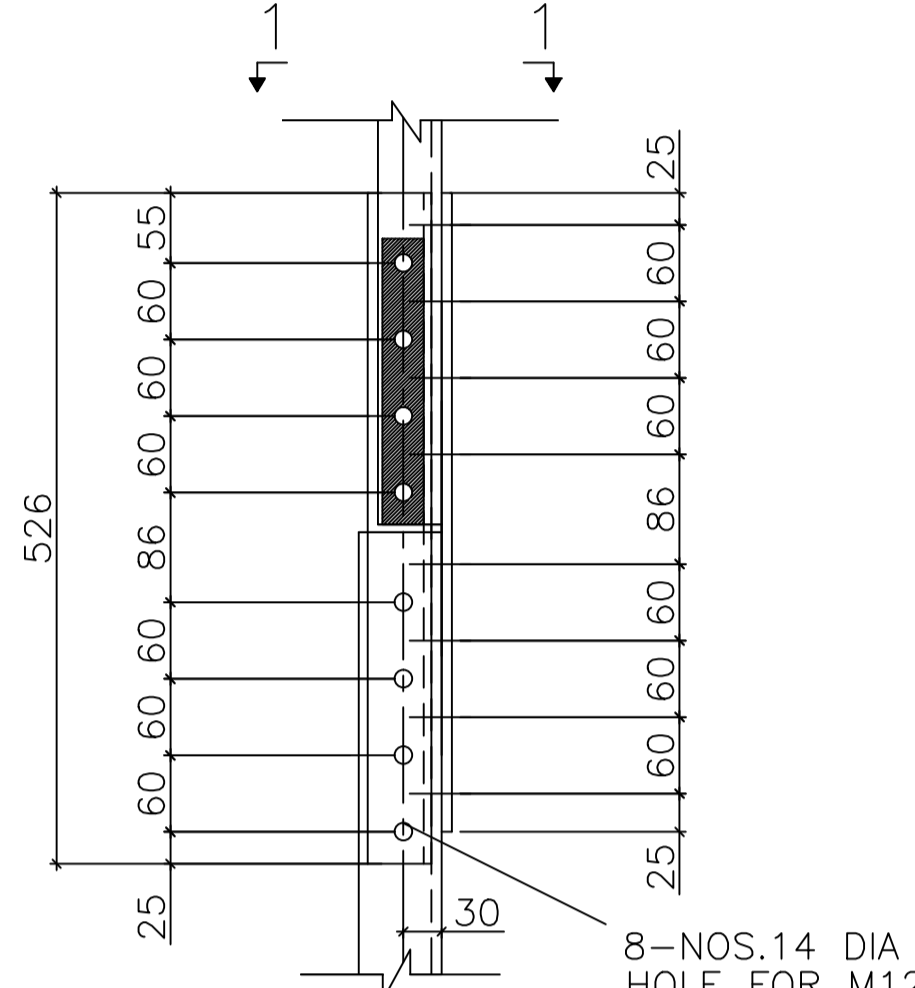
SIDE VIEW



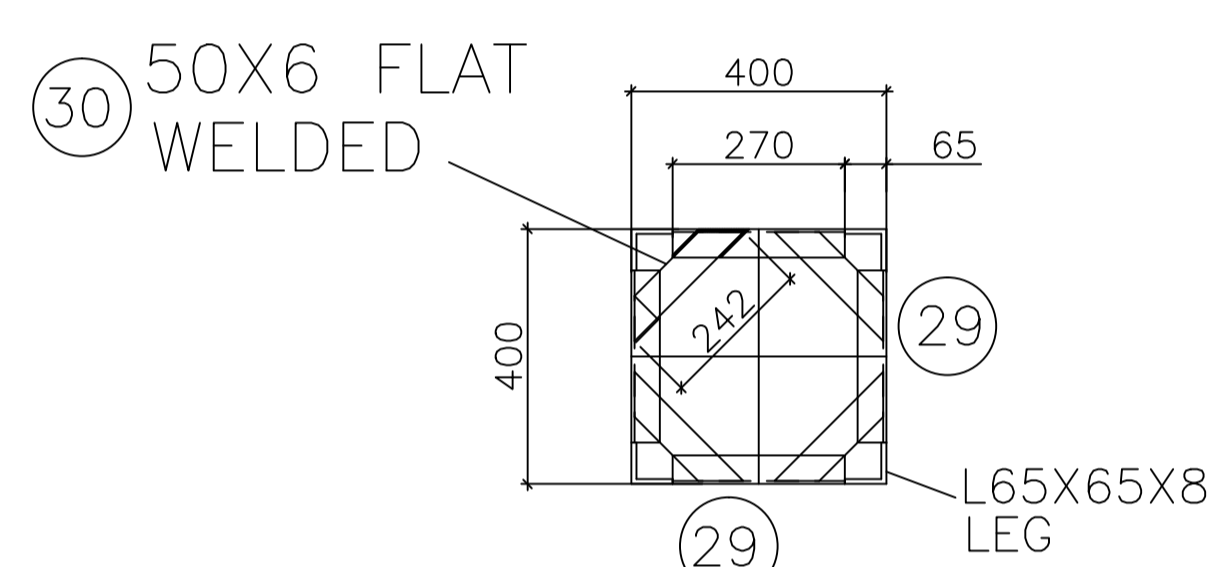
DETAIL AT-M



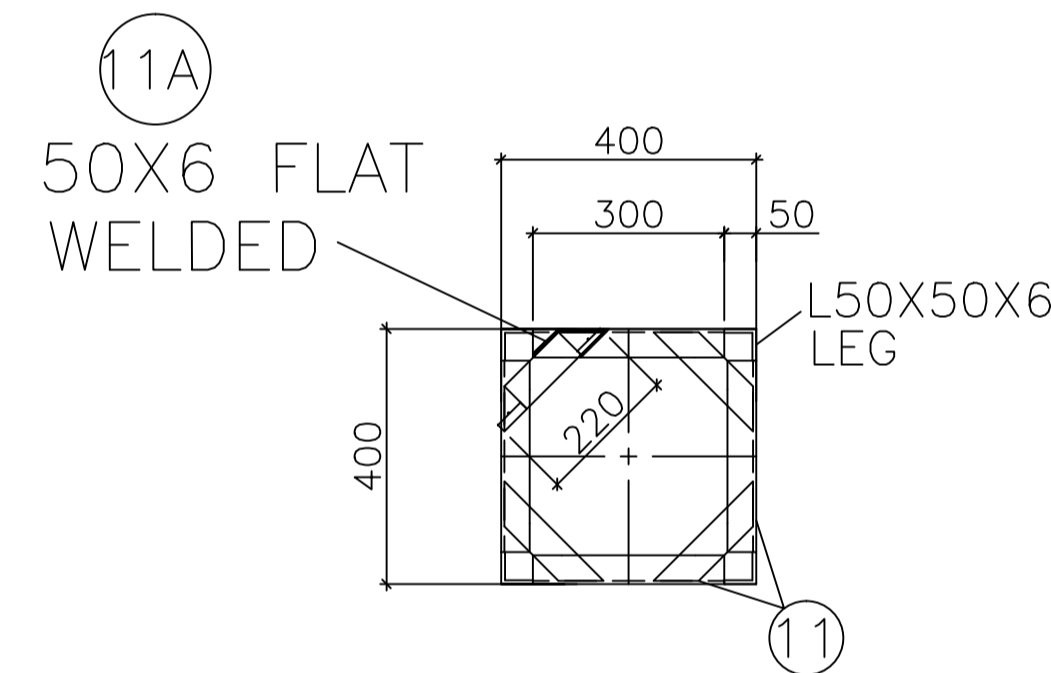
VIEW-1-1



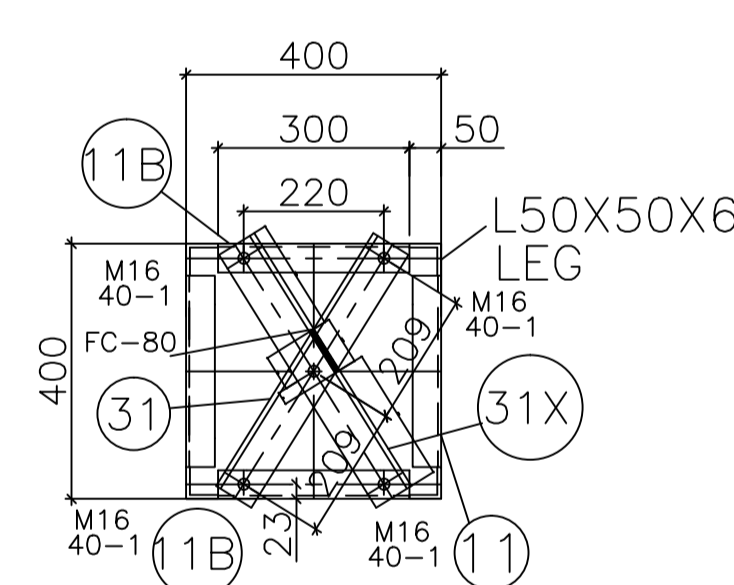
DETAIL AT-D



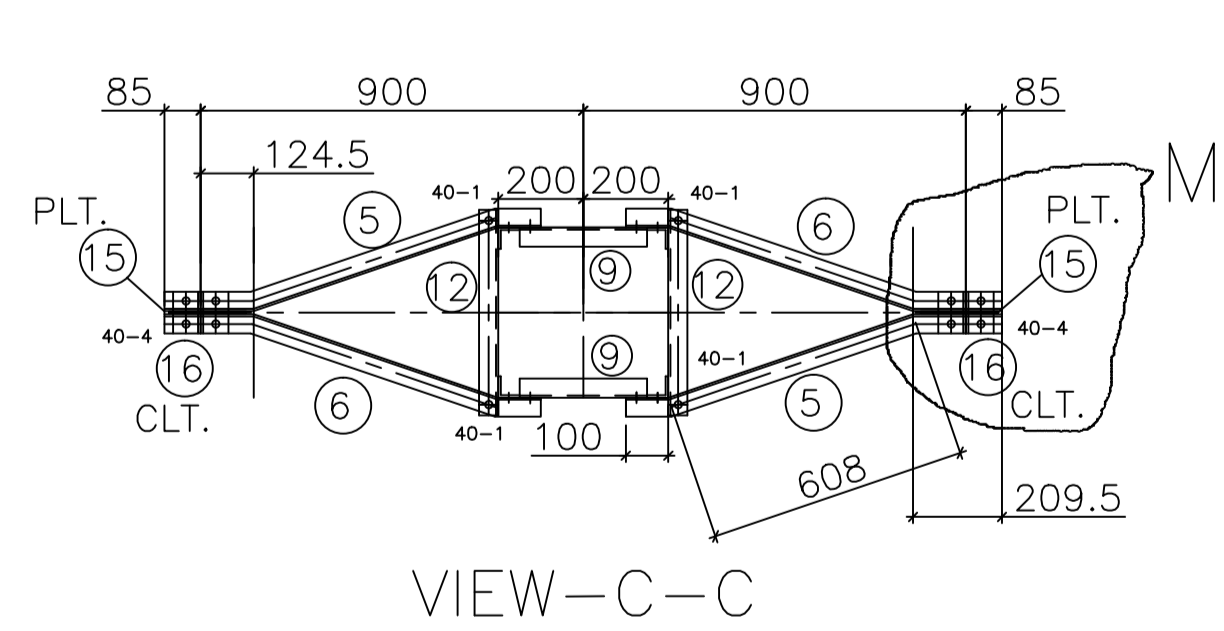
VIEW-E-E



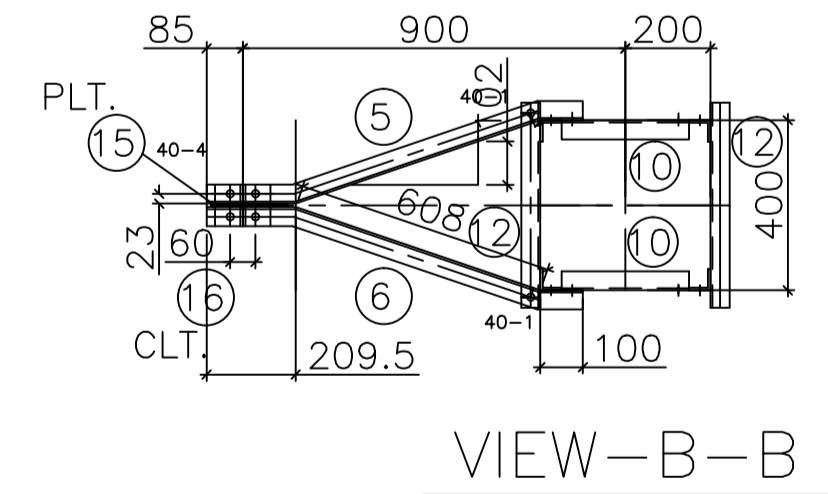
VIEW-F-F



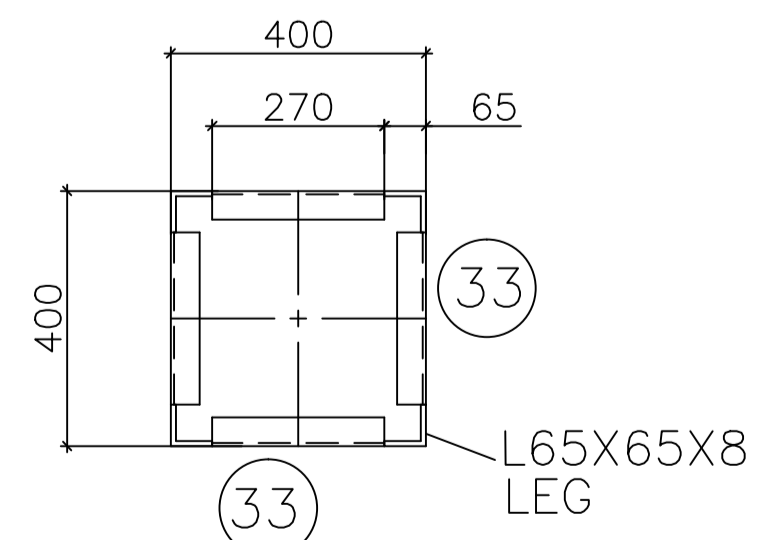
VIEW-A-A



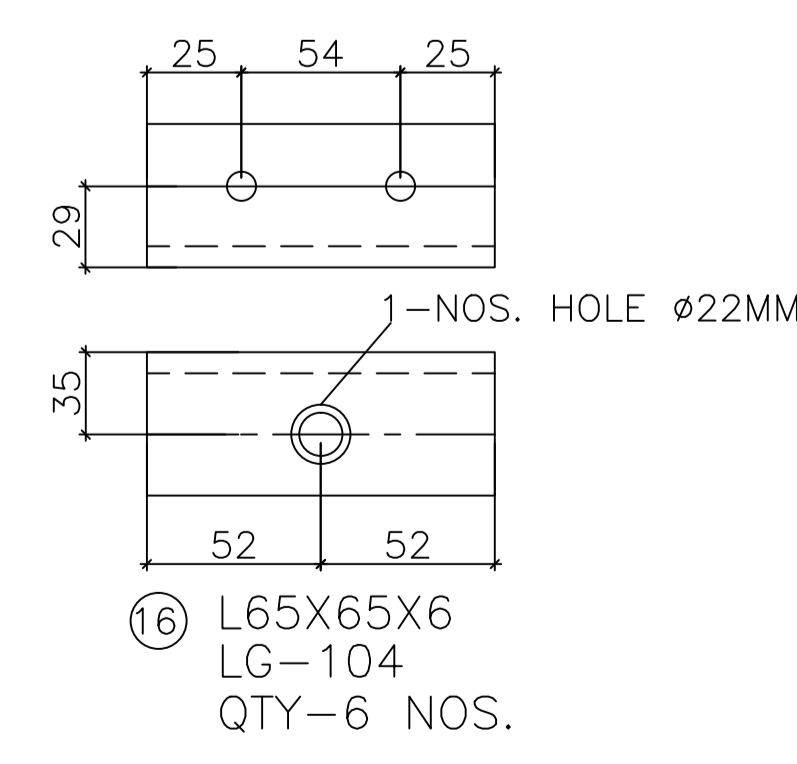
VIEW-C-C



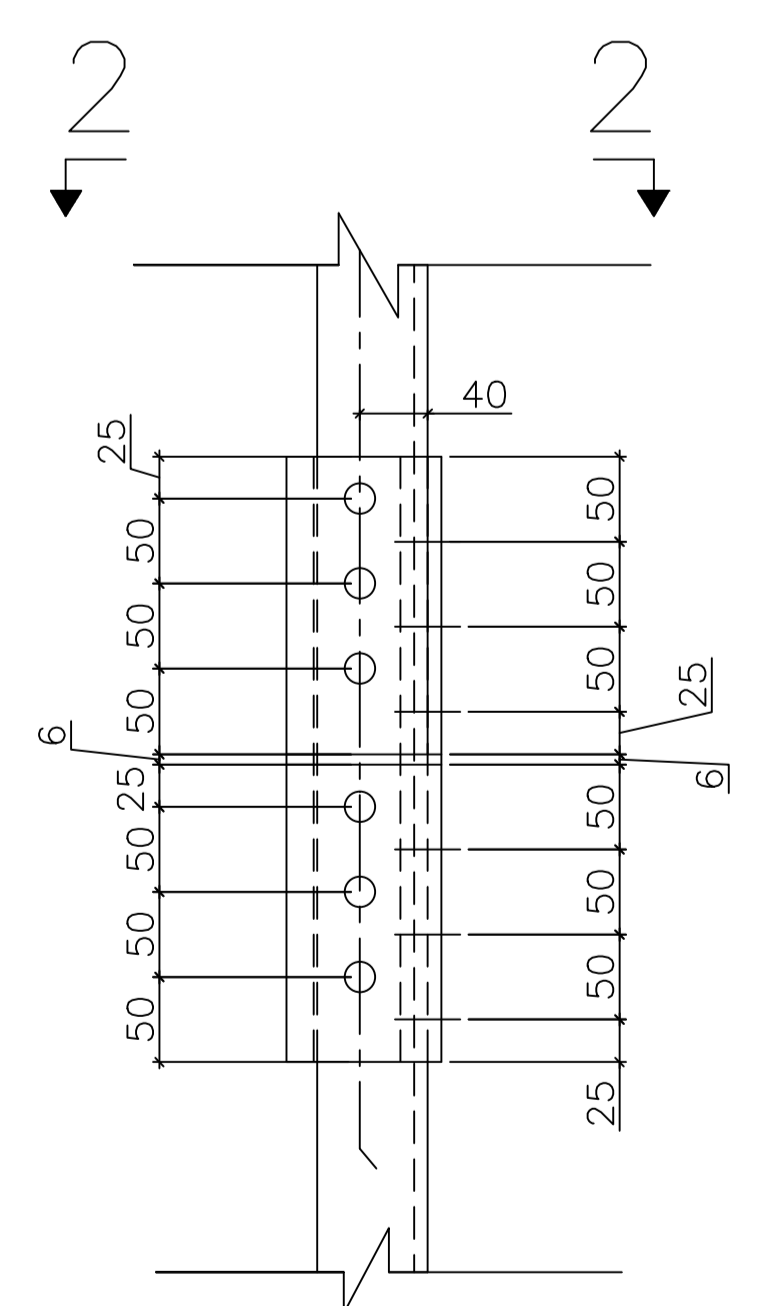
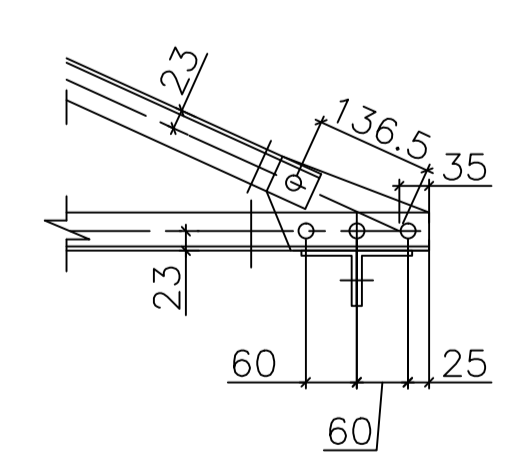
VIEW-B-B



VIEW-G-G



DETAIL AT-G



DETAIL AT-L

11KV REBAR LACED POLE BILL OF QUANTITY PER STRUCTURE						
MARK NO.	SECTION	LENGTH	UNIT WT. KGS/MTR	PCS. WEIGHT	QTY. SET	TOTAL WEIGHT (KGS)
SP-1	L65X65X8	4647	7.7	35.8	2	71.6
SP-2	L65X65X8	5007	7.7	38.55	2	77.1
SP-3	L50X50X6	4547	4.5	20.5	2	41
SP-4	L50X50X6	4187	4.5	18.8	2	37.6
SP-5	L45X45X5	918	3.4	3.12	3	9.36
SP-6	L45X45X5	918	3.4	3.12	3	9.36
SP-7	L45X45X5	719	3.4	2.4	3	7.3
SP-8	L45X45X5	719	3.4	2.4	3	7.3
SP-9	L45X45X5	300	3.4	1.0	2	2.0
SP-10	L45X45X5	300	3.4	1.0	2	2.0
SP-11	L45X45X5	300	3.4	1.0	10	10.0
SP-11A	FLAT-50X6	220	2.36	0.52	8	4.16
SP-11B	L45X45X5	300	3.4	1.0	2	2.0
SP-12	L45X45X5	483	3.4	1.64	4	6.6
SP-13	PL.100X6	174	47.1	0.82	3	2.46
SP-14	PL.100X6	174	47.1	0.82	3	2.46
SP-15	PL.111X6	191	47.1	1.0	3	3.0
SP-16	L65X65X6	104	5.8	0.6	6	3.62
SP-17	L50X50X6	526	4.5	2.37	4	9.48
SP-17A	FLAT-50X6	496	2.36	1.17	8	9.36
SP-17B	PL.40X2	230	15.7	0.14	8	1.16
SP-19	16 DIA ROD	4895	1.58	7.73	4	30.92
SP-19A	16 DIA ROD	2925	1.58	4.62	2	9.24
SP-19B	16 DIA ROD	2887	1.58	4.56	2	9.12
SP-20	16 DIA ROD	401	1.58	0.63	2	1.27
SP-21	16 DIA ROD	926	1.58	1.46	2	2.93
SP-22	16 DIA ROD	405	1.58	0.68	2	1.36
SP-23	16 DIA ROD	463	1.58	0.73	2	1.46
SP-24	16 DIA ROD	895	1.58	1.41	2	2.82
SP-25	16 DIA ROD	463	1.58	0.73	2	1.46
SP-29	L45X45X5	270	3.4	0.918	8	7.34
SP-30	FLAT-50X6	242	2.36	0.57	8	4.57
SP-31/31X	L65X65X8	468	7.7	3.6	1+1	7.21
TOTAL WEIGHT OF STRUCTURAL STEEL =						398.66

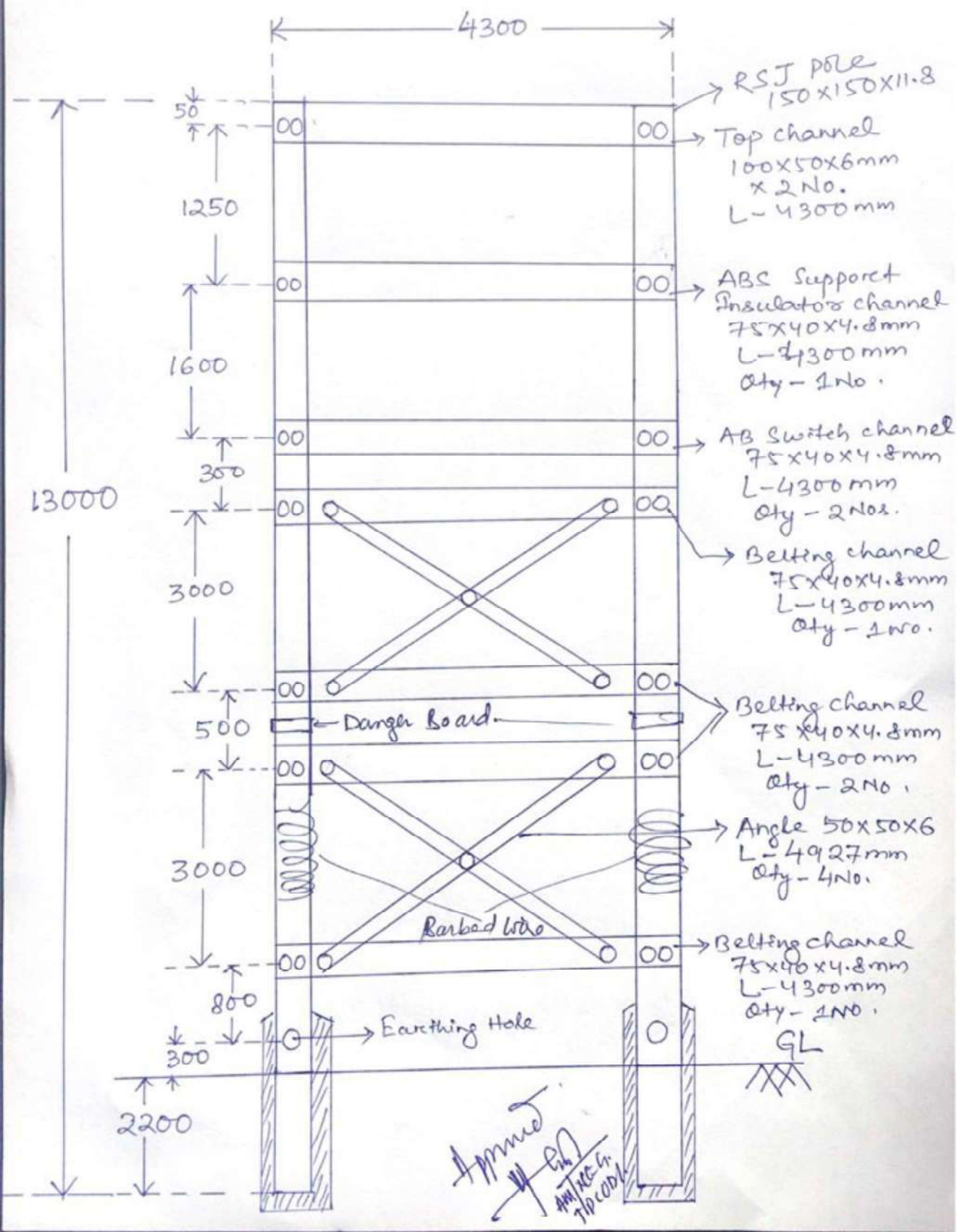
STUB BILL OF QUANTITY PER STRUCTURE						
MARK NO.	SECTION	LENGTH	UNIT WT. KGS/MTR	PCS. WEIGHT	QTY. SET	TOTAL WEIGHT (KGS)
SP-32	L65X65X8	772	7.7	5.94	4	23.78
SP-33	L45X45X5	270	3.4	0.918	8	7.34
SP-34	L75X75X6	356	6.8	2.42	4	9.68
SP-35	L75X75X6	356	6.8	2.42	4	9.68
TOTAL WEIGHT OF STUB STR. STEEL =						50.48

SUB. TOTAL WEIGHT OF STRUCTURAL STEEL = 449.14

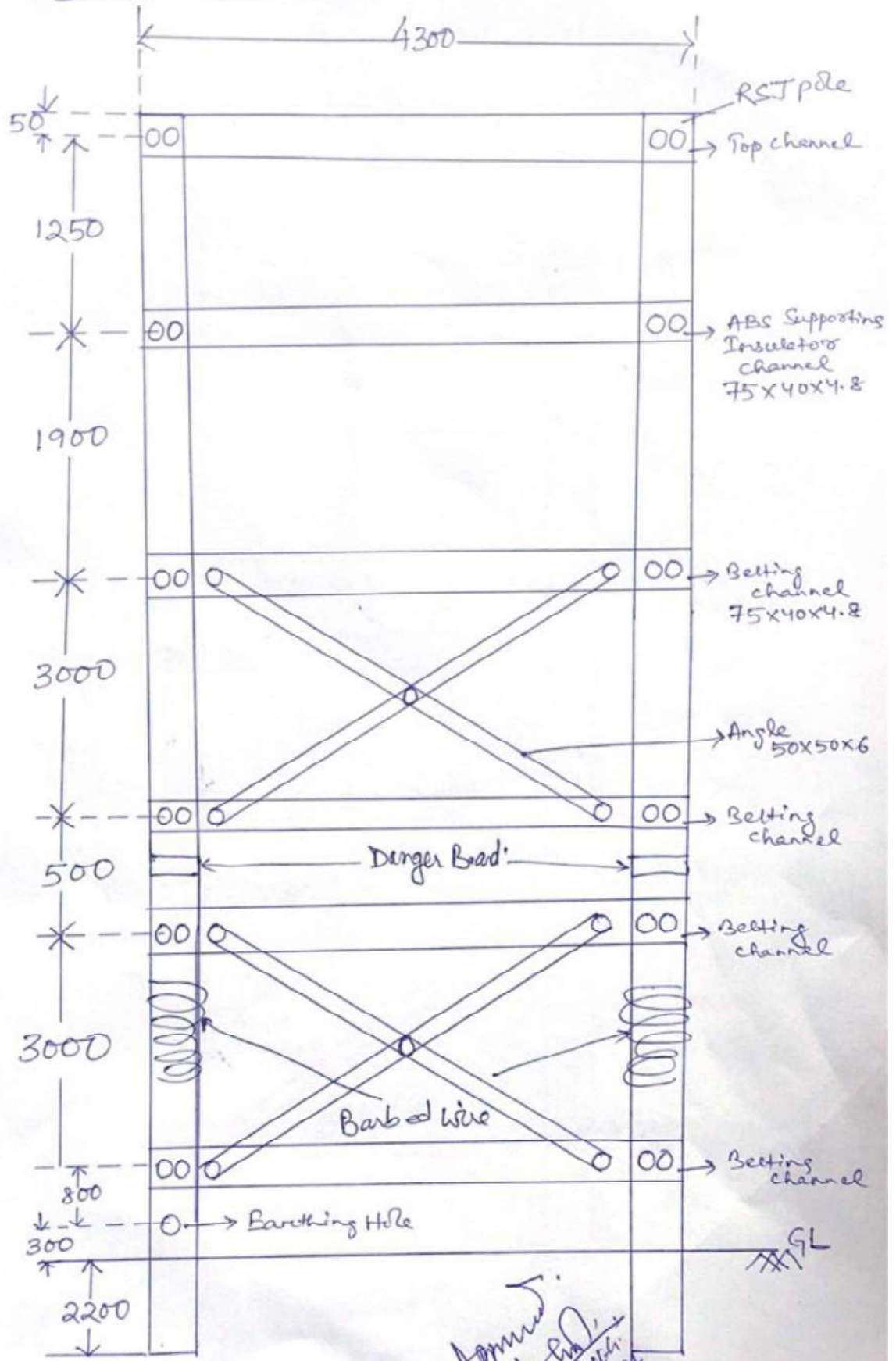
NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS SPECIFIED.
2. ALL HOLES ARE 18 DIA. FOR 16 DIA. BOLTS.
3. ALL ERECTION MARKS SHALL BE PREFIXED WITH "SP".
4. ALL STRUCTURAL STEEL SHALL CONFORM TO IS:2062 E-250, GR.-A
5. EDGE PREPARATION OF WELDING SHALL BE DONE AS PER IS:823 & WELDING AS PER IS:816
6. ALL WELDS ARE 6mm FILLET WELD UNO.
7. ALL STRUCTURAL STEEL MEMBERS & BOLT SHALL BE GALVANISED AFTER FABRICATION AS PER IS:2629 & 4759 AND ZINC COATING SHALL NOT BE LESS THAN 720gm/sq.m FOR STRUCTURAL STEEL MEMBER.

33KV DP WITH AB SWITCH



33KV DP





CENTRAL ELECTRICITY SUPPLY UTILITY OF ORISSA
8th Floor, IDCO TOWERS, Janpath, Bhubaneswar-751022
Phone: 2541575 Fax: 0674 - 2543125
Web Site: www: cescoorissa.com

Letter no: CESU/RAPDRP/ 21453 (7)

Date: 17 SEP 2016

To

M/s L&T Construction
N-1/168, Ground Floor,
IRC Village, Nayapalli,
Bhubaneswar.
Email:- ssinha@lntecc.com

Sub:- Approval of drawing for 33KV 14 Mtr 'H' Pole line crossing 180⁰ and 90⁰ with guarding arrangement for execution of work under Pkg.-1, RAPDRP Scheme.

Ref: 1. This office Letter of Award No.4683, dtd.26.02.2016 & 4688, dtd.26.02.2016.
2. Your letter No.LTCD/BBSR/RAPDRP/Aug.-07/145, dated 08.08.16.

Sir,

With reference to the subject cited above, please find enclosed herewith the approval of drawings for the following materials under Pkg.1, RAPDRP Scheme.

1. 33KV 14 Mtr 'H' Pole line crossing 90⁰ with guarding arrangement
2. 33KV 14 Mtr 'H' Pole line crossing 180⁰

This is for your information and necessary action.

Yours faithfully,

Sr. General Manager (RAPDRP)
CESU, Bhubaneswar

Copy submitted along with enclosures to :

DGM (APDRP) CESU, H.O/ Sr. G.M (Elect.), Circle-I, BBSR information and necessary action.
Project Coordinating Officer, Circle-I, Bhubaneswar (Email:- rapdrpbbsr1@cescoorissa.com)
for information and necessary action.
Manager (Ele), BCDD-I, / AGM (Ele), BCDD-II / Manager (Ele), BED, Bhubaneswar for
information and necessary action.

This drawing is the property of L&T Construction. It is to be used only for the project and site specified herein. It is not to be used for any other project or site without the written consent of L&T Construction. It is not to be used for any other project or site without the written consent of L&T Construction.

LEGENDS:-
 TEL - PITCHED GROUND LEVEL
 TRF - TRACK

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
3. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
4. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
5. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
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11. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
12. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
13. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.

BILL OF QUANTITY PER STRUCTURE

Excavation No.	Slab/Description	Length (mm)	No. off	Section wt/m	Total Weight (kg)
1	10 THK BASE PLATE	450x650	1	78.38	15.68
2	6 THK STIFFENER PLATE	150x150	4	47.10	3.19
3	6 THK STIFFENER PLATE	150x150	2	47.10	0.94
4	6 THK STIFFENER PLATE	150x150	2	47.10	0.94
5	6 THK STIFFENER PLATE	150x150	2	47.10	0.94
6	8 THK PLATE	150x270	30	47.10	1.27
7	8 THK PLATE	150x270	30	47.10	1.27
8	8 THK PLATE	150x270	30	47.10	1.27
9	8 THK PLATE	150x270	30	47.10	1.27
10	8 THK PLATE	150x270	30	47.10	1.27
11	8 THK PLATE	150x270	30	47.10	1.27
12	8 THK PLATE	150x270	30	47.10	1.27
13	8 THK PLATE	150x270	30	47.10	1.27
14	8 THK PLATE	150x270	30	47.10	1.27
15	8 THK PLATE	150x270	30	47.10	1.27

RODS & NUTS (GRADE 5.6) PER STRUCTURE

Hardware Name	Qty	Total Weight (kg)
M16-100mm LG	10	10.00
M16-150mm LG	10	15.00
M16-200mm LG	10	20.00
M16-250mm LG	10	25.00
M16-300mm LG	10	30.00
M16-350mm LG	10	35.00
M16-400mm LG	10	40.00
M16-450mm LG	10	45.00
M16-500mm LG	10	50.00
M16-550mm LG	10	55.00
M16-600mm LG	10	60.00
M16-650mm LG	10	65.00
M16-700mm LG	10	70.00
M16-750mm LG	10	75.00
M16-800mm LG	10	80.00
M16-850mm LG	10	85.00
M16-900mm LG	10	90.00
M16-950mm LG	10	95.00
M16-1000mm LG	10	100.00

SUMMARY OF WEIGHTS:-

WEIGHT OF STRUCTURE	814.28
WEIGHT OF BOLTS & NUTS	1508
TOTAL WT.	965.26 kg



CLIENT: CENTRAL ELECTRICITY SUPPLY UTILITY OF ODISSA
 PROJECT: R-APDRP BHUBANESHWAR

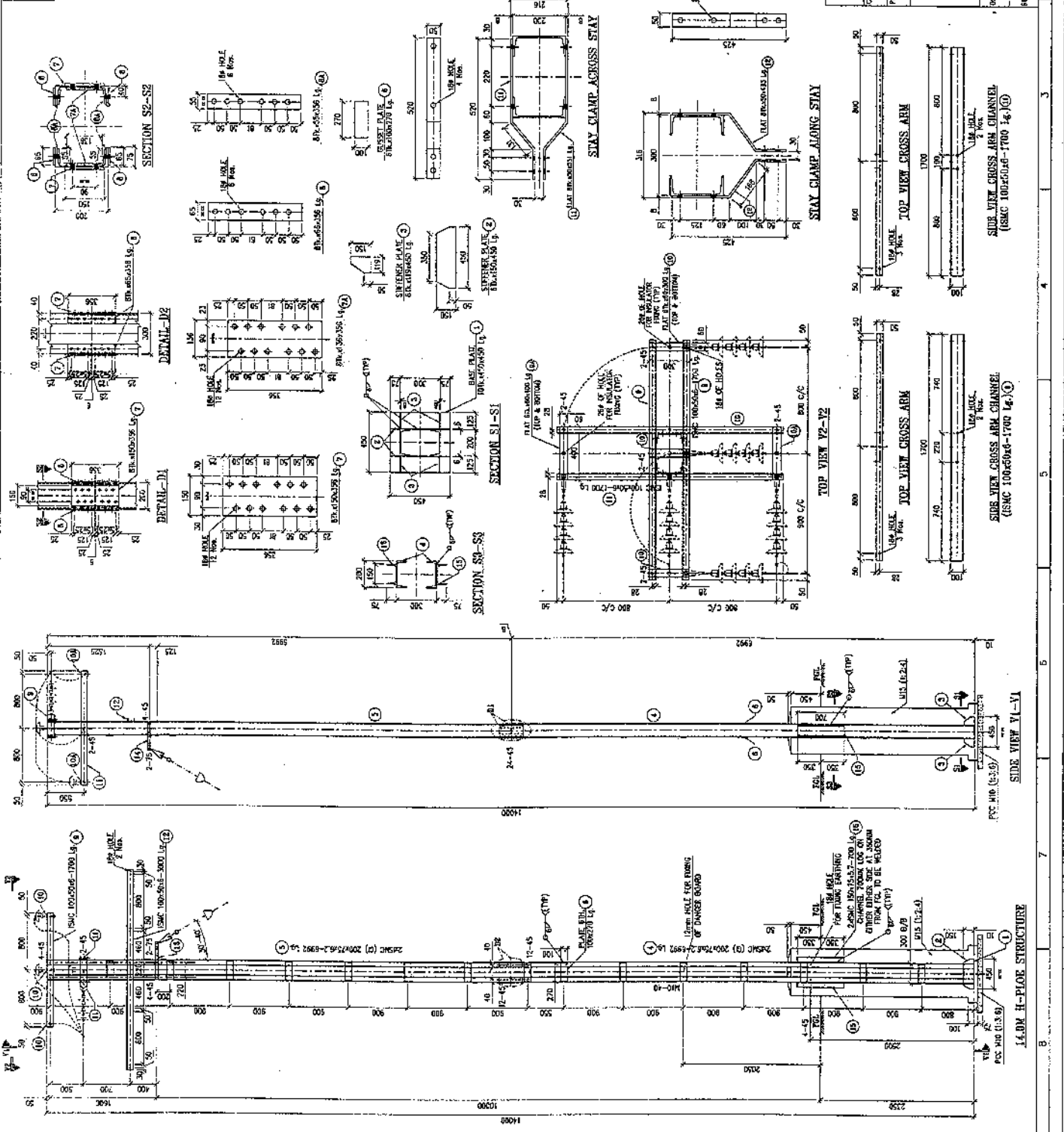
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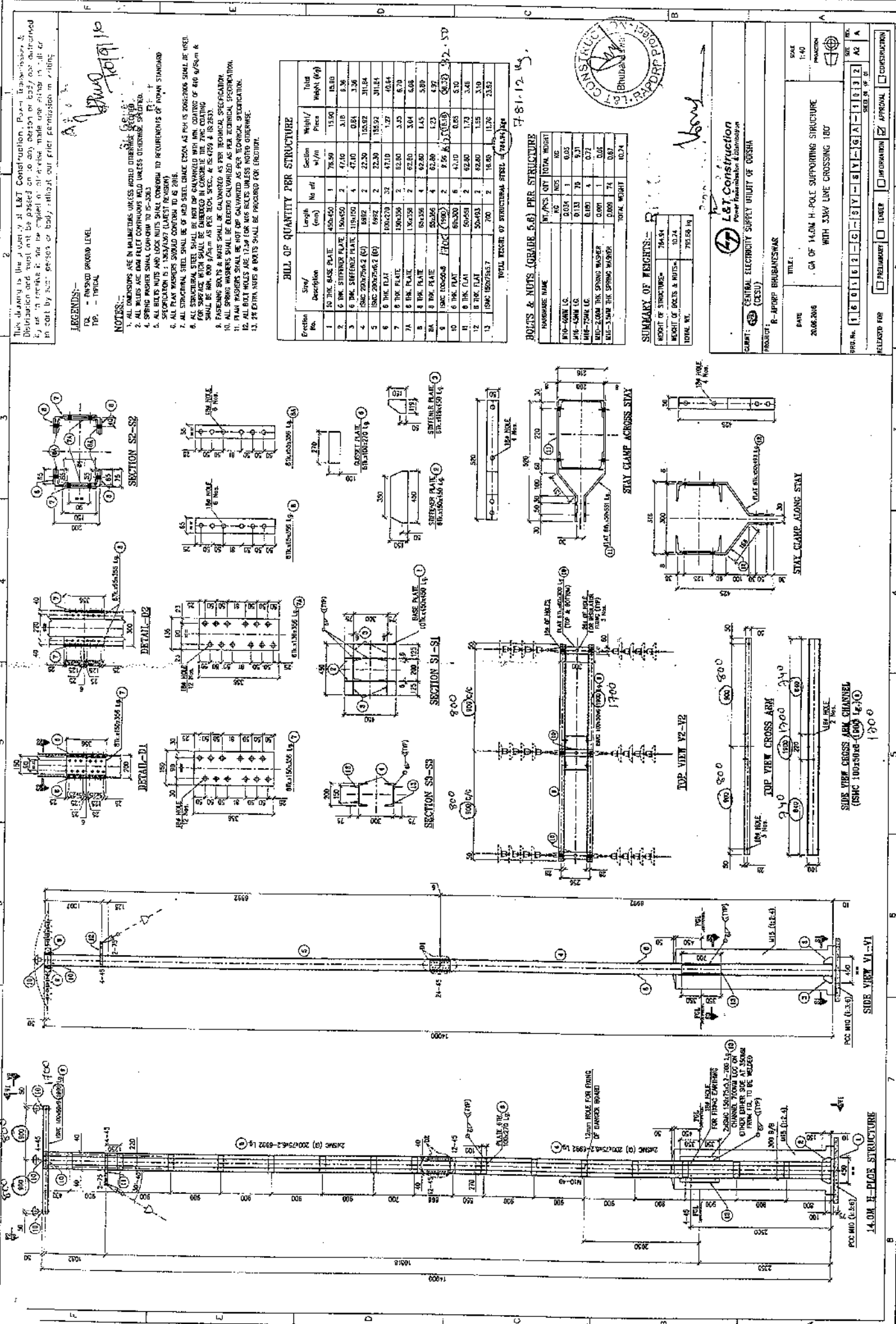
SCALE: 1:40

PROJECT: CA OF 14.0M H-POLE SUPPORTING STRUCTURE WITH 33KV LINE CROSSING 90°

REVISION: 1

APPROVAL: [Signature]





This drawing is the property of LAT Construction, Power Transmission & Distribution and must not be passed on to any person or body without the written consent of LAT Construction, Power Transmission & Distribution in accordance with the terms and conditions of the license agreement on file with the client. It is to be used only for the project and site mentioned herein and is not to be used for any other purpose without the prior written consent of LAT Construction, Power Transmission & Distribution.

LEGENDS-
FLG - FINISHED GROUND LEVEL
TOP - TYPICAL

NOTES-

- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- ALL WELDS ARE GAS METAL ARC WELDED UNLESS OTHERWISE SPECIFIED.
- SPRING WASHER SHALL CONFORM TO IS-3283.
- ALL BOLTS AND LOCK WASHERS SHALL CONFORM TO REQUIREMENTS OF ISAN STANDARD.
- ALL STRUCTURAL STEEL SHALL BE OF THE GRADE AS SPECIFIED IN THE DRAWING.
- ALL STRUCTURAL STEEL SHALL BE OF THE GRADE AS SPECIFIED IN THE DRAWING.
- FOR SURFACE WELDS SHALL BE ENGRAINED IN CONCRETE TO THE FULL DEPTH OF 40 mm/1.5 IN.
- FABRICATING SHALL BE AS PER IS: 8081.
- ALL SPRING WASHERS SHALL BE GALVANIZED AS PER TECHNICAL SPECIFICATION.
- FLAT WASHERS SHALL BE NOT AP GALVANIZED AS PER TECHNICAL SPECIFICATION.
- ALL BOLTS AND NUTS ARE TO BE OF THE GRADE AS SPECIFIED IN THE DRAWING.
- ALL EXTRA NUTS & BOLTS SHALL BE PROVIDED FOR ERECTION.

BILL OF QUANTITY PER STRUCTURE

Section No.	Item Description	Length (m)	No. of Pieces	Section Weight (kg)	Total Weight (kg)
1	10 THK. BASE PLATE	450x450	1	15.50	15.50
2	6 THK. STIFFENER PLATE	150x450	2	4.70	9.40
3	6 THK. STIFFENER PLATE	150x150	4	0.84	3.36
4	500x200x7.5x12 (C)	800	2	22.50	45.00
5	500x200x7.5x12 (C)	600	2	16.50	33.00
6	8 THK. PLATE	100x270	2	4.10	8.20
7	8 THK. PLATE	150x250	2	5.20	10.40
8	8 THK. PLATE	150x250	2	5.20	10.40
9	8 THK. PLATE	150x250	2	5.20	10.40
10	8 THK. PLATE	150x250	2	5.20	10.40
11	8 THK. PLATE	150x250	2	5.20	10.40
12	8 THK. PLATE	150x250	2	5.20	10.40
13	100x40x5.0x12.5	700	2	18.00	36.00

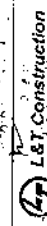
TOTAL WEIGHT OF STRUCTURAL STEEL = 194.40 kg

BOLTS & NUTS (GRADE 5.8) PER STRUCTURE

Hardware Name	M/F/A/S	Qty	Total Weight (kg)
M10-4MM LG.	NO	NO	NO
M10-4MM LG.	0.03	1	0.03
M10-4MM LG.	0.13	70	9.10
M10-4MM LG.	0.05	4	0.20
M10-4MM THK. SPRING WASHER	0.006	74	0.44
M10-4MM THK. SPRING WASHER	0.006	74	0.44
TOTAL WEIGHT		174	10.24

SUMMARY OF WEIGHTS-

WEIGHT OF STRUCTURE	194.40
WEIGHT OF BOLTS & NUTS	10.24
TOTAL WT.	204.64



CURT: CENTRAL ELECTRICITY SUPPLY AUTHORITY OF GUYANA
PROJECT: R-JUPITER BRIDGESHAR

DATE: 20.06.2008
SCALE: 1:40
PROJECT: R-JUPITER BRIDGESHAR
TITLE: GA OF 14.0M H-POLE SUPPORTING STRUCTURE WITH 33KV LINE CROSSING 180°
DRAWN BY: [Signature]
CHECKED BY: [Signature]
APPROVAL: [Signature]

RELEASED FOR: [] PRELIMINARY [] TENDER [] INFORMATION [] APPROVAL [] CONSTRUCTION



By e-mail

CENTRAL ELECTRICITY SUPPLY UTILITY OF ORISSA
8th Floor, IDCO TOWERS, Janpath, Bhubaneswar-751022
Phone: 2541575 Fax: 0674 - 2543125
Web Site: www.cescoorissa.com

Letter no: CESU/RAPDRP/Circle-I/ 15460 (6) Date: 8 JUL 2016

To

M/s L&T Construction
N-1/168, Ground Floor,
IRC Village, Nayapalli,
Bhubaneswar.
Email:- ssinha@intecc.com

Sub:- Approval of drawing of 14 Mtr Long 'H' Pole with Stay arrangement for Single Circuit 33KV line for execution of work under Pkg.1 RAPDRP Scheme.

Ref: 1. This office Letter of Award No.4683, dtd.26.02.2016 & 4688, dtd.26.02.2016.
2. Letter No.LITCD/BBSR/RAPDRP/June-35/58, dated 28.06.2016.

Sir,

With reference to the subject cited above, please find enclosed herewith the approved drawing of 14 Mtr Long 'H' Pole with Stay arrangement for Single Circuit 33KV line for execution of work under Pkg.1, RAPDRP Scheme.

This is for your information and necessary action.

Yours faithfully,

Sr. General Manager (RAPDRP)
CESU, Bhubaneswar

Encl: Approved drawings.

CC to :

Sr. G.M (Elect.), EC-I, Bhubaneswar for information.
Project Coordinating Officer, Circle-I, Bhubaneswar for information and necessary action.
Manager (Ele), BCDD-I / AGM (Ele), BCDD-II / Manager (Ele), BED, Bhubaneswar for information and necessary action **alongwith enclosure of drawing.**

Encl: Approved drawings.

This drawing is the property of L&T Construction, Power Transmission & Distribution and must not be passed on to any person or body not authorized by us. If a revision is to be applied or otherwise made use of it in full or in part by such person or body without our prior permission in writing.

LEGENDS:-
 FGL - FINISHED GROUND LEVEL
 TYP. - TYPICAL

- NOTES:-**
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE SPECIFIED.
 2. ALL WELDS ARE 6MM FILLET CONTINUOUS WELD UNLESS OTHERWISE SPECIFIED.
 3. SPRING WASHERS SHALL CONFORM TO IS-2053.
 4. ALL BOLTS NUTS AND LOCK NUTS SHALL CONFORM TO REQUIREMENTS OF INDIAN STANDARD SPECIFICATION IS : 1363/1367 (LATEST REVISION).
 5. ALL PLAIN WASHERS SHOULD CONFORM TO IS 2016.
 6. ALL STRUCTURAL STEEL SHALL BE OF MILD STEEL GRADE E250A AS PER IS 2062:2006 SHALL BE USED.
 7. ALL STRUCTURAL STEEL SHALL BE HOT DIP GALVANIZED WITH ZINC COATING OF 610 g/5cm² & FOR SURFACE WHICH SHALL BE EMBEDDED IN CONCRETE THE ZINC COATING SHALL BE MIN. 800 g/5cm² AS PER TECH. SPEC. & IS 4759 & IS 2633.
 8. FASTENING BOLTS & NUTS SHALL BE GALVANIZED AS PER TECHNICAL SPECIFICATION.
 9. ALL SPRING WASHERS SHALL BE ELECTRO GALVANIZED AS PER TECHNICAL SPECIFICATION.
 10. PLAIN WASHERS SHALL BE HOT DIP GALVANIZED AS PER TECHNICAL SPECIFICATION.
 11. ALL BOLT HOLES ARE 17.5% FOR M16 BOLTS UNLESS NOTED OTHERWISE.
 12. 2% EXTRA NUTS & BOLTS SHALL BE PROCURED FOR ERECTION.

BILL OF QUANTITY PER STRUCTURE

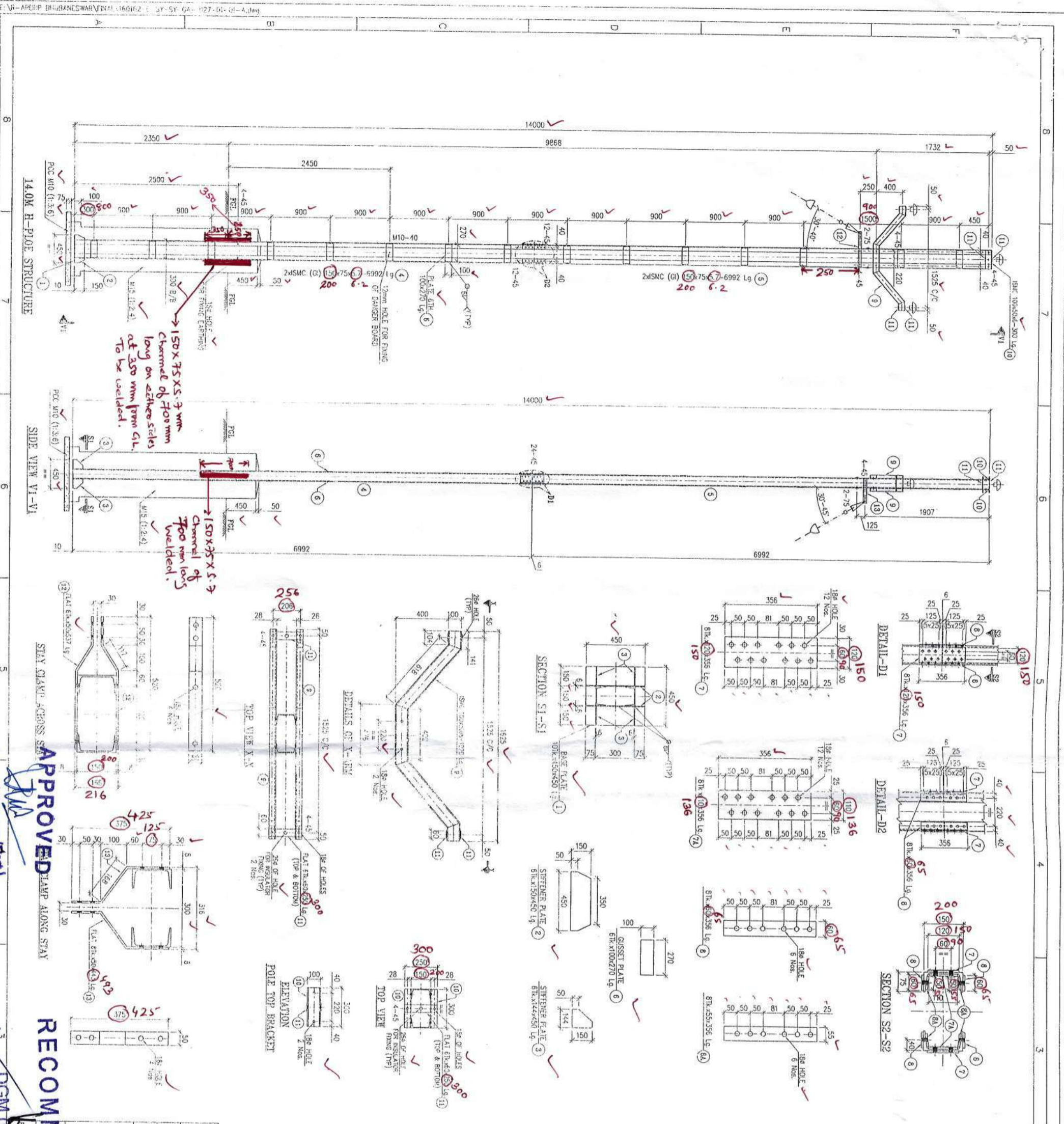
Erection No.	Size/Description	Length (mm)	No of	Section wt/m	Weight (kg)	Total Weight (kg)
1	10 THK. BASE PLATE	450x450	1	78.50	13.90	13.90
2	6 THK. STRENGTHENER PLATE	150x450	2	4.710	3.18	6.36
3	6 THK. STRENGTHENER PLATE	144x150	4	4.710	1.02	4.14
4	ISMC (150x75x6.5) (9)	6992	2	22.4(6.80)	(17.45)	34.90
5	ISMC (200x75x6.5) (9)	6992	2	22.4(6.80)	(17.45)	34.90
6	8 THK. PLATE	100x270	30	4.710	1.27	38.10
7	8 THK. PLATE	150 (200x356)	2	62.80	3.25	6.50
8	8 THK. PLATE	136 (100x356)	2	62.80	2.45	4.90
9	8 THK. PLATE	65 (60x356)	4	62.80	1.34	5.36
10	8 THK. PLATE	55x356	4	62.80	1.23	4.92
11	ISMC 100x50x6	1920	2	9.56	18.35	36.70
12	6 THK. FLAT	300	2	2.87	5.74	11.48
13	6 THK. FLAT	60x300	6	47.10	0.71	4.26
14	6 THK. FLAT	50x337	2	47.10	1.26	2.52
15	6 THK. FLAT	50x337	2	47.10	1.26	2.52
16	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
17	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
18	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
19	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
20	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
21	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
22	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
23	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
24	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
25	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
26	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
27	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
28	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
29	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
30	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
31	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
32	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
33	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
34	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
35	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
36	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
37	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
38	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
39	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
40	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
41	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
42	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
43	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
44	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
45	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
46	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
47	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
48	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
49	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68
50	150x75x5.7 THK. FLAT	6992	2	11.4(3.2)	(23.84)	47.68

BOLTS & NUTS (GRADE 5.6) PER STRUCTURE

Hardware Name	WT./PCS	QTY	TOTAL WEIGHT
M10-60MM LC	0.034	1	0.034
M16-60MM LC	0.133	86	11.40
M16-75MM LC	0.180	4	0.72
M16-60MM THK. SPRING WASHER	0.001	1	0.001
M16-35MM THK. SPRING WASHER	0.009	92	0.83
TOTAL WEIGHT			13.29

SUMMARY OF WEIGHTS:-

WEIGHT OF STRUCTURE	606.14
WEIGHT OF BOLTS & NUTS	13.29
TOTAL WT.	619.43 kg



APPROVED

RECOMMENDED

REVISIONS:

NO.	DATE	DESCRIPTION
1	20/06/2016	GA OF 14.0M H-PILE SUPPORTING STRUCTURE WITH 33KV V-CROSS ARM & TOP BRACKET

CLIENT: CENTRAL ELECTRICITY SUPPLY UTILITY OF ODISHA (CESU)

PROJECT: R-APDRP BHUBANESWAR

DESIGNED BY: DGM (Elect.)

CHECKED BY: Sr. General Manager (Elect.) R-APDRP Cell, CESU Bhubaneswar

DATE: 20/06/2016

TITLE: GA OF 14.0M H-PILE SUPPORTING STRUCTURE WITH 33KV V-CROSS ARM & TOP BRACKET

SCALE: 1:10

SHEET NO. OF 02

APPROVALS:

PRELIMINARY TENDER INFORMATION APPROVAL CONSTRUCTION

DATE: 20/06/2016

BY: DGM (Elect.)

FOR: Sr. General Manager (Elect.) R-APDRP Cell, CESU Bhubaneswar

LEGEND/KEY PLAN:-

NOTES:-

REFERENCES:-

PROJECT:-

CONTRACTOR:-

SUB CONTRACTOR:-

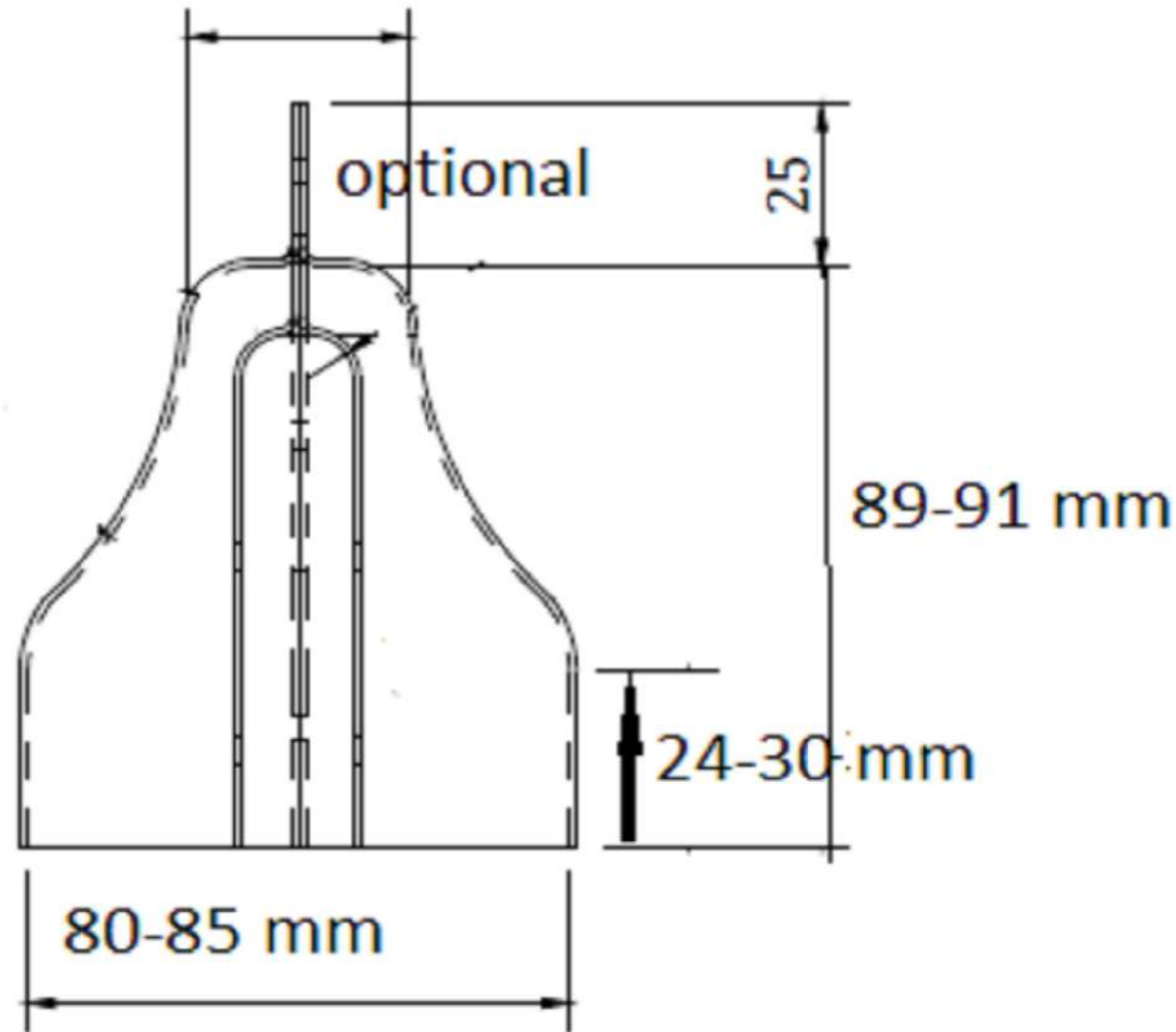
REVISION STATUS:-

DATE	REV NO.	REMARKS	DGN.	REV.	APPD.	ISSUED.
	02					
	01					
dd.mm.yyyy	00	XXXXXXXXXXXXXXXXXXXXXXX				

 TATA POWER DELHI DISTRIBUTION LIMITED
(A TATA POWER AND DELHI GOVERNMENT JOINT VENTURE)
District Office Building, Sector 03, Rohini, , Delhi-110085

DESIGN(DGN.)	XX	TITLE:-			
DRAWN(DRN.)	XX	ANNEXURE			
REVIEWED(REV.)	XX				
APPROVED(APPD.)	XX	SHEET	DRAWING NO.	REV.	
SCALE	XXX	0 OF 0	(ALPHA NUMERIC)	00	

32-43 mm



Project:	Rural Electrification Work under Deendayal Upadhyay Gram Jyoti Yojana (DDUGJY) in Odisha in the WESCO Utility (Pkg-4)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	L&T CONSTRUCTION
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)

GURANTEED TECHNICAL PARTICULARS OF 11KV 1250A ISOLATOR		
Sl.No	Particular	Bidder's Offer
1	Main switch	Double end break Centre post rotating, gang operated
2	Service	Outdoor
3	Applicable standard	IS : 9921
4	Pole	3 pole gang operator
5	Rated voltage nominal/ Maximum	11/12 kV
6	Rated Frequency	50 Hz \pm 5%
7	System earthing	Effectively earthed
8	Max. temperature rise of Isolator above 50°C ambient temperature	55 °C
9	Insulation level impulse with stand voltage	
	a) Across Isolating distance	85 kVpeak
	b) To earth & between poles	75 kVpeak
10	1 minute power frequency withstand voltage	
	a) Across Isolating distance	32 kVpeak
	b) To earth & between poles	28 kVpeak
11	Rated current in Amp	1250
12	Short time current for 3 sec	25kA
13	Operating mechanism	Manual
14	Auxiliary voltage	
	a) Control & Inter lock	NA
15	Safe duration of overload	
	a)150% of rated current	5 minute
	b)120% of rated current	30 minute
16	Maximum current that can be safely interrupted by the Isolator	
	a) Inductive	0.7A at 0.15 pf
	b) Capacitive	0.7A at 0.15 pf
17	Type of mounting	Horizontal upright mounting
18	Terminal connector type	Rigid Bolted type terminal connector suitable for AAC Dog/Wolf/Panther made of aluminium alloy as per IS:5561
19	Class of phase coupling and operating pipe	Class-B GI Pipe as per IS:1239-68 (Tata/SAIL/Jindal/RIML make)
20	INSULATOR:	
(a)	Manufacturer	SUN/ABIL or other approved manufacturer
(b)	Conforming standard	IS:2544
(c)	No. of Insulator per stack	1 (one) 11KV Post Insulator
(d)	Nominal system voltage	11 kV
(e)	Highest system voltage	12 kV
(f)	Minimum creepage distance	320 mm
(g)	Impulse withstand voltage	75 kVp
(h)	Wet power frequency 1 min withstand voltage	35 kV
(i)	Height	254 mm
(j)	Tensile strength	10 kN
(k)	Bending strength	6 kN

Note:

- Operating mechanism shall be provided with Pad Locking facilities for 5 Lever Pad Lock (Pad lock is not within scope of supply of J. D. Electricals and shall arrange by M/s L&T Construction).
- Contact surfaces of fixed & moving contacts shall be silver plated with a thickness of 0.05mm.

* 'Terminal connectors' by approved make



Feedback Info Sheet APPROVED

Checked & Reviewed Field Expert
Subal K. Kumar
Name & Designation 21/11/2017

Verified *[Signature]*
Name & Designation

100

70


Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA WESCO IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/ SUPPLY/2016/3940 (8) DATED 09.09.2016		
Contractor:	L&T CONSTRUCTION		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Item:	12KV 1250A DOUBLE BREAK ISOLATOR		

SL. NO.	<input type="text"/>	YEAR OF MFG	<input type="text"/> 2017
VOLTAGE	<input type="text"/> 12 KV	CURRENT	<input type="text"/> 1250A
STC FOR 3 SEC	<input type="text"/> 25 kA rms	FREQUENCY	<input type="text"/> 50 HZ

FOR ISOLATORBASE CHANNEL

Feedback Infra Pvt. Ltd. Approved
 Checked & Reviewed: **SUBODH KUMAR**
 Designation: **Expert**
 Name & Designation: **Saham PVT. Ltd.**
 Verified: **Saham**
 Name & Designation:

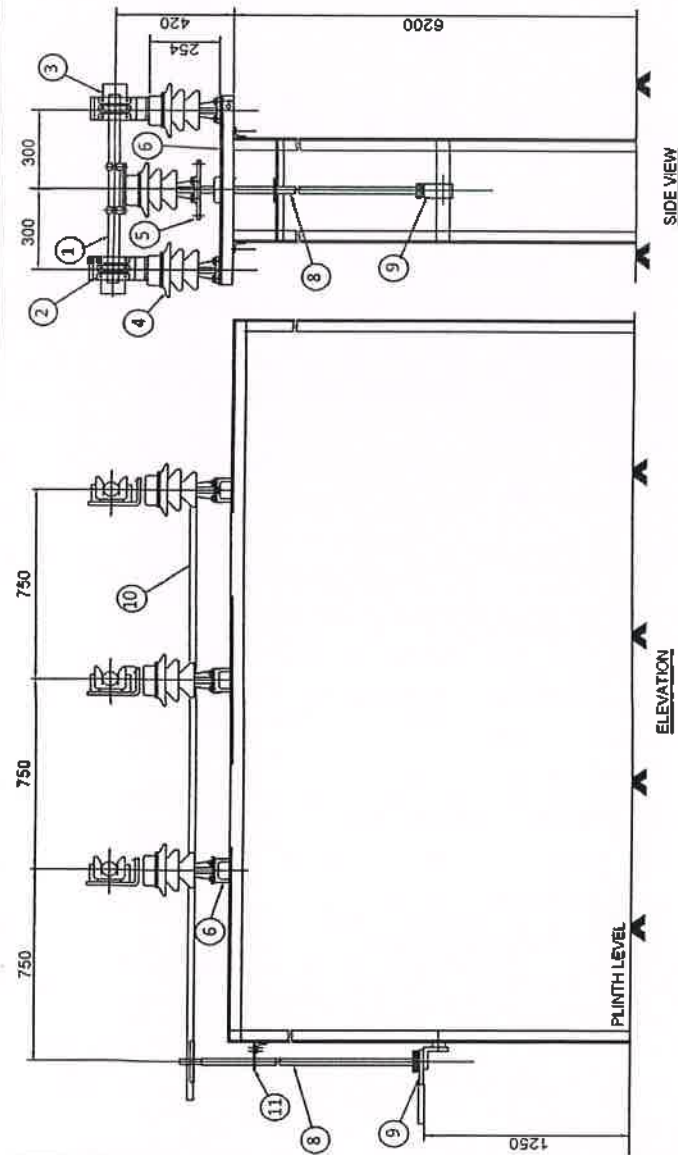
1. ALL DIMENSIONS ARE IN mm
2. TOLERANCE ON DIMENSIONS: ±5%

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016		
Consultant:	FEEDBACK INFRA		
Contractor:	L&T CONSTRUCTION		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Title:	NAME PLATE FOR 12KV, 1250A, DOUBLE BREAK ISOLATOR		
DRN	NAME	DATE	SCALE
CHD	dm	09.12.2016	: NTS
APPD			
			
			DRG NO. JDE-12RR-NP
			SHEET 1 OF 1
			REV 02

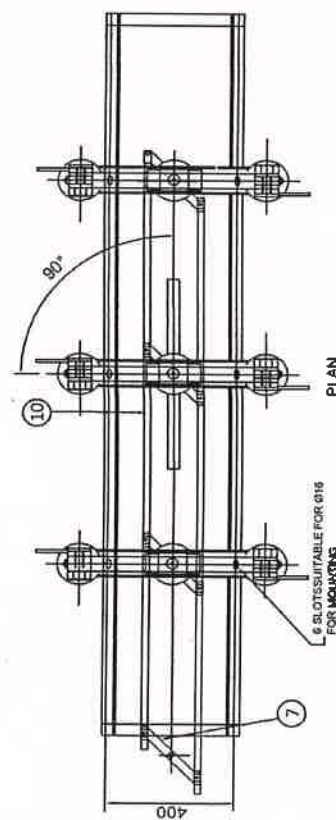


MARK	DESCRIPTION	QNTY (NOS.)
1	MOVING CONTACT BLADE (COPPER)	3
2	FIXED CONTACT ASSEMBLY (COPPER)	6
3	TERMINAL PAD (COPPER)	6
4	INSULATOR, 11KV POST TYPE (PORCELAIN)	9
5	ROTATING BASE ASSEMBLY (MS GALV)	3
6	BASE CHANNEL (MS GALV), 75 x 40	3
7	OPERATING LEVER (MS GALV)	1
8	OPERATING PIPE (32 NB GI PIPE, CLASS-B)	1
9	OPERATING MECHANISM (MS GALV)	1
10	TANDEM PIPE (24 NB GI PIPE, CLASS-B)	2
11	PIPE GUIDE (MS GALV)	1

Feedback Infra Pvt. Ltd. Approved
 Checked & Reviewed
SUBODH KUMAR
 Name & Designation Expert
 Verified
Ghan
 Feedback Infra Pvt. Ltd.
 Name & Designation



SIDE VIEW



PLAN

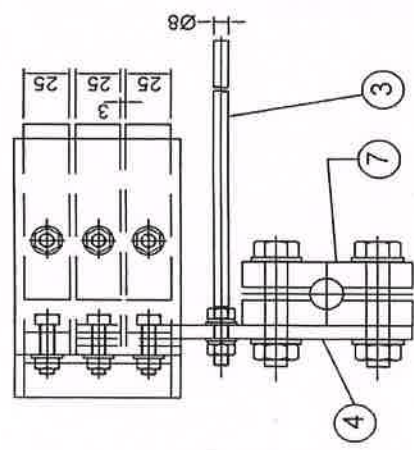
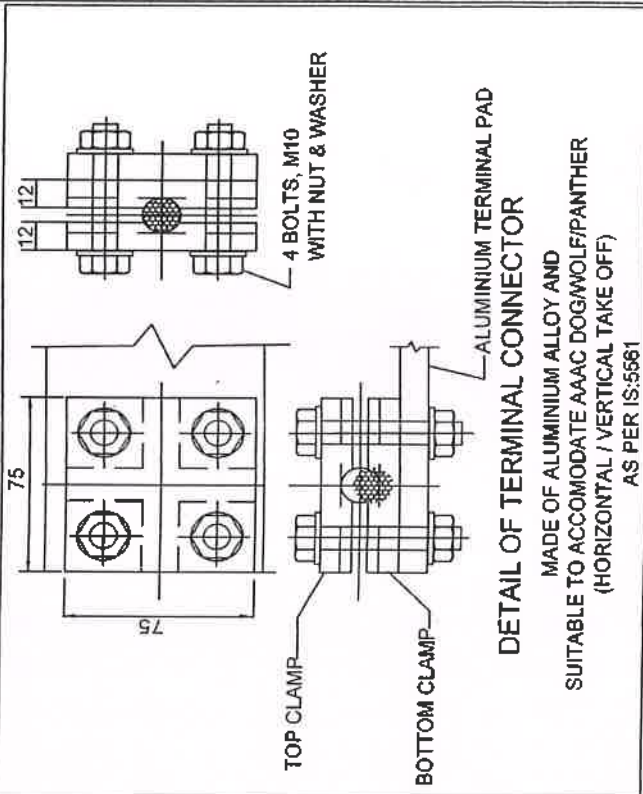
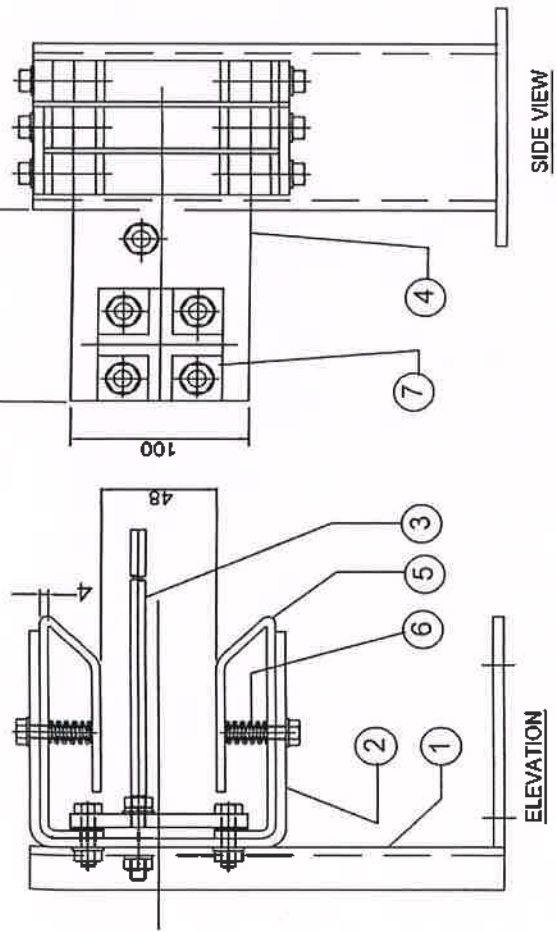
NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED
2. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED
3. CONTACT SURFACES OF CURRENT CARRYING PARTS SHALL BE SILVER PLATED (25 MICRONS)
6. MANUFACTURING TOLERANCE ON DIMENSIONS: ±5%

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM (YOTI YOIANA (DDUGIY) IN ODISHA IN THE WESCO UTILITY (PKG-04)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LOA No.:	OPTCL/PMU/DDUGIY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	L&T CONSTRUCTION
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)
Title:	GENERAL ARRANGEMENT FOR 12KV, 1250A, DOUBLE BREAK, MANUAL OPERATED ISOLATOR WITHOUT EARTH SWITCH
NAME	SCALE : NTS
DRN	DATE 09.12.2016
CHD	DRG NO. JDE-12RRH12
APPD	REV 1 OF 1
	SHEET 1 OF 1
	REV 02



MARK	DESCRIPTION	MATERIAL
1	CONTACT BASE	MS GALVANISED
2	CONTACT GUARD	MS GALVANISED
3	ARCING HORN	MS GALVANISED
4	TERMINAL PAD	ALUMINIUM, 100 X 12
5	FIXED FEMALE CONTACT	HDE COPPER, (25mm x 4mm) X 3
6	COIL SPRING	STAINLESS STEEL
7	TERMINAL CONNECTOR	ALUMINIUM ALLOY



PLAN

- NOTE:
1. ALL DIMENSIONS ARE IN mm
 2. CONTACTS SHALL BE SILVER PLATED (25 MICRONS)
 3. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED
 4. MANUFACTURING TOLERANCE: ±5%

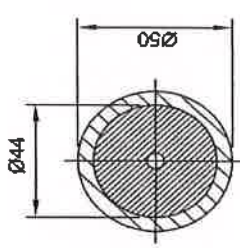
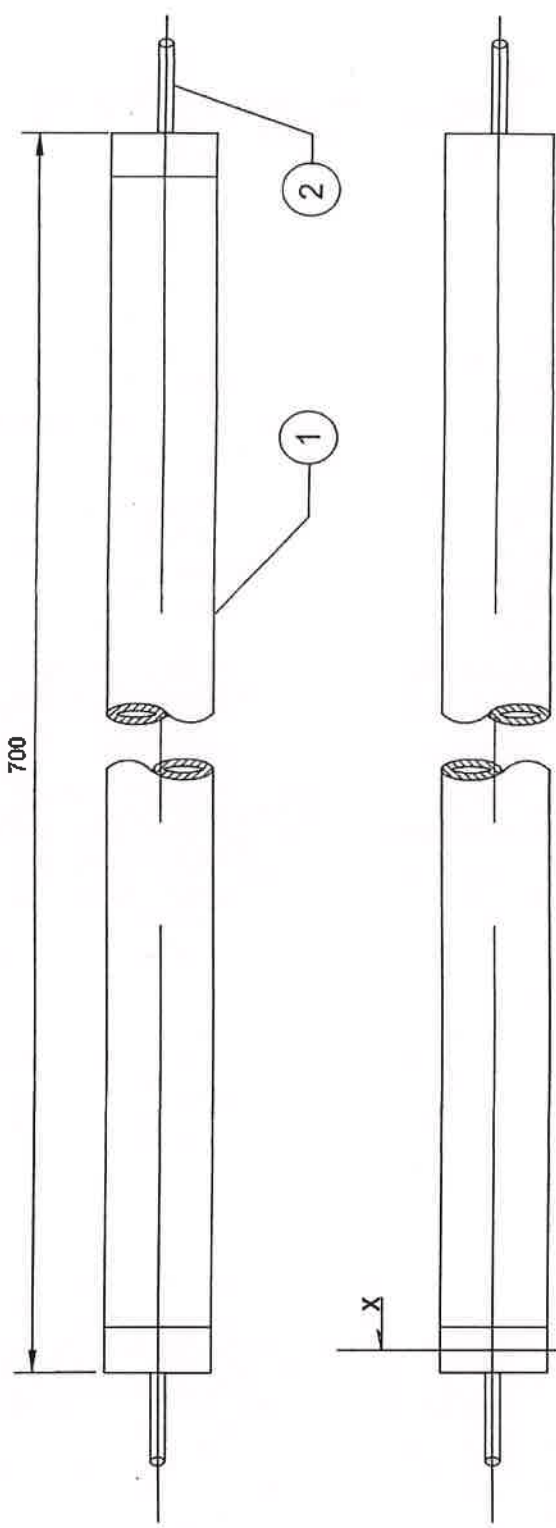
Feedback Infra Pvt. Ltd. Approved

Checked by **SUBODH KUMAR**
Subodh Kumar
 Name & Designation Expert
Feedback Infra Pvt. Ltd.
 Verified *Sahram*
 Name & Designation



Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)			
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED			
LOA No.:	OPTEL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016			
Consultant:	FEEDBACK INFRA			
Contractor:	L&T CONSTRUCTION			
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)			
Title:	FIXED CONTACT ASSEMBLY FOR 12KV, 1250A DOUBLE BREAK ISOLATOR			
DRN	NAME	DATE	SCALE	NTS
CHD	drn	09.12.2016		
APPD				
	DRG NO.	JDE-12RRFC12		
	SHEET	1 OF 1		
	REV			02

MARK	DESCRIPTION	MATERIAL
1	MOVING CONTACT BLADE	HDE COPPER TUBE, 50 OD x 44 ID
2	ARCING HORN	8 DIA.MS GALVANISED



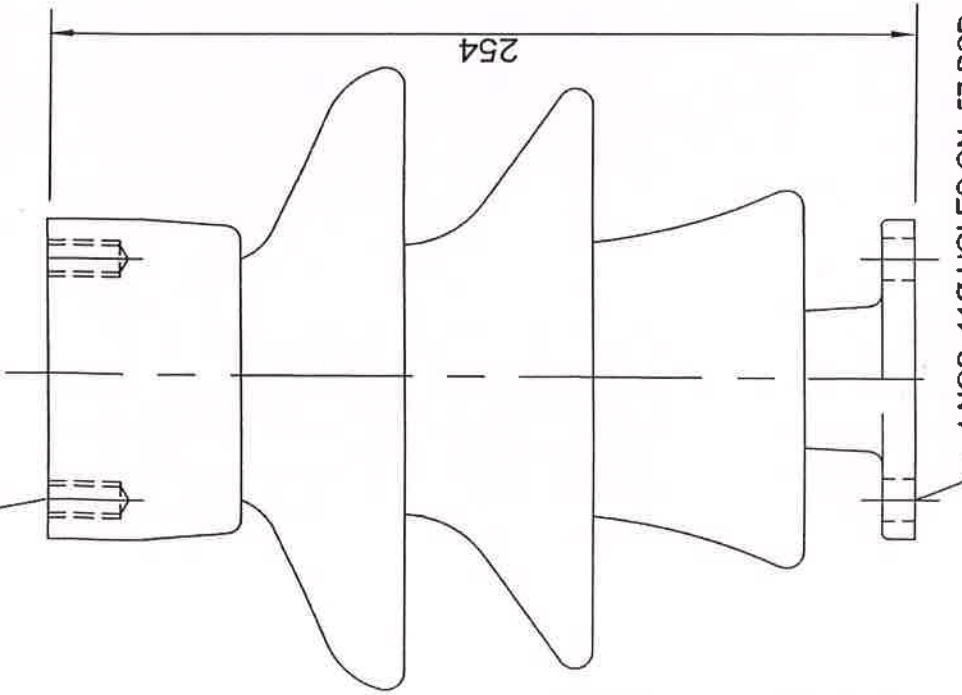
feedback Infra Pvt. Ltd. Approved
 Checked & Reviewed by **SUBODH KUMAR**
 Name & Designation **Subodh Kumar, Field Expert**
 Feedback Infra Pvt. Ltd.
 Verified **Gham**
 Name & Designation

- NOTE:
1. ALL DIMENSIONS ARE IN mm
 2. ALL FERROUS PARTS SHALL BE HOT DIP GALVALISED
 3. BOTH CONTACT ENDS OF THE MOVING BLADE SHALL BE SILVER PLATED (25 MICRONS)
 4. MANUFACTURING TOLERANCE: ±5%

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)					
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED					
LOA No.:	OPTCL/PMU/DDUGJY/04/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016					
Consultant:	FEEDBACK INFRA					
Contractor:	L&T CONSTRUCTION					
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)					
Title:	MOVING CONTACT BLADE FOR 12KV, 1250A, DOUBLE BREAK ISOLATOR					
DRN	NAME	DATE	SCALE	NTS		
CHD	dm	09.12.2016				
APPD						
			DRG NO.	JDE-12RRMB12	SHEET	1 OF 1
					REV	02



4 NOS. M10 TAPPED HOLES ON 57 PCD



4 NOS. 11Ø HOLES ON 57 PCD

Feedback Infra Pvt. Ltd. Approved
 Checked & Signed: **SUBODH KUMAR**
Subodh K
 Name & Designation: **Feedback Infra Pvt. Ltd.**
 Verified: *Sphur*

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. MANUFACTURING TOLERANCE ±5%

TECHNICAL PARAMETERS:

CONFORMING STANDARD: IS:2544
 NOMINAL SYSTEM VOLTAGE: 11 KV
 HIGHEST SYSTEM VOLTAGE: 12 KV
 DRY PF ONE MINUTE WITHSTAND VOLTAGE: 35 KV
 WET PF ONE MINUTE WITHSTAND VOLTAGE: 35 KV
 PF PUNCTURE WITHSTAND TEST VOLTAGE: 1.3 TIME THE ACTUAL DRY FLASH OVER VOLTAGE OF THE UNIT
 IMPULSE WITHSTAND TEST VOLTAGE: 75 KV PEAK
 VISIBLE DISCHARGE TEST VOLTAGE: 9 KV
 MINIMUM CREEPAGE DISTANCE: 320 mm
 TENSILE STRENGTH: 10 KN
 MANUFACTURER: SUN / ABIL

Project	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016		
Consultant:	FEEDBACK INFRA		
Contractor:	L&T CONSTRUCTION		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Title:	POST INSULATOR FOR 12KV, 1250A, DOUBLE-BREAK INSULATOR		
DRN	NAME	DATE	SCALE: NTS
CHD	dm	09.12.2018	
APPD			DRG NO. IDE-5-281
			SHEET 1 OF 1
			REV 02



Project:	Rural Electrification Work under Deendayal Upadhyay Gram Jyoti Yojana (DDUGJY) in Odisha in the WESCO Utility (Pkg-4)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	L&T CONSTRUCTION
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)

GURANTEED TECHNICAL PARTICULARS OF 33KV ISOLATOR		
Sl.No	Particular	
1	Main switch	Double end break Centre post rotating, gang operated
2	Service	Outdoor
3	Applicable standard	IS : 9921
4	Pole	3 pole gang operator
5	Rated voltage nominal/ Maximum	33/36 kV
6	Rated Frequency	50 Hz $\pm 5\%$
7	System earthing	Effectively earthed
8	Max. temperature rise of Isolator above 50°C ambient temperature	55 °C
9	Insulation level impulse with stand voltage	
	a) Across Isolating distance	195kVpeak
	b) To earth & between poles	170kVpeak
10	1 minute power frequency withstand voltage	
	a) Across Isolating distance	80 kVpeak
	b) To earth & between poles	70 kVpeak
11	Rated current in Amp	800
12	Short time current for 3 sec	30 kA rms
13	Operating mechanism	Manual
14	Auxiliary voltage	33kV
	a) Control & Interlock	NA
15	Safe duration of overload	
	a) 150% of rated current	5 minute
	b) 120% of rated current	30 minute
16	Maximum current that can be safely interrupted by the Isolator	
	a) Inductive	0.7A at 0.15 pf
	b) Capacitive	0.7A at 0.15 pf
17	Type of Mounting	Horizontal upright mounting
18	Terminal connector type	Rigid bolted type Connector suitable for AAAC Dog/Wolf/Panther conductor made from aluminium alloy as per IS:5561
19	Class of Phase Coupling and Operating Pipe	Class-B GI Pipe as per IS:1239-68 (Tata/SAIL/Jindal/RIML make)
20	INSULATOR	
(a)	Manufacturer	ABI / Sun or other approved make
(b)	Conforming standard	IS:2544
(c)	No. of Insulator per stack	2 unit of 22kV Post Insulator per stack
(d)	Nominal system voltage	33kV
(e)	Highest system voltage	36kV
(f)	Minimum creepage distance of insulator stack	900 mm
(g)	Impulse withstand voltage	170kV
(h)	Wet power frequency 1 min withstand voltage	75kVp
(i)	Height of stack	508mm
(j)	Tensile strength	30kN
(k)	Bending strength	4.5kN

Note:

- Operating mechanism shall be provided with Pad Locking facilities for 5 Lever Pad Lock (Pad lock is not within scope of supply of J. D. Electricals and shall arrange by M/s L&T Construction)
- Contact surfaces of fixed & moving contacts shall be silver plated with a minimum coating of 25 microns.

* Terminal connector shall be of approved make



Approved
Checked & Reviewed
Name & Designation
21/11/2017
Verified
Sham

120

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/ SUPPLY/2016/3940 (8) DATED 09.09.2016		
Contractor:	L&T CONSTRUCTION		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Item:	36KV, 800A DOUBLE BREAK ISOLATOR		

SL. NO.		TYPE	DBCR
VOLTAGE	36 kV	CURRENT	800A
STC FOR 3 SEC	30 kA rms	FREQUENCY	50 Hz
OPERATING DEVICE	MANUAL	YEAR OF MFG	2017

FOR ISOLATOR OPERATING BOX

100

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/ SUPPLY/2016/3940 (8) DATED 09.09.2016		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Item:	36KV, 800A DOUBLE BREAK ISOLATOR		

VOLTAGE	36 kV	CURRENT	800A
STC FOR 3 SEC	30 kA rms	FREQUENCY	50 Hz
SL. NO.		YEAR OF MFG	2017

FOR ISOLATOR BASE CHANNEL

120

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/ SUPPLY/2016/3940 (8) DATED 09.09.2016		
Contractor:	L&T CONSTRUCTION		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Item:	EARTH SWITCH FOR 36KV, 800A DOUBLE BREAK ISOLATOR		

SL. NO.		VOLTAGE	36 kV
STC FOR 3 SEC	30 kA rms	FREQUENCY	50 Hz
OPERATING DEVICE	MANUAL	YEAR OF MFG	2017

FOR EARTH SWITCH OPERATING BOX

Feedback Infra Pvt. Ltd. Approved

Checked by Arjun Kumar
 Name & Designation
 Feedback Infra Pvt. Ltd.

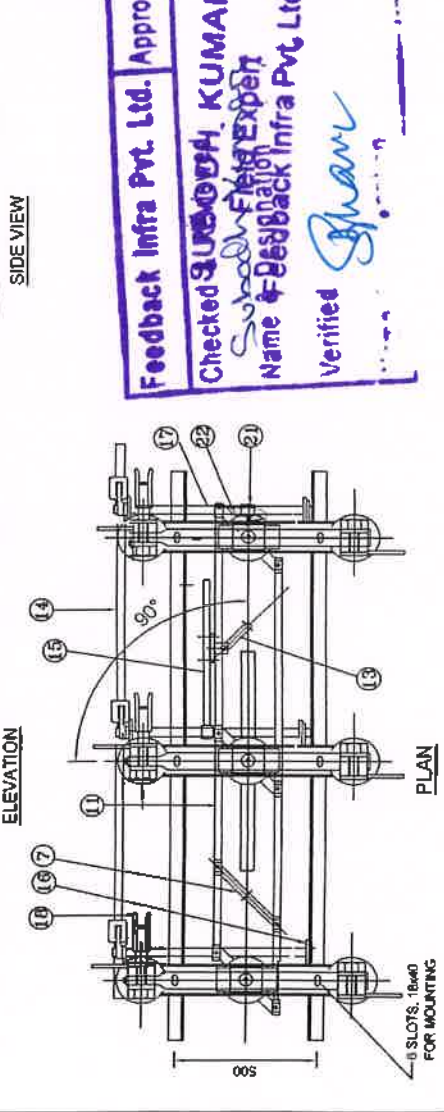
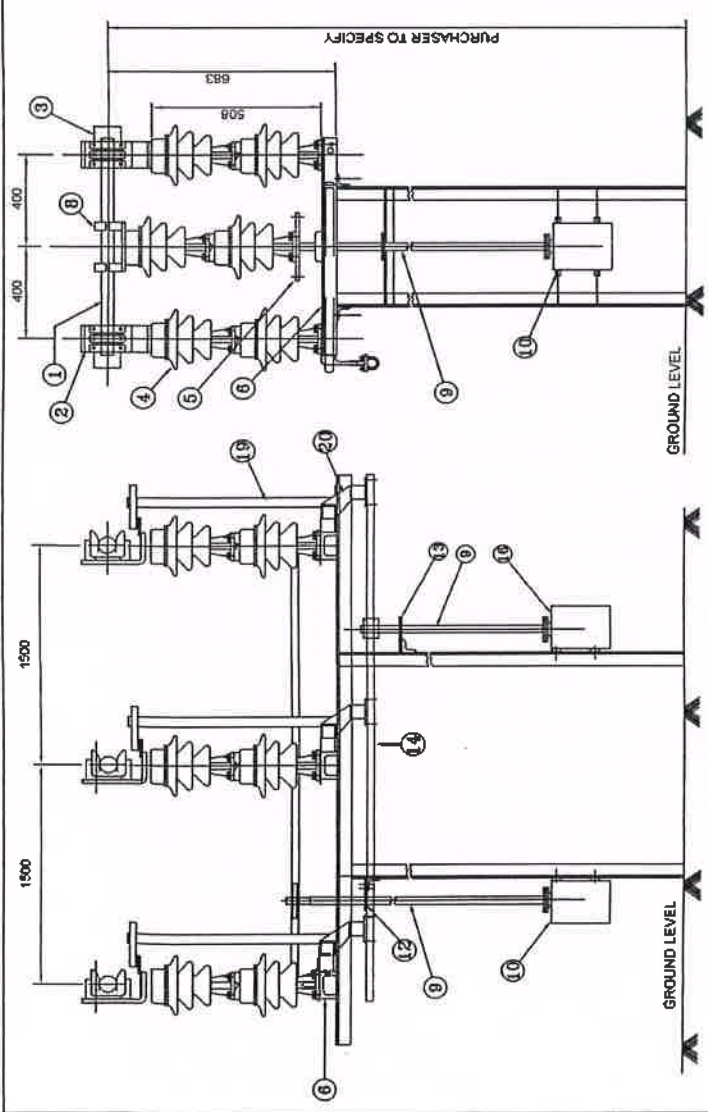
Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016		
Consultant:	FEEDBACK INFRA		
Contractor:	L&T CONSTRUCTION		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Title:	NAME PLATE FOR 36KV, 800A, DOUBLE BREAK ISOLATOR		



NAME	DATE	SCALE	NTS
dm	09.12.2016		
DRN			
CHD			
APPD			

SHEET	1 OF 1	REV	02
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MARK	DESCRIPTION	QNTY (NOS.) ISO E.S.W
1	MOVING CONTACT BLADE (HDE COPPER, SILVER PLATED)	3
2	FIXED CONTACT ASSEMBLY (HDE COPPER, SILVER PLATED)	6
3	TERMINAL PAD (ALUMINIUM)	6
4	INSULATOR, 2 UNIT OF 22KV POST PER STACK, PORCELAIN	9
5	ROTATING BASE ASSEMBLY (MS GALV)	3
6	BASE CHANNEL, 100 x 50 (MS GALV)	3
7	OPERATING LEVER (MS GALV)	1
8	BLADE HOLDING ARRANGEMENT	3
9	OPERATING PIPE (40 DIA GI PIPE, CLASS B)	1
10	ISOLATOR OPERATING MECHANISM (MS PAINTED)	1
11	PHASE COUPLING PIPE (25NB GI PIPE, CLASS B)	2
12	PIPE GUIDE (MS GALV)	1
13	OPERATING LEVER FOR EARTH SWITCH (MS GALV)	1
14	PHASE COUPLING PIPE FOR ES (25NB GI PIPE, CLASS-B)	1
15	LINK PIPE FOR EARTH SW (25NB GI PIPE, CLASS B)	1
16	EARTH SW. OPERATING MECHANISM (MS PAINTED)	1
17	OPERATING SHAFT (MS SQ.)	1
18	EARTH CONTACT ASSEMBLY (COPPER SILVER PLATED, MS)	3
19	EARTH BLADE ASSEMBLY (COPPER SILVER PLATED, MS)	3
20	PHASE COUPLING LEVER (MS GALV)	4
21	INTERLOCKING LEVER (MS GALV)	1
22	INTERLOCKING STOPPER (MS GALV)	1



Feedback Infra Pvt. Ltd. Approved
 Checked **ANURAGH KUMAR**
Subodh Kishor
 Name of **Feedback Infra Pvt. Ltd.**
 Verified *Sham*

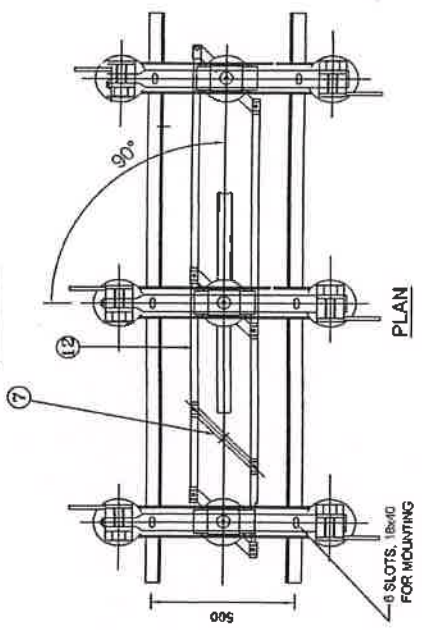
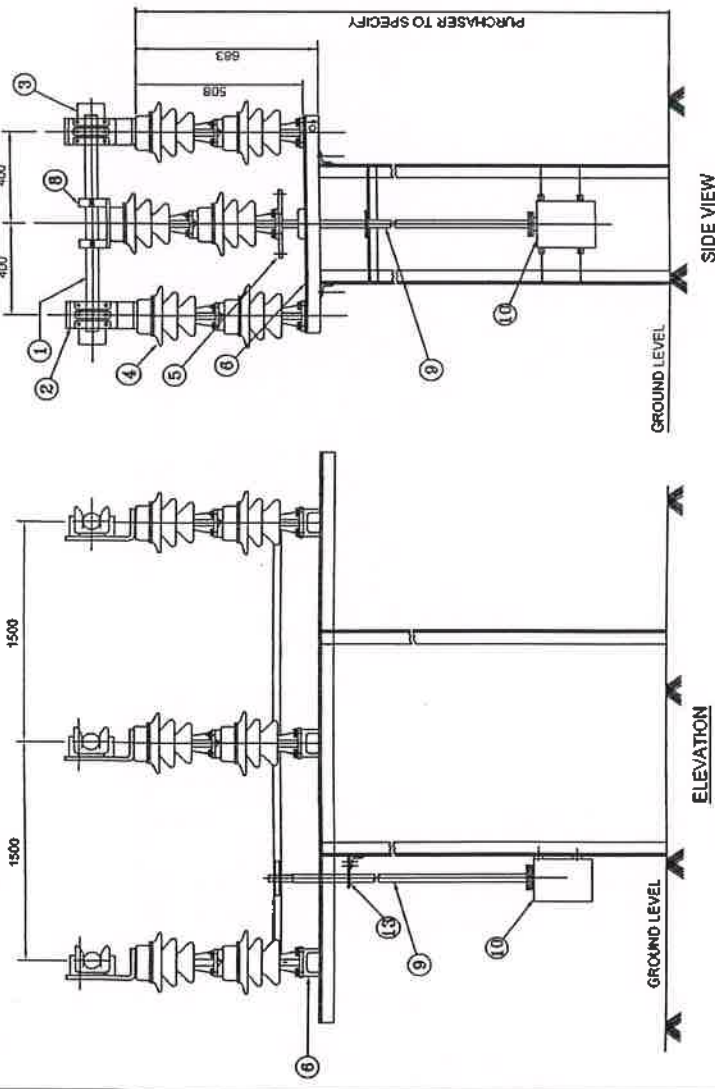
Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DOUGYI) IN ODISHA IN THE WESCO UTILITY (PKG-04)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LCA No.:	OPTCL/PMU/RODUGY/10A/WESCO/04/7 8/SUPPLY/2016/5940 (8) DATED 09.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	L&T CONSTRUCTION
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)
Title:	GENERAL ARRANGEMENT FOR 36KV, 800A, DOUBLE BREAK, MANUAL OPERATED ISOLATOR WITH EARTH SWITCH
DRN	NAME dm
DHD	DATE 06.12.2016
APPD	DRG NO. JDE-388RHHES8
REV	SHEET 1 OF 1
02	



- NOTES:**
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED
 2. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED
 3. CONTACT SURFACES OF CURRENT CARRYING PARTS SHALL BE SILVER PLATED (25 MICRONS)
 4. PAD LOCKING FACILITIES SHALL BE PROVIDED AT OPERATING MECHANISM BOX (PAD LOCK ARE NOT INCLUDED IN THIS SCOPE OF SUPPLY)
 5. TOLERANCE ON DIMENSIONS: ±5%

MARK	DESCRIPTION	QNTY (NOS.)
1	MOVING CONTACT BLADE (HDE COPPER, SILVER PLATED)	3
2	FIXED CONTACT ASSEMBLY (HDE COPPER, SILVER PLATED)	6
3	TERMINAL PAD (ALUMINIUM)	6
4	INSULATOR, 2 UNIT OF 22KV POST TYPE PER STACK, PORCELAIN	9
5	ROTATING BASE ASSEMBLY (MS GALV)	3
6	BASE CHANNEL 100 x 50 (MS GALV)	3
7	OPERATING LEVER (MS GALV)	1
8	BLADE HOLDING ARRANGEMENT	3
9	OPERATING PIPE (40 DIA GI PIPE, CLASS-B)	1
10	ISOLATOR OPERATING MECHANISM (MS PAINTED)	1
11	CONNECTOR FOR ACSR RACONDDOG (AL. ALLOY LM-9 OR LM-25)	6
12	PHASE COUPLING PIPE (25 NB GI PIPE, CLASS-B)	2
13	PIPE GUIDE (MS GALV)	1

Feedback Infra Pvt. Ltd. Approved
 Checked & Reviewed
Sudhakar Kumar
 Name & Design Expert
Feedback Infra Pvt. Ltd.
 Verified
Pranav
 Name & Location



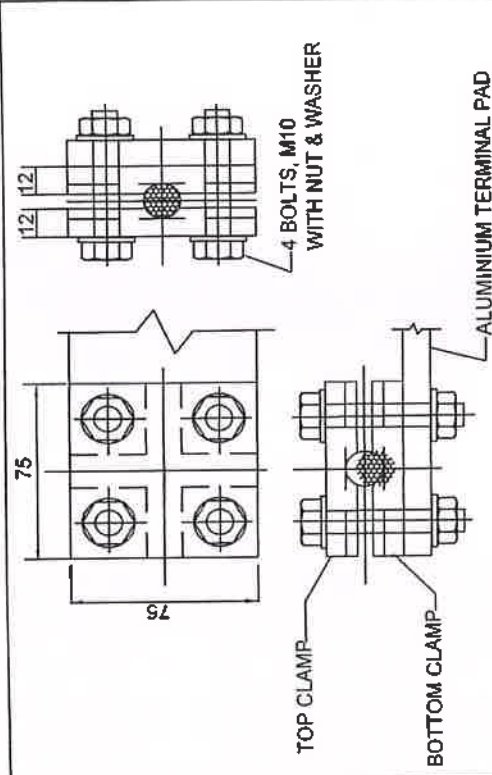
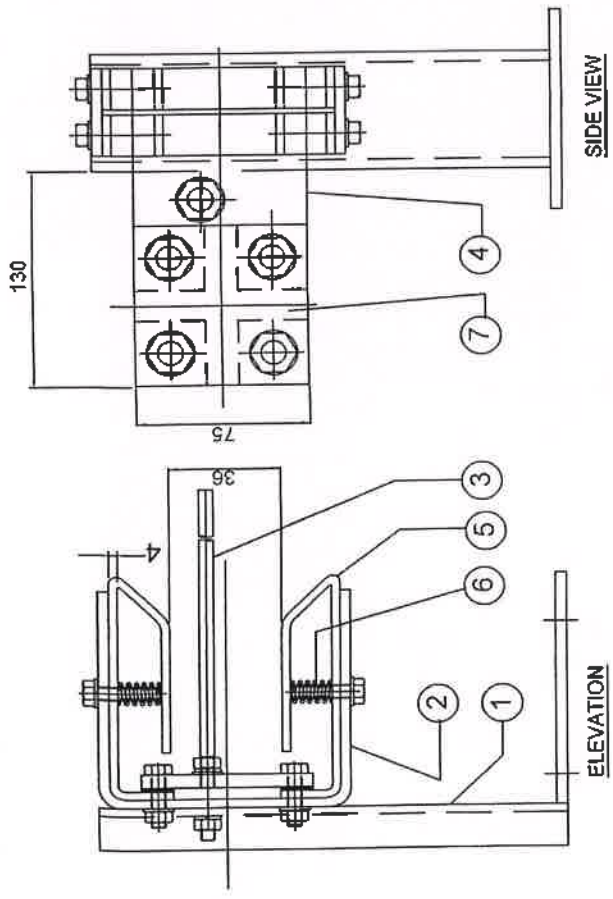
- NOTES:**
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED
 2. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED
 3. CONTACT SURFACES OF CURRENT CARRYING PARTS SHALL BE SILVER PLATED (25 microns)
 4. TOLERANCE ON DIMENSIONS: ±5%

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DOUGJI) IN ODISHA IN THE WESCO UTILITY (PKG-04)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LDA No.:	OPTCL/PMU/DDUGJ/LOA/WESCO/04/7 & SUPPLY/2016/3940 (8) DATED 09.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	I&T CONSTRUCTION
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J-Electricals)
Title:	GENERAL ARRANGEMENT FOR 33KV/300A, DOUBLE BREAK, MANUAL OPERATED ISOLATOR WITHOUT EARTH SWITCH
NAME:	dm
DRN	09.12.2016
CHKD	09.12.2016
APPD	JDE 3688R/018
SHEET	1 OF 1
REV	02



Pranav

MARK	DESCRIPTION	MATERIAL
1	CONTACT BASE	MS GALVANISED
2	CONTACT GUARD	MS GALVANISED
3	ARCING HORN	MS GALVANISED
4	TERMINAL PAD	ALUMINIUM, 75 X 12
5	FIXED FEMALE CONTACT	HDE COPPER, (25mm x 4mm) X 2
6	COIL SPRING	STAINLESS STEEL
7	TERMINAL CONNECTOR	ALUMINIUM ALLOY

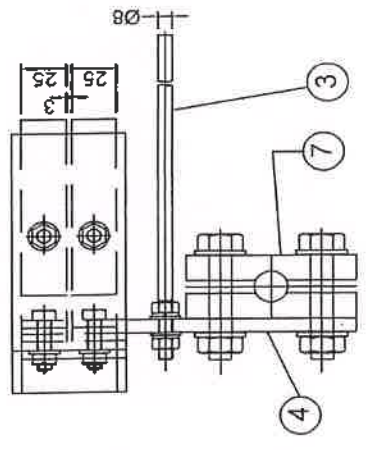


DETAIL OF TERMINAL CONNECTOR
 MADE OF ALUMINIUM ALLOY AND
 SUITABLE TO ACCOMMODATE AAAC DOGMOLF/PANTHER
 (HORIZONTAL / VERTICAL TAKE OFF)
 AS PER IS:5561

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM YOTTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LOA No.:	OPTCL/PNU/DDUGJY/LOA/WESCO/04/7 B/SUPPLY/2016/3940 (8) DATED 08.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	L&T CONSTRUCTION
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)
Title:	FIXED CONTACT ASSEMBLY FOR 36KV, 800A, DOUBLE BREAK CONTACTOR

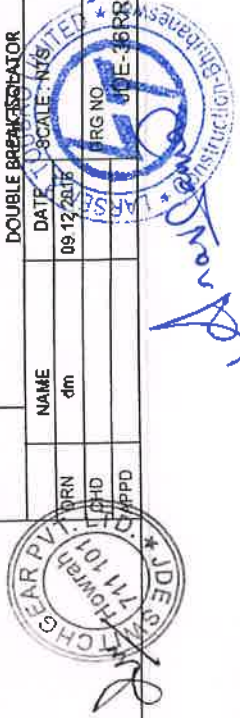
NAME	DATE	SCALE	REVISION
dm	09.12.2016	1:1	1 OF 1
DR			
CHD			
APPD			

Feedback Infra Pvt. Ltd. Approved
 Checked & Reviewed: **KUMAR**
 Subodh K. Expert
 Name & Designation: **Pvt. Ltd.**
 Verified: *[Signature]*
 Name & Designation: *[Signature]*

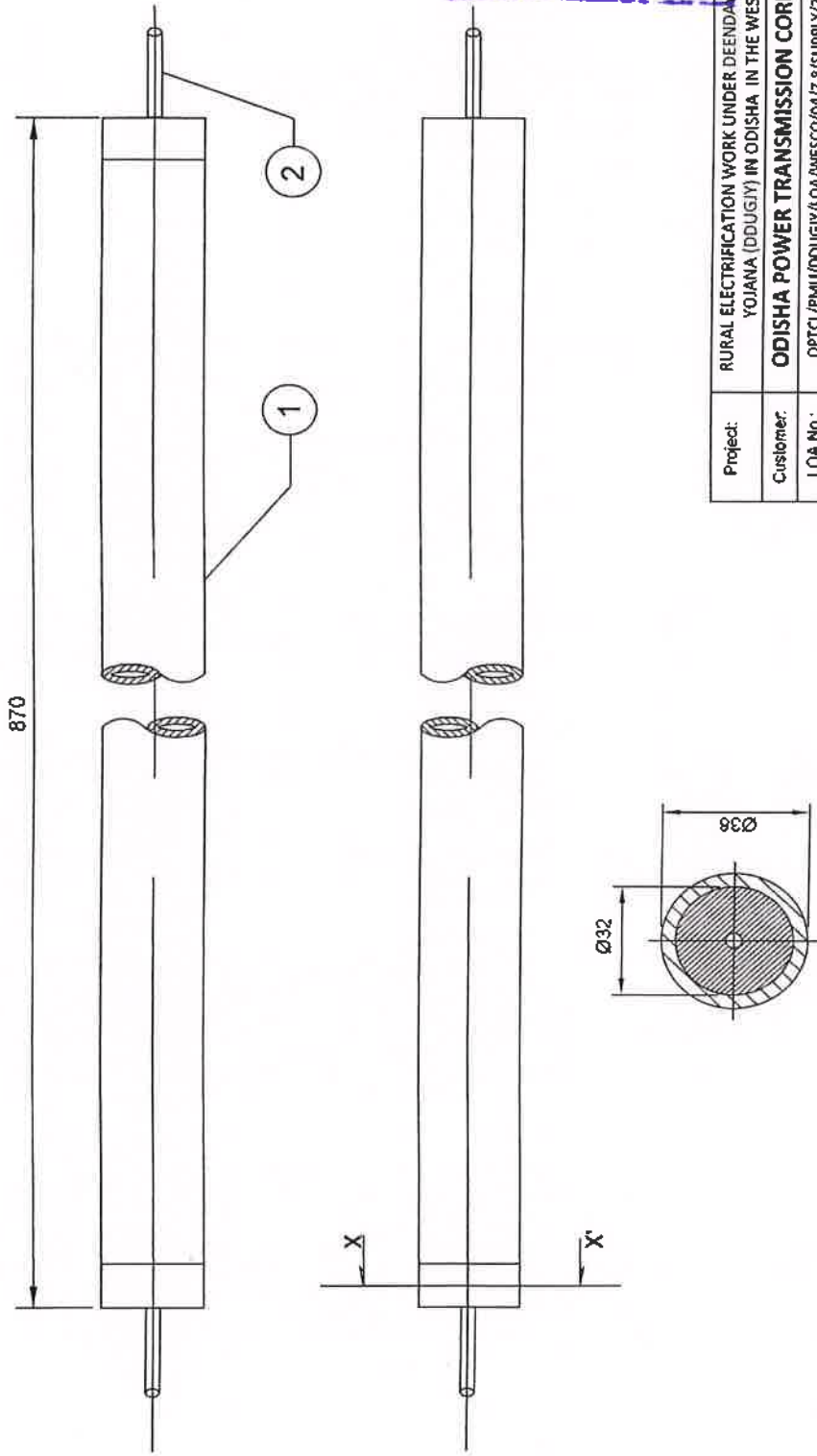


PLAN

- NOTE:**
1. ALL DIMENSIONS ARE IN mm
 2. CONTACTS SHALL BE SILVER PLATED (25 MICRONS)
 3. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED
 4. MANUFACTURING TOLERANCE: ±5%



MARK	DESCRIPTION	MATERIAL
1	MOVING CONTACT BLADE	HDE COPPER TUBE, 38 OD x 32 ID
2	ARCING HORN	8 DIA MS GALVANISED



SECTION ON 'X-X'

- NOTE:
1. ALL DIMENSIONS ARE IN mm
 2. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED
 3. BOTH CONTACT ENDS OF THE MOVING BLADE SHALL BE SILVER PLATED (SILVER PLATED)
 4. MANUFACTURING TOLERANCE: ±5%

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAKAL UPADHAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)		
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED		
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 08.09.2016		
Consultant:	FEEDBACK INFRA		
Contractor:	L&T CONSTRUCTION		
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)		
Title:	MOVING CONTACT BLADE FOR 36KV, 800A, DOUBLE BREAK ISOLATOR		
DRN	NAME	DATE	SCALE
CHD	dm	08.12.2016	AS PER DRAWING
APPD			

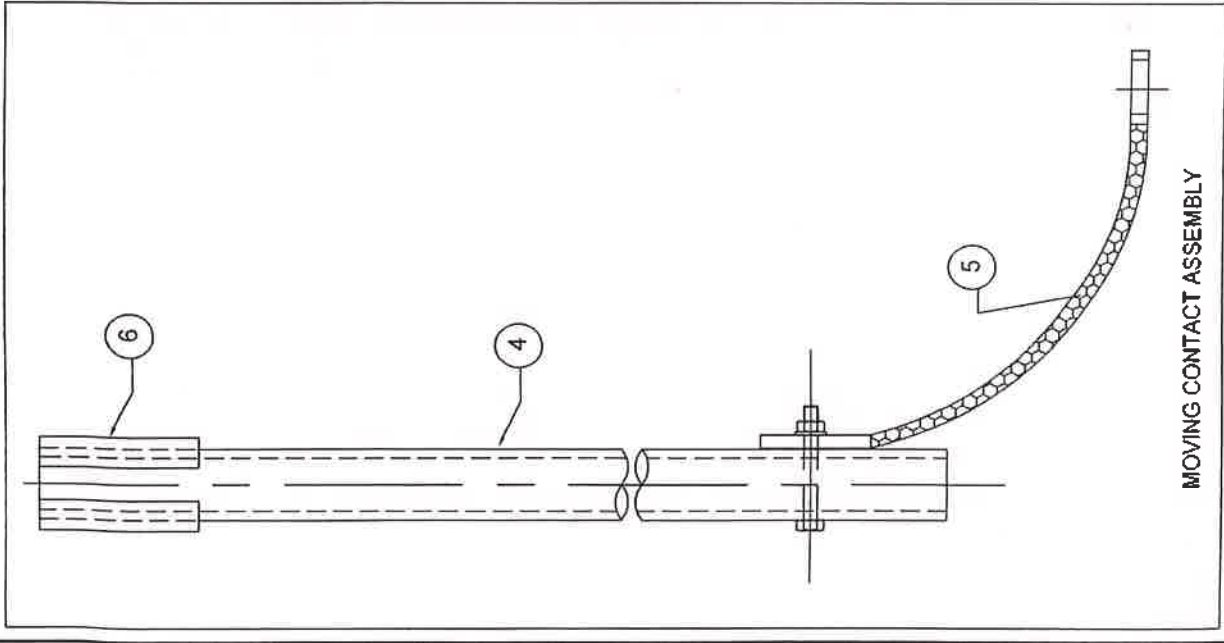
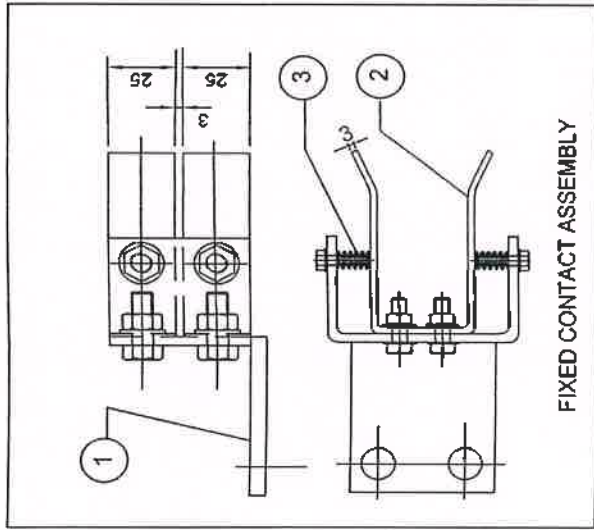
Feedback Infra Pvt. Ltd. Approved
 Checked By: R. K. J. MAR
 Subscribed By: R. K. J. MAR
 Verified By: R. K. J. MAR
 Feedback Infra Pvt. Ltd.



Handwritten signature and date: 08.12.2016

SHEET	REV
1 OF 1	02

MARK	DESCRIPTION
1	FIXED CONTACT BASE (MS GALV)
2	FIXED CONTACT JAW (25 X 3 COPPER FLAT - 2 NOS.)
3	FIXED CONTACT SPRING
4	MOVING ARM (MS GALV)
5	BRAIDED TAPE (TINNED COPPER 25 x 3)
6	CONTACT TIP (COPPER, SILVER PLATED)



NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED.
3. CONTACT SURFACE SHALL BE SILVERPLATED
4. MANUFACTURING TOLERANCE : ±5%.

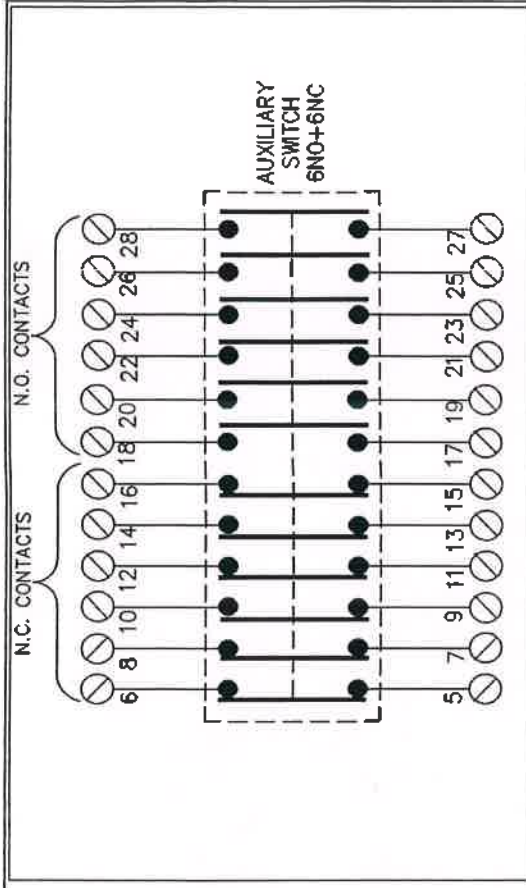
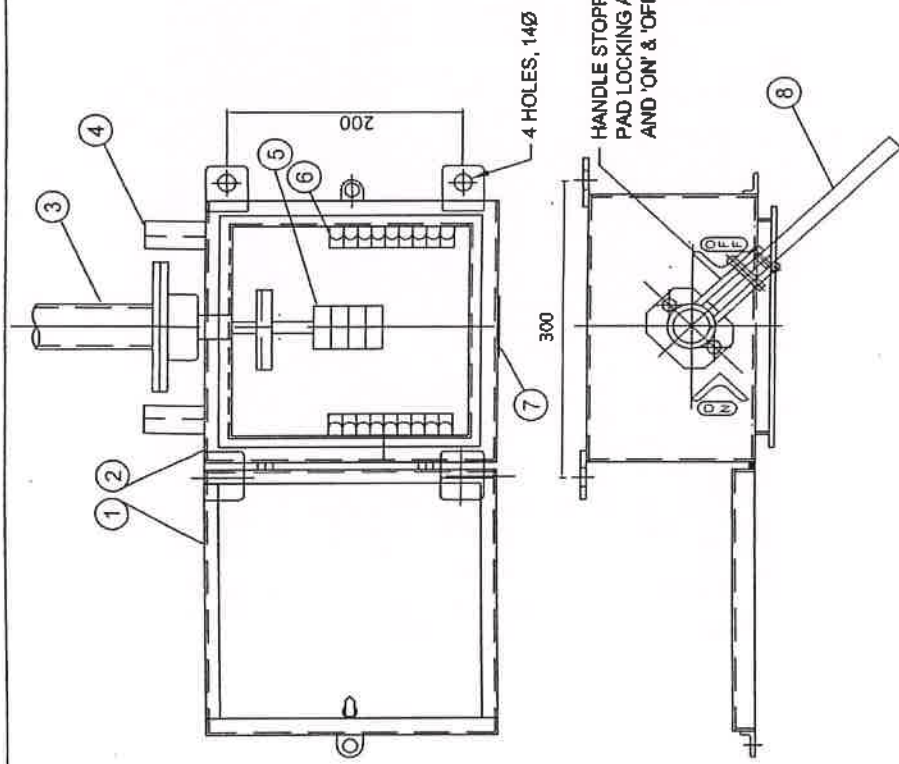
Feedback Infra Pvt. Ltd. Approved
 Checked & Reviewed by *WAK*
 Sub Field Expert
 Name's Designation Pvt. Ltd.

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GOVT. Yojana (DDUGJY) IN ODISHA IN THE WESCO UTILITY (PKG-04)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	L&T CONSTRUCTION
Manufacturer:	IDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)
Title:	FIXED & MOVING CONTACT ASSEMBLY FOR EARTH SWITCH OF 36KV, 800A, DOUBLE BREAK CIRCUATOR
NAME	dm
DATE	09.12.2016
SCALE	NFS
DRG NO	IDE/04/ES-CMB
SHEET	1 OF 1
REV	02

Stamp: IDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)

Signature: *[Handwritten Signature]*

Stamp: *[Circular Stamp]*



- NOTES:
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
 2. OPERATING BOX SHALL BE PAINTED WITH SHADE NO. 631 (LIGHT GREY) AS PER IS:5
 3. ALL COMPONENTS SHALL BE WIRED UP TO TERMINAL BLOCK BY 1.1KV, 1.5 SQ.MM PVC INSULATED Cu. CONDUCTOR.
 4. 20% SPARE TERMINAL SHALL BE PROVIDED
 5. PAD LOCKING PROVISION AT HANDLE STOPPER WITH 'ON' & 'OFF' INDICATION SHALL BE PROVIDED (PAD LOCK IS NOT INCLUDED IN THIS SCOPE OF SUPPLY).
 6. MANUFACTURING TOLERANCE: ± 5%

MARK	DESCRIPTION
1	DOOR (MS SHEET, 2.5mm THK (PAINTED))
2	OPERATING KIOSK (MS SHEET, 2.5mm THK (PAINTED))
3	OPERATING PIPE (40 DIA GI PIPE)
4	HANDLE STOPPER (MS)
5	AUXILIARY SWITCH, 6NO+6NC, 10A
6	TERMINAL BLOCK
7	DETACHABLE GLAND PLATE (MS)
8	OPERATING HANDLE (MS GALVANISED)

Feedback Infra Pvt. Ltd. | Approved

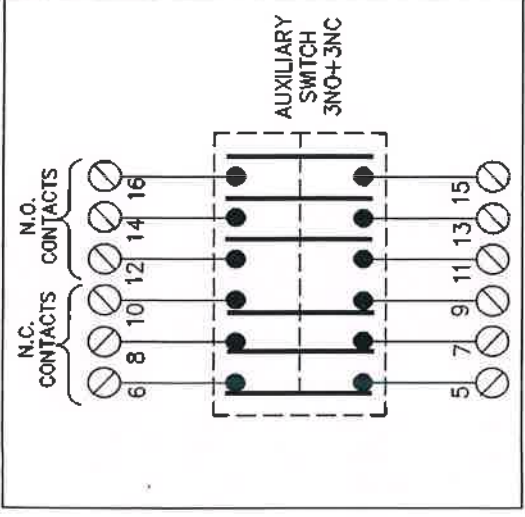
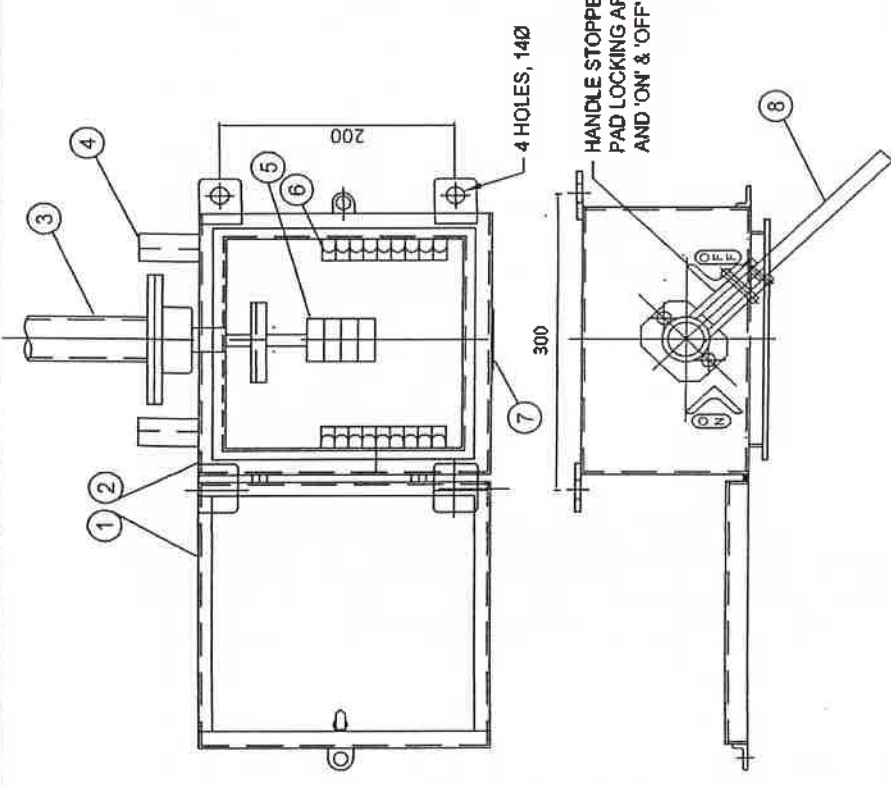
Checked by **SUDHAKAR KUMAR**
Sudhakar Kumar
 Name & Designation
 Verified **Sphank**
Sphank
 Name & Designation

Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA DISTRICTS IN THE WESCO UTILITY (PKG-04)
Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
LOA No.:	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016
Consultant:	FEEDBACK INFRA
Contractor:	L&T CONSTRUCTION
Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)
Title:	OPERATING MECHANISM BOX FOR 36KV, 800A, DOUBLE BREAK ISOLATOR AND EARTH SWITCH
DRN	dm
DRD	09.12.2016
APPD	SCALE : NTS
	DRG NO. JDE-36HOM

Stamp: **SWITCHGEAR PVT. LTD.** (Circular stamp with company name and logo)

Stamp: **FEEDBACK INFRA** (Circular stamp with company name and logo)

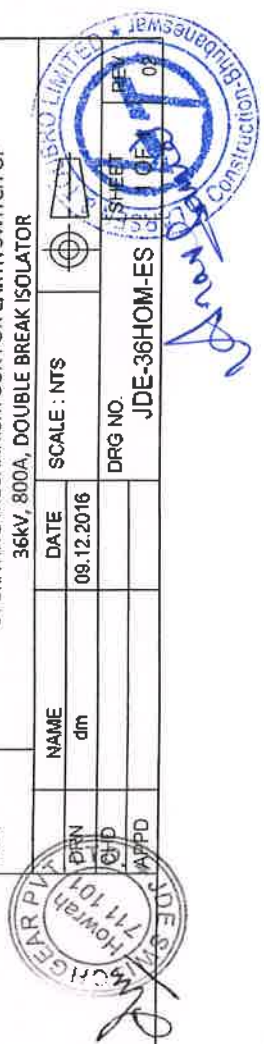
Signature: *Sudhakar Kumar*



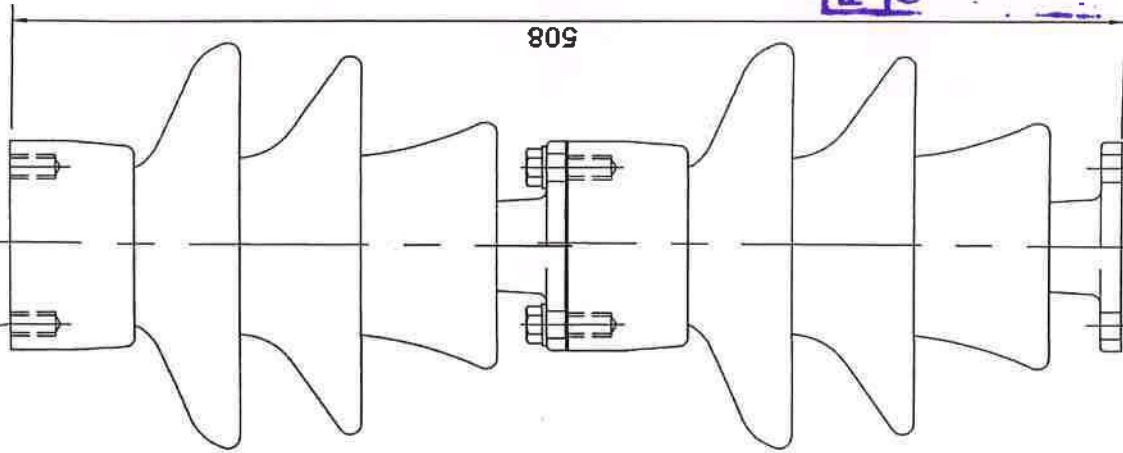
- NOTES:**
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
 2. OPERATING BOX SHALL BE PAINTED WITH SHADE NO. 631 (LIGHT GREY) AS PER IS:5
 3. ALL COMPONENTS SHALL BE WIRED UP TO TERMINAL BLOCK BY 1.1KV, 1.5 SQ.MM IT PVC INSULATED Cu. CONDUCTOR.
 4. 20% SPARE TERMINAL SHALL BE PROVIDED
 5. PAD LOCKING PROVISION AT HANDLE STOPPER WITH 'ON' & 'OFF' INDICATION SHALL BE PROVIDED (PAD LOCK IS NOT INCLUDED IN THIS SCOPE OF SUPPLY).
 6. MANUFACTURING TOLERANCE: ± 5%

MARK	DESCRIPTION
1	DOOR, (MS SHEET, 2.5mm THK (PAINTED))
2	OPERATING KIOSK (MS SHEET, 2.5mm THK (PAINTED))
3	OPERATING PIPE (40 DIA GI PIPE)
4	HANDLE STOPPER (MS)
5	AUXILIARY SWITCH, 3NO+3NC, 10A
6	TERMINAL BLOCK
7	DETACHABLE GLAND PLATE (MS)
8	OPERATING HANDLE (MS GALVANISED)

Feedback Infra Pvt. Ltd. Approved		Project:	RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA (DDUGIY) IN ODISHA IN THE WESCO UTILITY (PKG-04)
Checked & Reviewed KUMAR		Customer:	ODISHA POWER TRANSMISSION CORPORATION LIMITED
Subodh Kishor Sahoo		OA No.:	OPTCL/PNU/DDUGIY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016
Name & Designation		Consultant:	FEEDBACK INFRA
Verified		Contractor:	L&T CONSTRUCTION
Name & Designation		Manufacturer:	JDE SWITCHGEAR PVT. LTD. (Formerly J. D. Electricals)
		Title:	OPERATING MECHANISM BOX FOR EARTH SWITCH OF 36KV, 800A, DOUBLE BREAK ISOLATOR
PN	NAME	DATE	SCALE : NTS
711101	dm	09.12.2016	
101			
APPD			DRG NO. JDE-36HOM-ES



4 NOS. M12 TAPPED HOLES ON 76 PCD



4 NOS. 14Ø HOLES ON 76 PCD

NOTE:

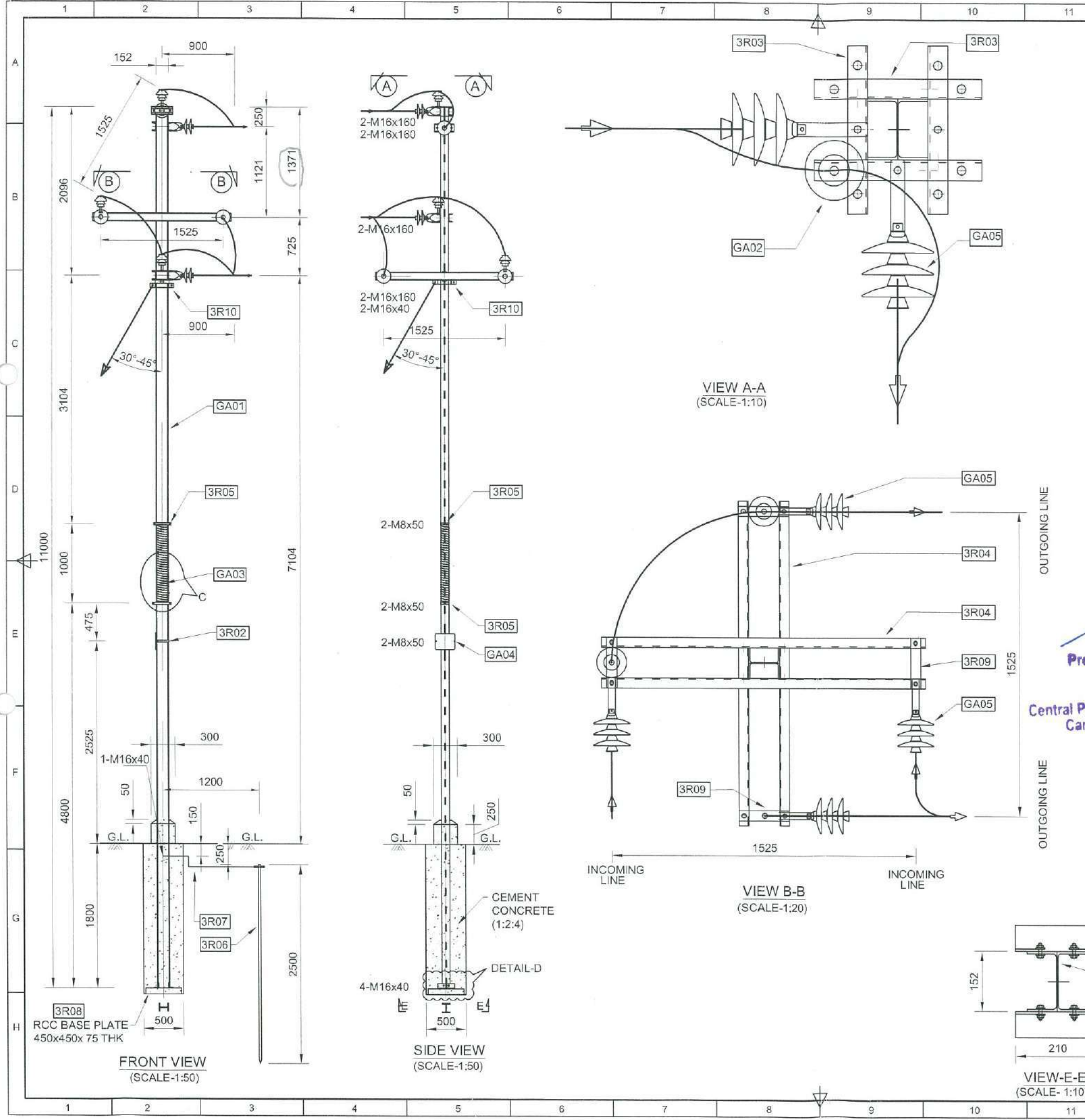
1. ALL DIMENSIONS ARE IN mm
2. MANUFACTURING TOLERANCE ± 5%

TECHNICAL PARAMETERS:

CONFORMING STANDARD: IS:2544
 NOMINAL SYSTEM VOLTAGE: 33 KV
 HIGHEST SYSTEM VOLTAGE: 36 KV
 IMPULSE WITHSTAND VOLTAGE: 170 KV
 WET PF ONE MINUTE WITHSTAND VOLTAGE: 75 KV
 HEIGHT OF STACK: 508 mm (254 mm x 2)
 MINIMUM CREEPAGE DISTANCE: 900 mm
 TENSILE STRENGTH: 30 kN
 BENDING STRENGTH: 4.5 kN
 UNIT PER STACK: 2 UNIT OF 22KV
 MANUFACTURER: ABIL / SUN

Feedback Infra Pvt. Ltd. Approved:		RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHAYAY GRAM JYOTI YOJANA (DDUGJY) IN ODISHA DISTRICTS IN THE WESCO UTILITY (PKG-04)	
Customer:	SUBODH KUMAR	ODISHA POWER TRANSMISSION CORPORATION LIMITED	
LOA No.:	Subodh K. Expert	OPTCL/PMU/DDUGJY/LOA/WESCO/04/7 8/SUPPLY/2016/3940 (8) DATED 09.09.2016	
Consultant:	Feedback Infra Pvt. Ltd.	FEEDBACK INFRA	
Contractor:	Ghan	L&T CONSTRUCTION	
Manufacturer:		JDE SWITCHGEAR PVT. LTD.	
Title:		(Formerly J. D. Electricals)	
		POST INSULATOR STACK FOR 36KV, 800A, DOUBLE BREAK ISOLATOR	
NAME	DATE	SCALE	NTS
DRN	09.12.2016		
CHD			
APPD		DRG NO.	JDE-367
		SHEET	1 OF 1
		REV	01





BILL OF MATERIAL			
ERECTION MARK	DESCRIPTION	QTY.	REF. DRAWING NO
GA01	11m (152x152), 37.1 kg/m RSJ POLE	1 NO.	
GA02	33kV PORCELAIN TYPE PIN INSULATOR WITH H/W OR 33kV POLYMER TYPE PIN INSULATOR WITH H/W	2 SETS.	
GA03	G.I. BARBED WIRE (ANTI CLIMBING DEVICE)	3.5kg.	
GA04	33kV DANGER BOARD	1 NO.	K2016EL005A-02-DRG-059
GA05	33kV DISC INSULATOR WITH ATTACHING HARDWARE.	6 SETS	
GA06	3.53mm DIA AL. BINDING WIRE	(Kg) 0.135	
3R01	BASE CLEATS FOR RSJ POLE (65X65X6)	2 NOS.	REFER SHT.2
3R02	BACK CLAMP FOR DANGER BOARD	1 NO.	- DO -
3R03	TOP INCOMING CHANNEL (100X50X6)	4 NOS.	- DO -
3R04	BOTTOM INCOMING CHANNEL (100X50X6)	4 NOS.	- DO -
3R05	CLAMP- ANTICLIMBING DEVICE	4 NOS.	- DO -
3R06	ROD EARTHING	1 SET	K2016EL005A-02-DRG-017
3R07	6 SWG G.I. WIRE FOR EARTHING	(Kg) 0.206	
3R08	RCC BASE PLATE- 450 x 450 x 75 THK.	1 NO.	K2016EL005A-02-DRG-153
3R09	FISH PLATE - 50x8	2 NOS.	REFER SHT.2
3R10	STAY CLAMP - 50x8	4 NOS.	REFER SHT.2
	FOUNDATION FOR RSJ POLE	1 SET	

FOR QUANTITY & DETAILS OF BOLTS, NUTS, WASHERS ETC. REFER TO SHT. 2

30.6.17
Approved without Prejudice to contractual obligation & liabilities
 Project Consultant
 Cum
 Co-ordinator
 Central Power Research Institute
 Camp:-Bhubaneswar

NOTES:
 1. FOR NOTES & OTHER DETAILS REFER SHEET 2 OF 2.

STATUS:
 23-06-2017- REVISION 1 ISSUED FOR APPROVAL.

REV. NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	23.6.17	REVISED AS PER CPRI'S COMMENT DATED 20.6.2017	TKC	RNB	RNB

PROJECT: ELECTRICATION WORKS IN CESU UTILITY OF ODISHA UNDER INTEGRATED POWER DEVELOPMENT SCHEME (PKG- 01)

LOA NO.: OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/SUPPLY- 42 DATED 25.10.2016.
 OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/ERECTION - 43 DATED 25.10.2016.

CLIENT: ODISHA POWER TRANSMISSION CORPORATION LIMITED

PMC: केन्द्रीय विद्युत अनुसंधान संस्थान
Central Power Research Institute

CONTRACTOR: STERLING AND WILSON PVT. LTD., KOLKATA

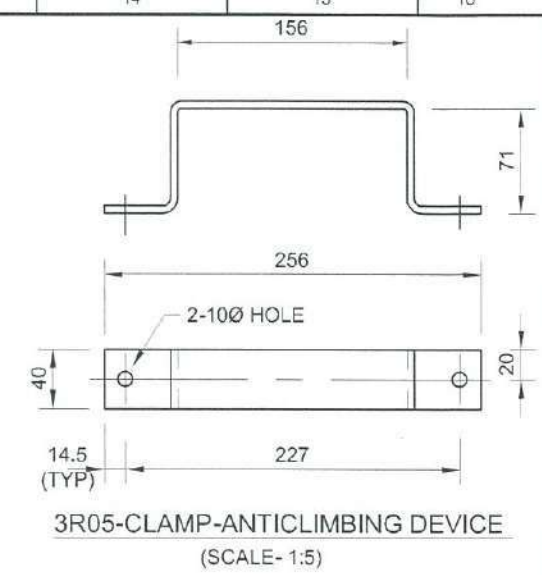
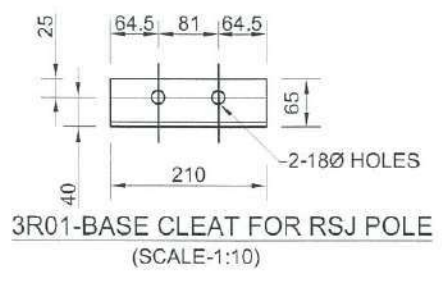
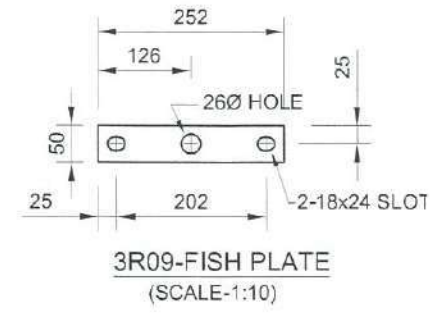
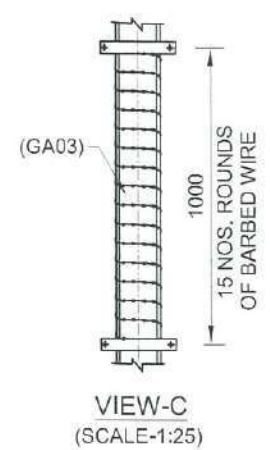
NAME	SIGN	DATE	GENERAL ARRANGEMENT OF 33kV SINGLE POLE CUT-POINT (90° DIRECTION), ON 11M 152x152 mm GI/MS RSJ POLE.
DRAWN	TKC	17.04.17	
CHECKED	RNB	05.06.17	
APPROVED	RNB	05.06.17	SCALE: AS NOTED
CONTRACTOR DRG. NO. K2016EL004A-05-DRG-026			SHEET 01 OF 02
DRG. NO.: IPDS/CESU/S&W/LINE/33kV/026			REV. 1

DRG. SIZE- A3

WEIGHT OF PARTS

ERECTION MARK	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (Nos.)	WT. (kg./m)	WT./ITEM (kg.)	TOTAL WT./ARRANGEMENT (kg.)
3R01	BASE CLEAT FOR RSJ POLE	65x65x6	ANGLE	210	2	5.8	1.22	2.44
3R02	BACK CLAMP FOR DANGER BOARD	30x3	FLAT	536	1	0.701	0.38	0.38
3R03	TOP INCOMING CHANNEL	100x50x6	CHANNEL	420	4	9.56	4.015	16.1
3R04	BOTTOM INCOMING CHANNEL	100x50x6	CHANNEL	1625	4	9.56	15.535	62.14
3R05	CLAMP- ANTICLIMBING DEVICE	40x5	FLAT	398	4	1.58	0.63	2.51
3R09	FISH PLATE	50x8	FLAT	352	8	3.1	1.09	8.73
3R10	STAY CLAMP	50x8	FLAT	427	4	3.1	1.32	5.3
TOTAL								97.6

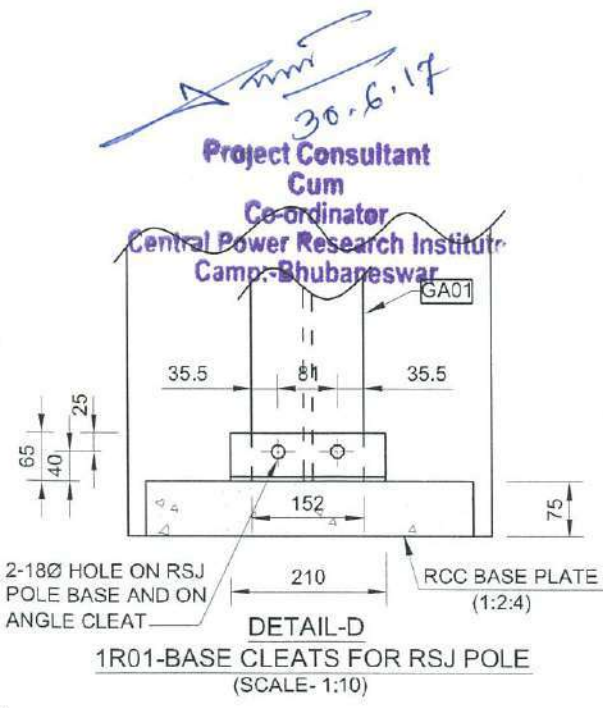
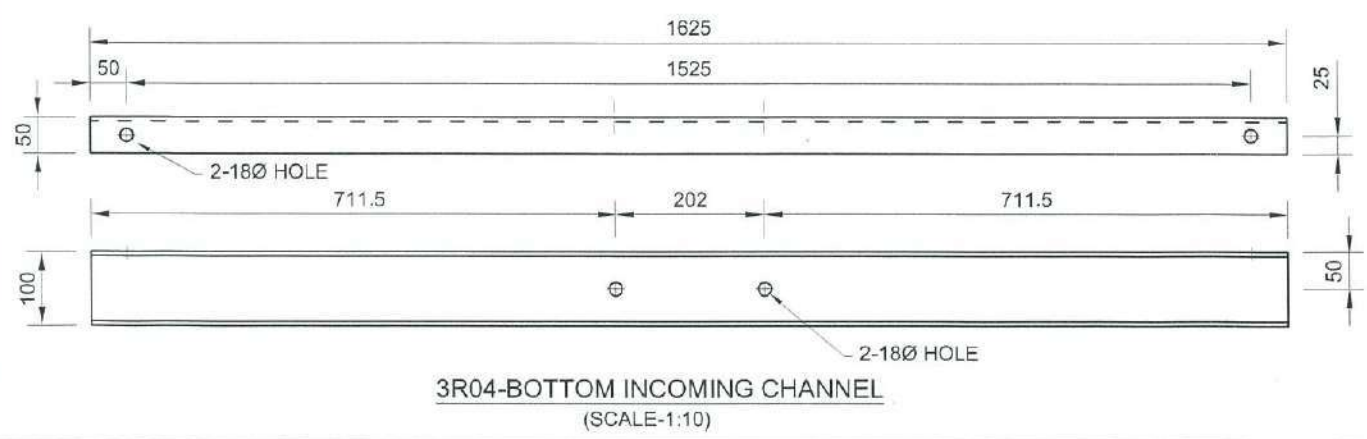
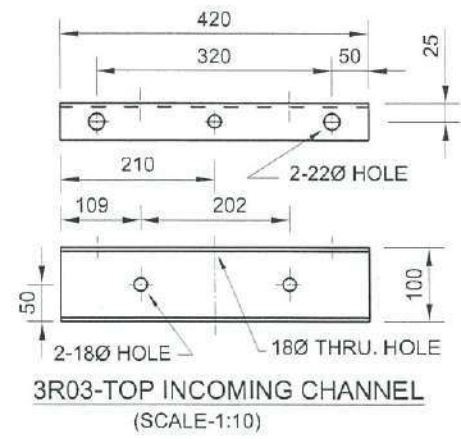
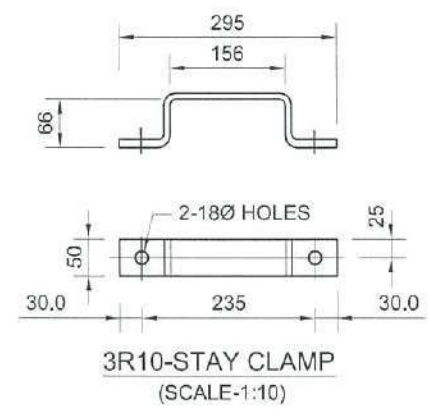
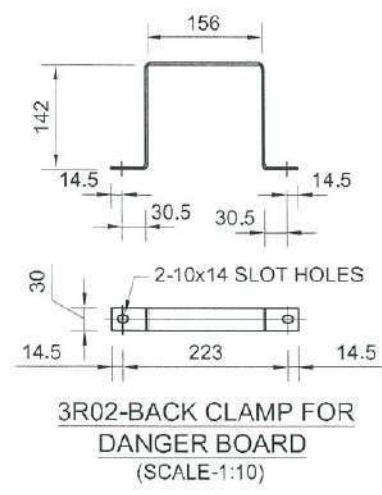
A	BOLT & NUTS	M16	40	13	0.121	1.573
B	BOLT & NUTS	M16	160	8	0.310	2.48
C	BOLT & NUTS	M8	50	6	0.029	0.174
D	SPRING WASHERS	M16		21	0.009	0.189
E	SPRING WASHERS	M8		6	0.002	0.012
F	FLAT WASHERS	M16		21	0.014	0.294
G	FLAT WASHERS	M8		6	0.005	0.03
TOTAL						4.75



NOTES:-

- ALL DIMENSIONS ARE IN mm OTHERWISE SPECIFIED.
- THE QUANTITY OF INSULATORS, STAY, HARDWARES & ALL OTHER ACCESSORIES INCLUDING AL. BINDING WIRE MENTIONED IN THE DRAWING CORRESPONDS TO MINIMUM QUANTITY & SAME WILL BE SUPPLIED AS PER ACTUAL REQUIREMENT FOR COMPLETION OF WORK.
- BARBED WIRE SHALL CONFORM TO IS-278. (GRADE A1).
- ALL CHANNELS, ANGLE, PLATES & CLAMP WILL BE HOT DIP GALVANIZED AS PER IS-2629/1985 & 4759 FOR COASTAL AREA AND MILD STEEL FOR NON-COASTAL AREA.
- THE INSULATORS WILL BE PORCELAIN TYPE FOR COASTAL AREA AND POLYMER TYPE FOR NON-COASTAL AREA AS PER BOQ SL. NO. A-7.
- INSULATORS AND FIXING HOLES SHOWN IN THIS DRAWING ARE BASED ON DIMENSIONS OF SIMILAR ITEM. THIS DRAWING WILL BE REVISED, IF REQUIRED, AFTER RECEIPT OF PROJECT SPECIFIC INSULATOR DRAWINGS.
- IN ELEPHANT CORRIDOR IN ADDITION TO ANTICLIMBING DEVICE SPIKE CLAMP WILL BE PROVIDED.
- RSJ AND ALL STRUCTURAL ITEMS WILL BE OF GI FOR COASTAL AREA, AND MS FOR NON-COASTAL AREA.
- POLE NUMBERING WILL BE PAINTED AT SITE.
- THE DRG. HAS BEEN PREPARED IN LINE WITH BOQ, TENDER DRG NO. REC/DDUGJY/33KV/05 AND TECHNICAL MEETING MOM DATED 13.12.2016.
- FOR EARTH PIT DETAILS REFER DWG. NO. IPDS/CESU/S&W/NEW-SS/008, Rev. 0
- FOR GUARDING ARRANGEMENT, WHEREVER REQ'D., REFER DWG. NO. IPDS/CESU/S&W/LINE/33KV/021.

Approved without Prejudice to contractual obligation & liabilities

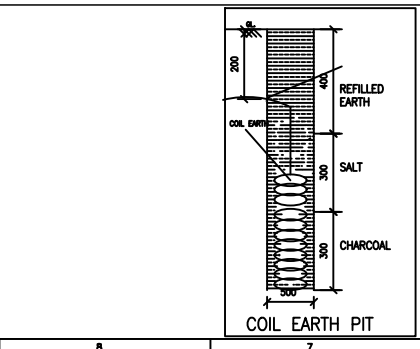
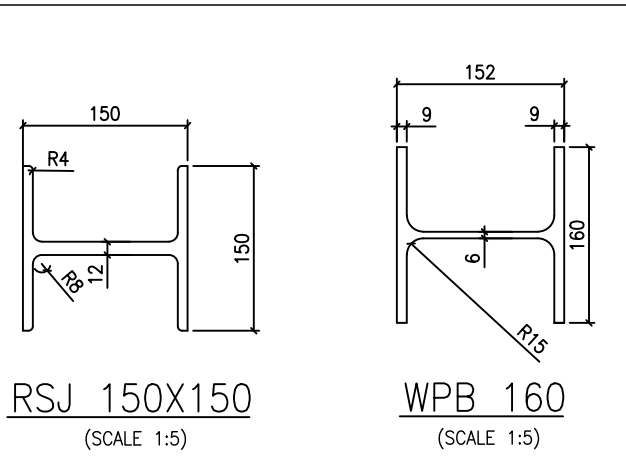
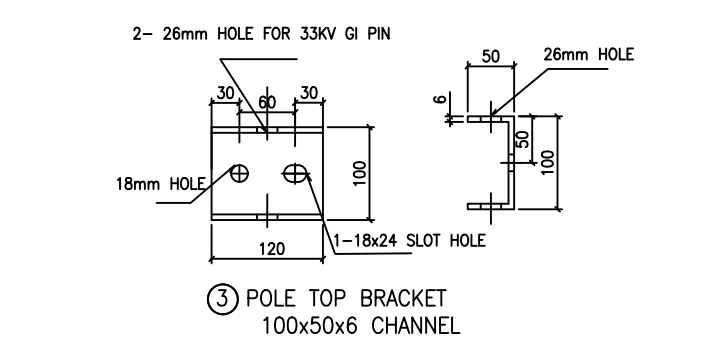
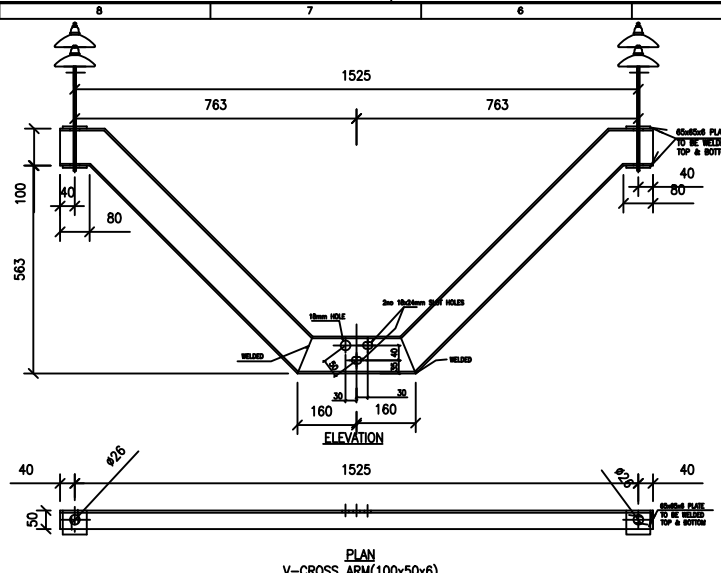
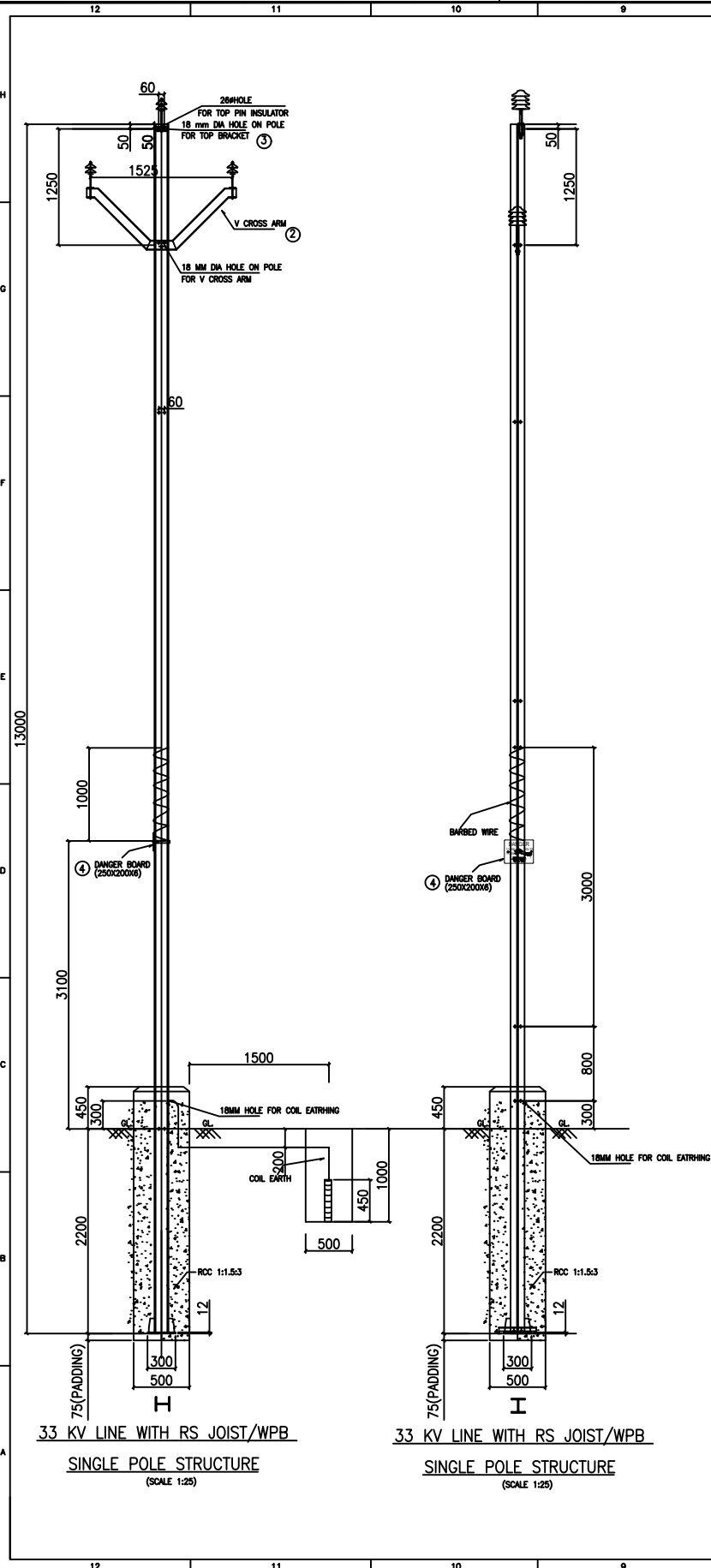


STATUS: 23-08-2017- REVISION 1 ISSUED FOR APPROVAL.

REV. NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	23.8.17	REVISED AS PER CPRI'S COMMENT DATED 20.6.2017	TKC	RNB	RNB
PROJECT		ELECTRICATION WORKS IN CESU UTILITY OF ODISHA UNDER INTEGRATED POWER DEVELOPMENT SCHEME (PKG. - 01)			
LOA NO.		OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/SUPPLY - 42 DATED 25.10.2016. OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/ERECTION - 43 DATED 25.10.2016.			
CLIENT		ODISHA POWER TRANSMISSION CORPORATION LIMITED			
PMC		केन्द्रीय विद्युत अनुसंधान संस्थान Central Power Research Institute			
CONTRACTOR		STERLING AND WILSON PVT. LTD., KOLKATA			
DRAWN	TKC	SIGN	DATE	GENERAL ARRANGEMENT OF 33KV SINGLE POLE CUT-POINT (90° DIRECTION), ON 11M 152x152 mm GI/MS RSJ POLE.	
CHECKED	RNB		17.04.17		
APPROVED	RNB		05.05.17		
			05.06.17	SCALE: AS NOTED	
CONTRACTOR DRG. NO. K2016EL004A-05-DRG-026				SHEET REV.	
DRG. NO.: IPDS/CESU/S&W/LINE/33KV/026				02 OF 02 1	
				DRG. SIZE- A3	

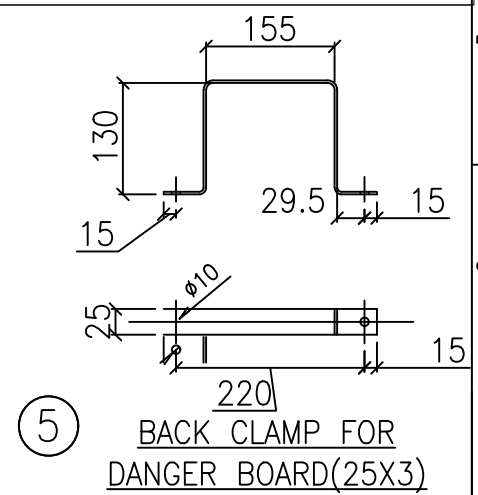
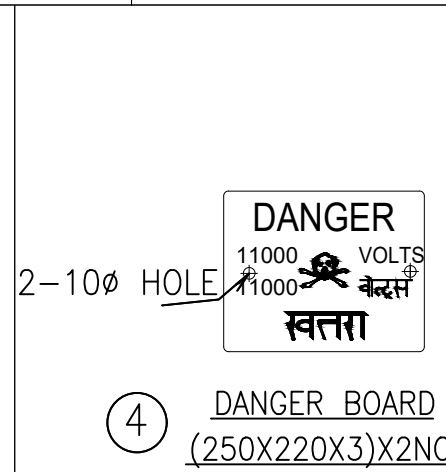
Project Consultant
Cum
Co-ordinator
Central Power Research Institute
Camp, Bhubaneswar

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per IS)



BOM OF 33KV SINGLE POLE WITH V CROSS ARM							
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/ 160x152	JOIST	13000	1	34.6 / 30.44	380.6 / 334.84
2	33KV CROSS ARM	100x50x6	CHANNEL	2071	1	9.56	19.799
3	FLAT FOR V	65x6	FLAT	65	4	3.06	0.199
4	POLE TOP BRACKET	100x50x6	CHANNEL	120	1	9.56	1.147
5	DANGER BOARD	200x6	FLAT	250	1	9.42	2.355
6	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	1	0.59	0.301
TOTAL WT EXCEPT POLE							24.397

NUT & BOLTS REQUIRED									
NUT & BOLTS	LENGTH (mm)	V CROSS ARM	POLE TOP BRACKET	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50		2			1	3	0.134	0.402
M16	120	3					3	0.229	0.687
M16	200					#	#	0.331	#####
M8	50			2			2	0.026	0.052
M16	FLAT WASHER						12	0.014	0.168
M16	SPRING WASHER						12	0.009	0.108
M8	FLAT WASHER						4	0.005	0.020
M8	SPRING WASHER						4	0.002	0.008
TOTAL WEIGHT									1.445



TPCODL
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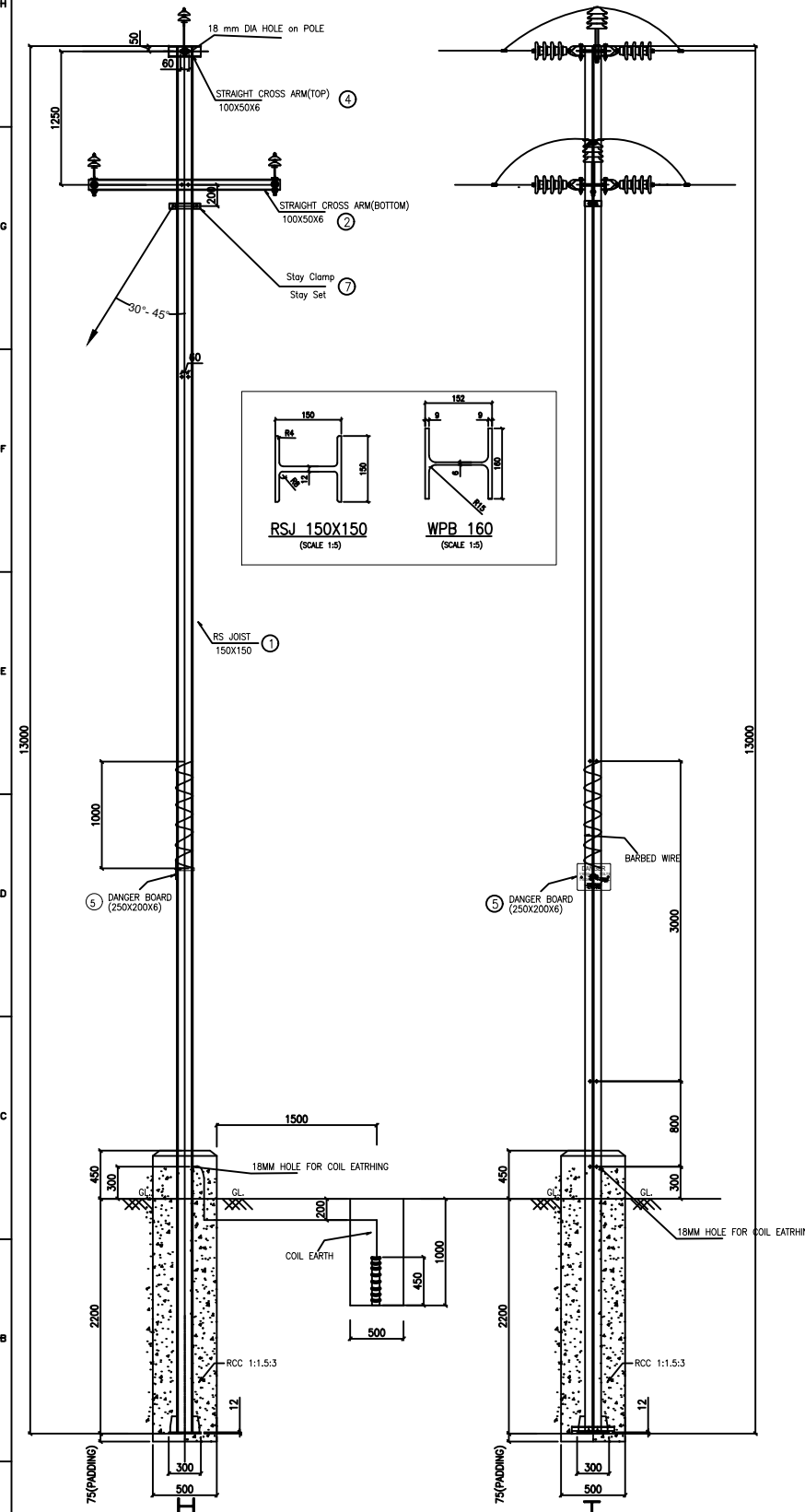
TITLE:-
33KV LINE SINGLE POLE WITH V CROSS ARM (with 13mtr. 150x150 RSJ or WPB 160)

SCALE : NTS ISSUE DT: 05/07/2021

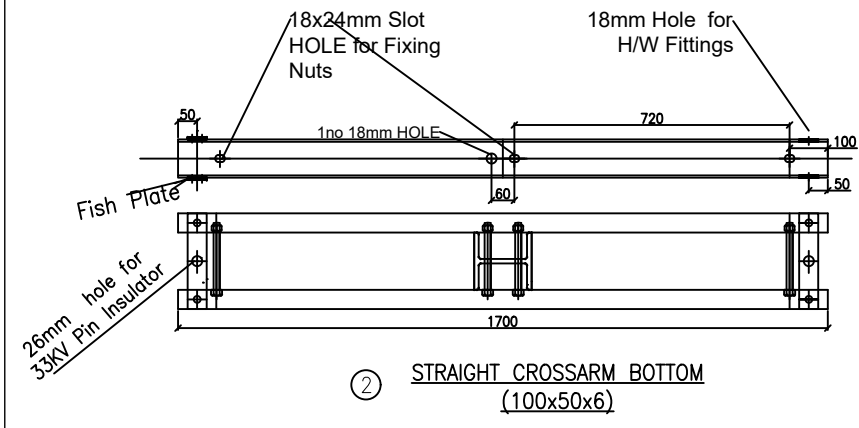
NAME	
DRAWN BY:	J SANGRAM, E&Q
CHECKED BY:	PHIROJ UTTARAY, E&Q K.C.BHARDWAJ,E&Q
APPROVED BY:	P.GARG, E&Q
ISSUED BY:	PARVEEN VERMA,COS

DRAWING NO: TPCODL-HVD-0001 REV NO:

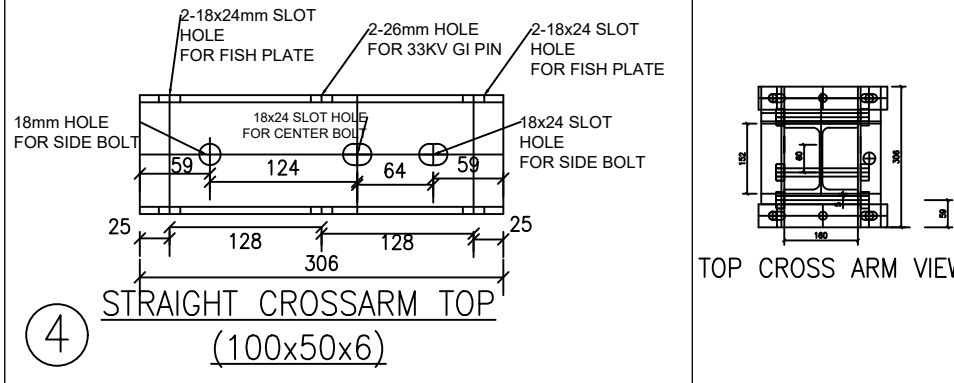
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



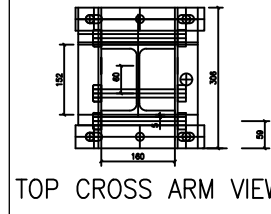
33 KV LINE 180 DEGREE CUTPOINT
SINGLE POLE STRUCTURE
(SCALE 1:25)



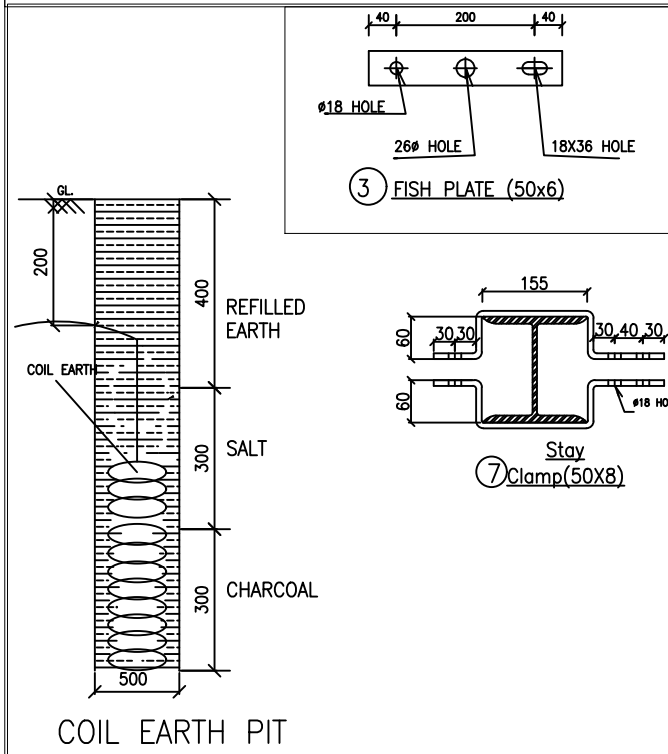
2 STRAIGHT CROSS ARM BOTTOM
(100x50x6)



4 STRAIGHT CROSS ARM TOP
(100x50x6)



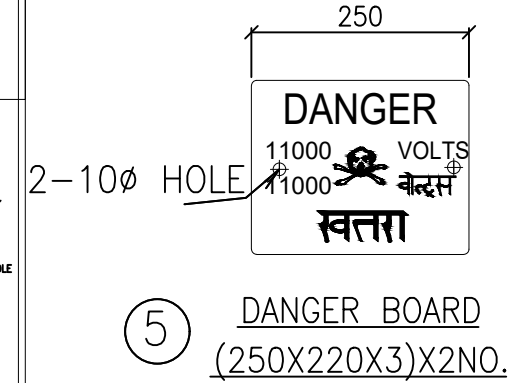
TOP CROSS ARM VIEW



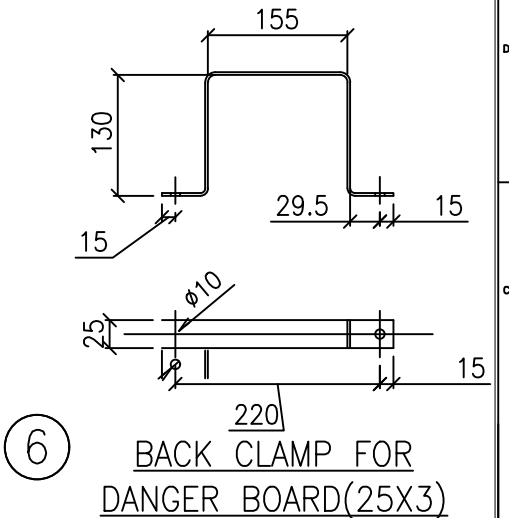
COIL EARTH PIT

BOM OF 180 DEGREE CUT POINT SINGLE POLE								
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	1	34.6 / 30.44	380.6 / 334.84	449.8 / 395.72
2	STRAIGHT CROSS ARM BOTTOM	100x50x6	CHANNEL	1700	2	9.56	16.252	32.504
3	FISH PLATE	50x6	FLAT	280	8	2.36	0.661	5.286
4	STRAIGHT CROSS ARM TOP	100x50x6	CHANNEL	306	2	9.56	2.925	5.851
5	DANGER BOARD	250x3	FLAT	250	1	9.42	2.355	2.355
6	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	1	0.59	0.301	0.301
7	STAY CLAMP	50x8	FLAT	551	1	3.14	1.730	1.730
TOTAL WT EXCEPT POLE								48.027

NUT & BOLTS REQUIRED										
NUT & BOLTS	LENGTH (mm)	STRAIGHT CROSS ARM BOTTOM	FISH PLATE	STRAIGHT CROSS ARM TOP	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	90						1	1	0.134	0.134
M16	50		0			3		3	0.188	0.564
M16	150		4					4	0.270	1.080
M16	200	4		3				7	0.331	2.317
M8	70				2			2	0.033	0.066
M16	FLAT WASHER							30	0.014	0.420
M16	SPRING WASHER							30	0.009	0.270
M8	FLAT WASHER							4	0.005	0.020
M8	SPRING WASHER							4	0.002	0.008
TOTAL WEIGHT										4.879



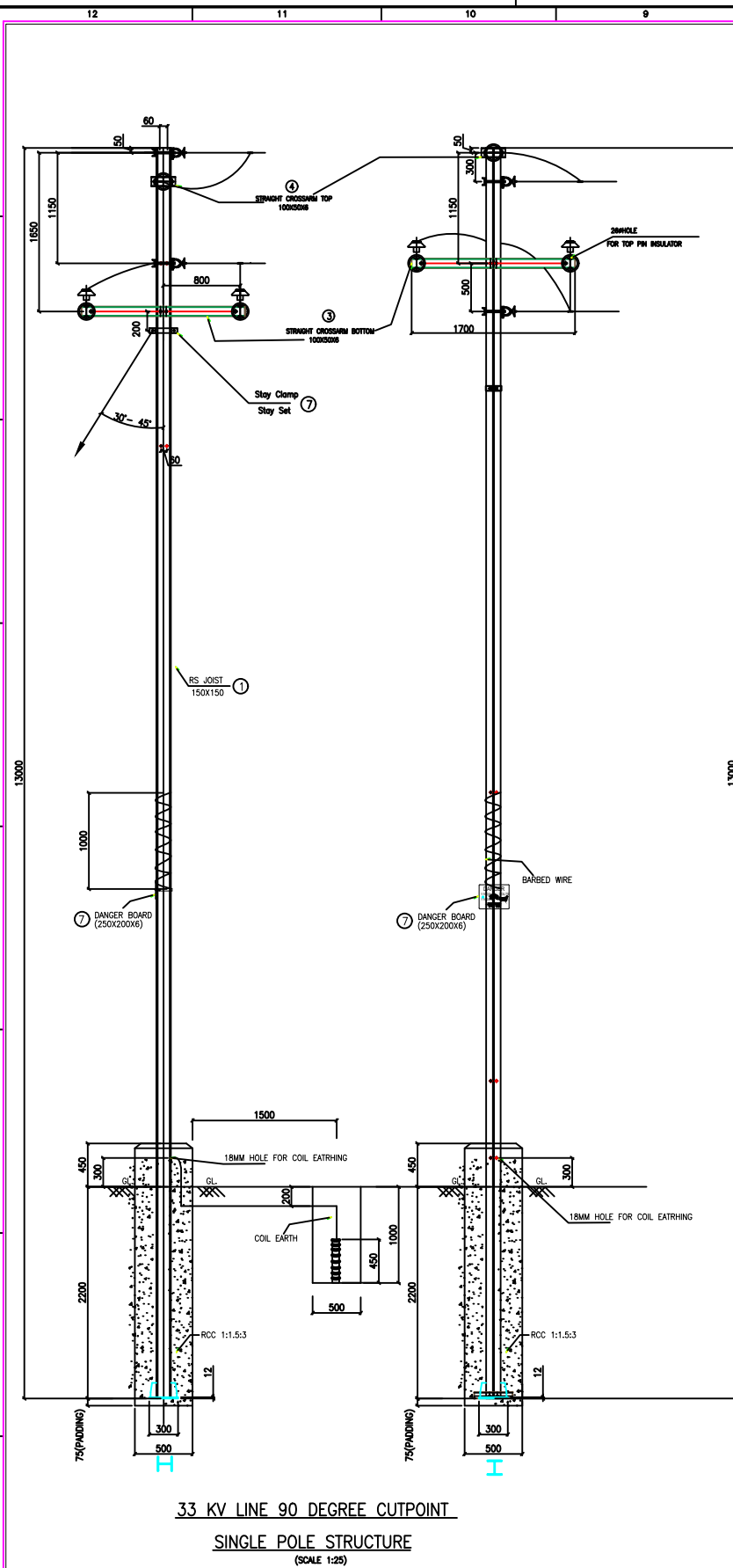
5 DANGER BOARD
(250x220x3)x2NO.



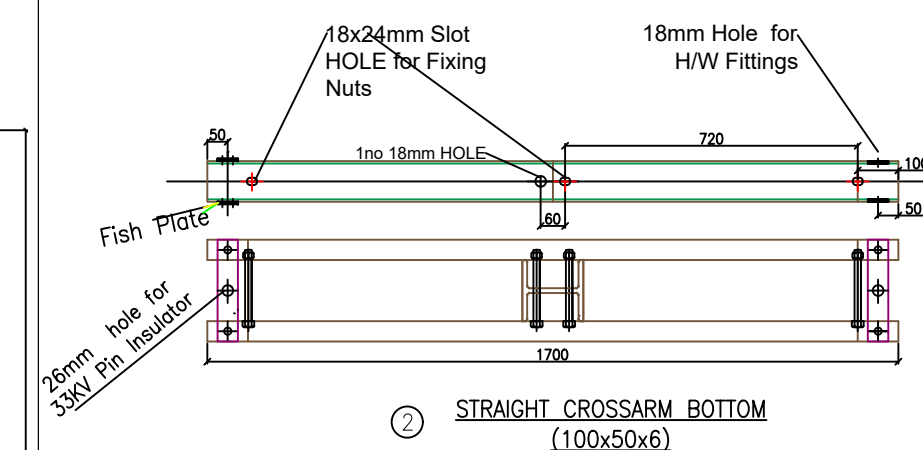
6 BACK CLAMP FOR
DANGER BOARD(25x3)

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 33KV LINE SINGLE POLE WITH 180 DEGREE CUT POINT(13mtr. 150x150 RSJ/WPB 160)		NAME J SANGRAM, E&Q PHIROJ UTTARAY, E&Q K.C.BHARDWAJ,E&Q P GARG, E&Q PARVEEN VERMA,COS	
SCALE : NTS	ISSUE DT: 05/07/2021	DRAWING NO:TPCODL-HVD-0002 REV NO:	

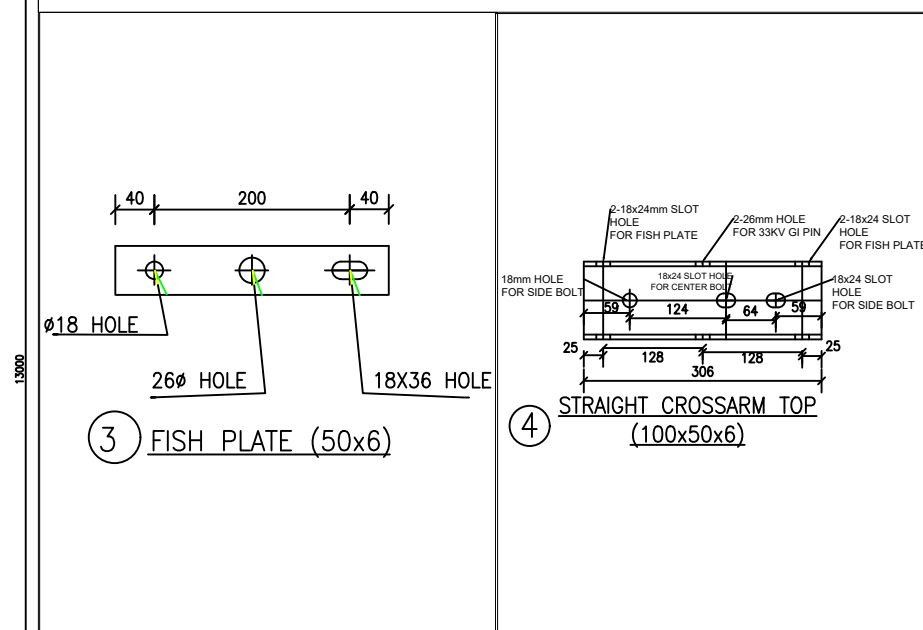
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



33 KV LINE 90 DEGREE CUTPOINT
SINGLE POLE STRUCTURE
(SCALE 1:25)



2 STRAIGHT CROSSARM BOTTOM
(100x50x6)

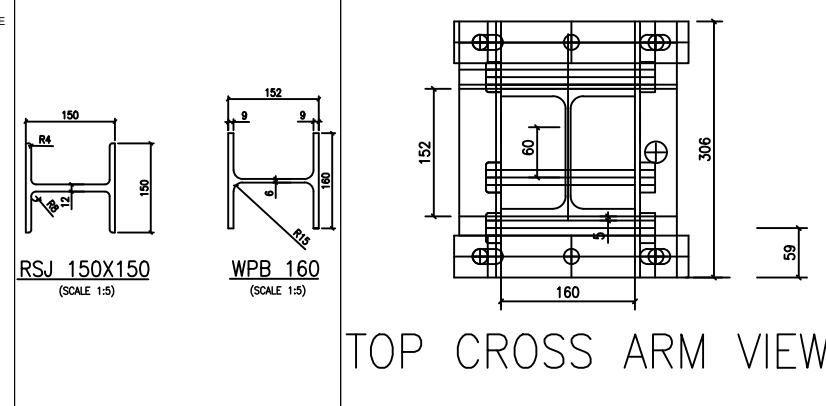


3 FISH PLATE (50x6)

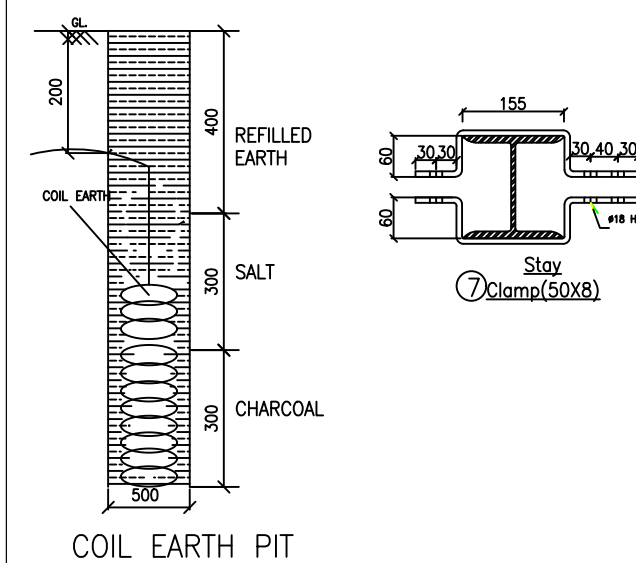
4 STRAIGHT CROSSARM TOP
(100x50x6)

BOM OF 90 DEGREE CUT POINT SINGLE POLE								
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KGMTR)	WT/ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	1	34.6 / 30.44	380.6 / 334.84	449.8 / 395.72
2	STRAIGHT CROSS ARM BOTTOM	100x50x6	CHANNEL	1700	4	9.56	16.252	65.008
3	FISH PLATE	50x6	FLAT	280	16	2.36	0.661	10.573
4	STRAIGHT CROSS ARM TOP	100x50x6	CHANNEL	306	4	9.56	2.925	11.701
5	DANGER BOARD	250x6	FLAT	250	1	9.42	2.355	2.355
6	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	1	0.59	0.301	0.301
7	STAY CLAMP	50x8	FLAT	551	1	3.14	1.730	1.730
TOTAL WT EXCEPT POLE								91.668

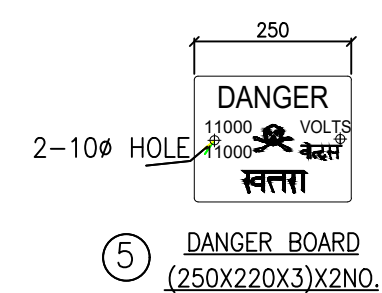
NUT & BOLTS REQUIRED										
NUT & BOLTS	LENGTH (mm)	STRAIGHT CROSS ARM BOTTOM	FISH PLATE	STRAIGHT CROSS ARM TOP	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50						1	1	0.134	0.134
M16	90					3		3	0.188	0.564
M16	150		16					16	0.270	4.320
M16	200	8		6				14	0.331	4.634
M8	70				2			2	0.033	0.066
M16	FLAT WASHER							68	0.014	0.952
M16	SPRING WASHER							68	0.009	0.612
M8	FLAT WASHER							4	0.005	0.020
M8	SPRING WASHER							4	0.002	0.008
TOTAL WEIGHT									11.310	



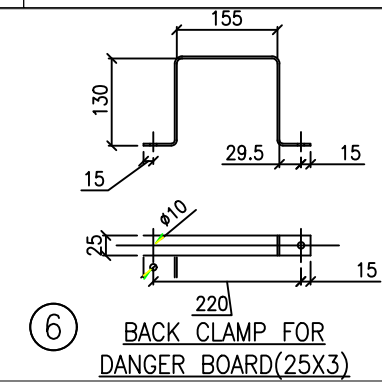
TOP CROSS ARM VIEW



COIL EARTH PIT



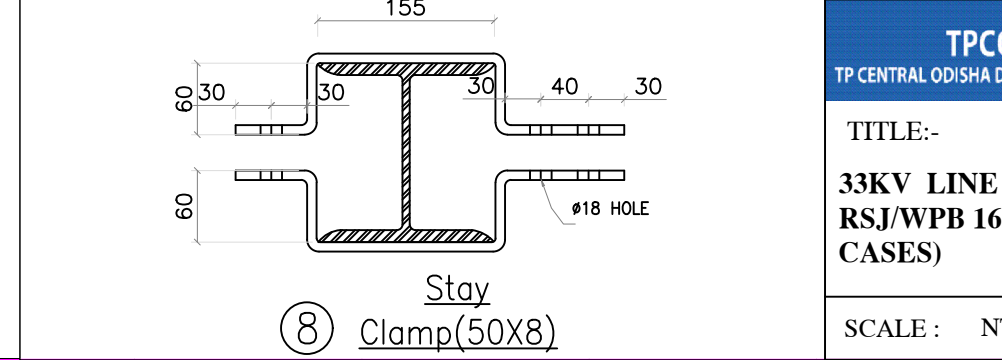
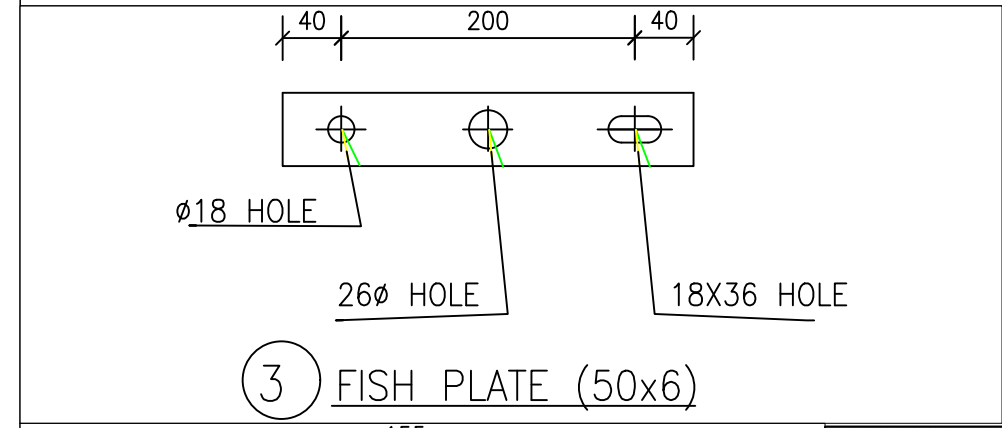
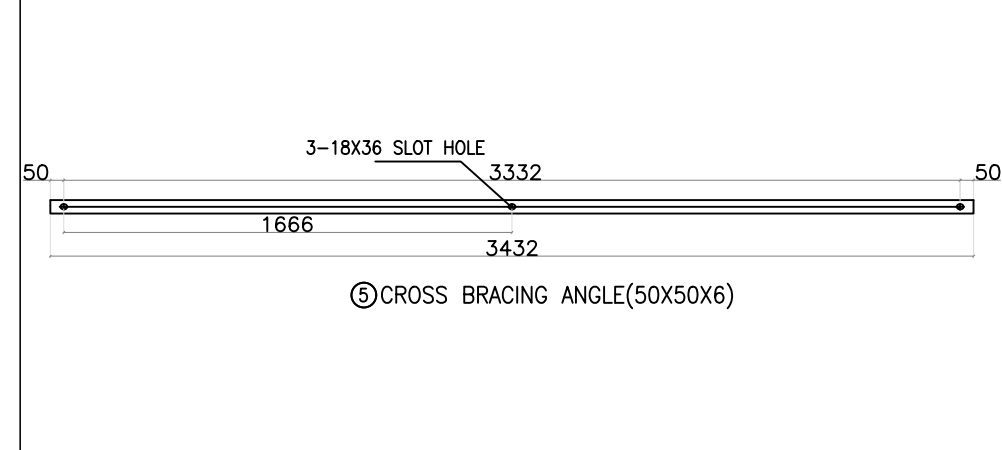
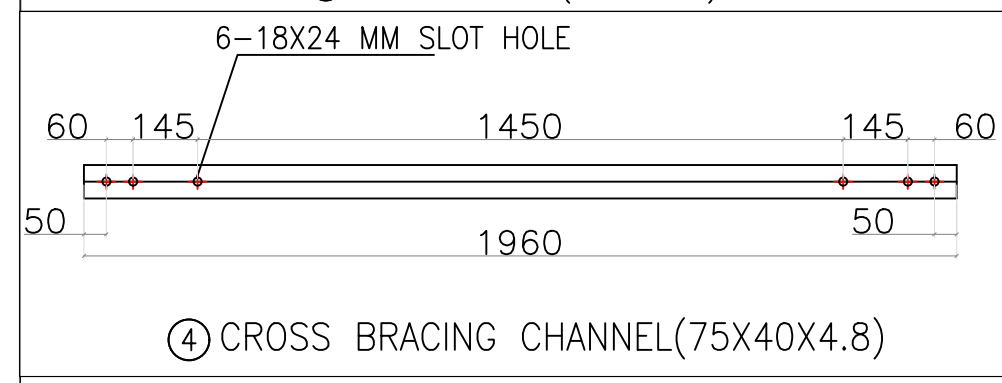
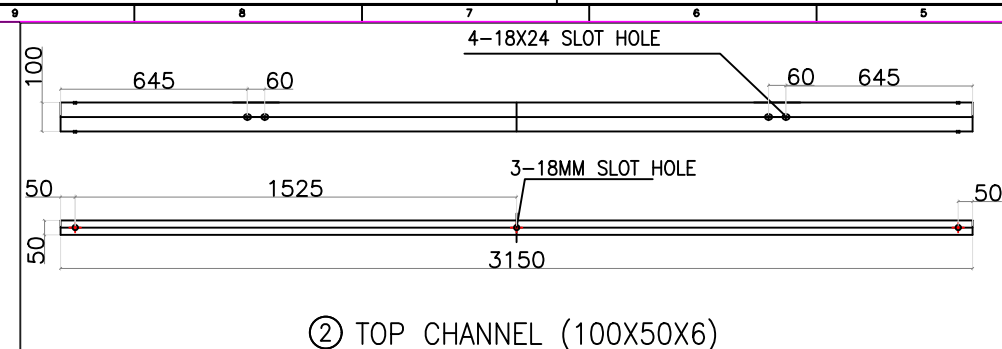
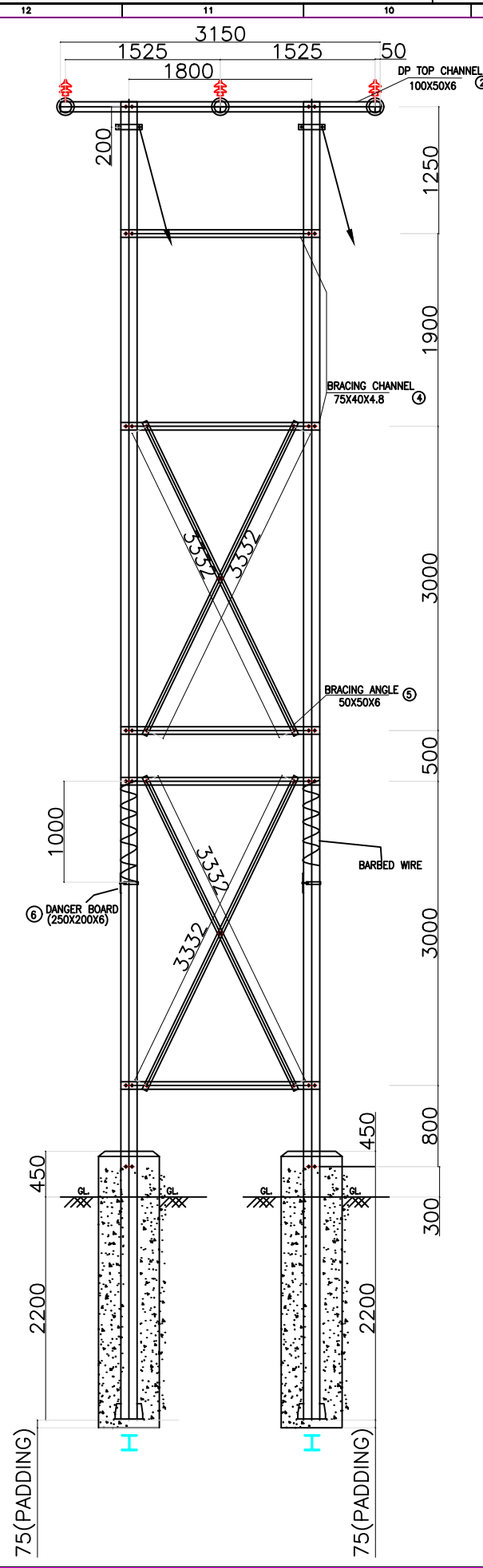
5 DANGER BOARD
(250x220x3)x2NO.



6 BACK CLAMP FOR
DANGER BOARD(25X3)

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 33KV LINE SINGLE POLE WITH 90 DEGREE CUT POINT(13mtr. 150x150 RSJ/WPB 160)		NAME J. SANGRAM, E&Q PHIROJ UTTARAY, E&Q K.C.BHARDWAJ,E&Q P GARG, E&Q PARVEEN VERMA,COS	
SCALE : NTS	ISSUE DT: 05/07/2021	DRAWING NO:TPCODL-HVD-0003 REV NO:	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)

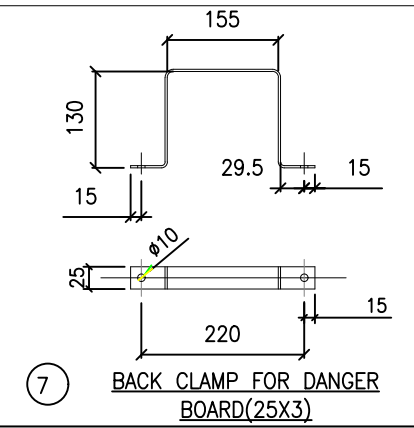
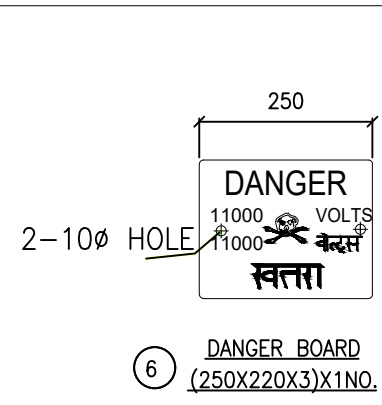


BOM OF GI ITEMS OF 33KV 13MTR INLINE DOUBLE POLE(FOR SPACE CONSTRAINT)

ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	2	34.6 / 30.44	449.8 / 395.72	899.6 / 791.44
2	DP TOP CHANNEL	100x50x6	CHANNEL	3250	2	9.56	31.070	62.140
3	FISH PLATE	50x6	FLAT	280	6	2.36	0.661	3.965
4	CROSS BRACING	75x40x4.8	CHANNEL	1960	5	7.14	13.994	69.972
5	CROSS BRACING	50x50x6	ANGLE	3432	4	4.50	15.444	61.776
6	DANGER BOARD	200x6	FLAT	250	2	9.42	2.355	4.710
7	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	2	0.59	0.301	0.602
8	STAY CLAMP	50x8	FLAT	551	2	3.14	1.730	3.460
9	PIPE EARTHING		PIPE	3000	2	0.00	0.000	0.000
TOTAL WT EXCEPT POLE								206.625

NUT & BOLTS REQUIRED

NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				10				12	0.134	1.608
M16	90						6		6	0.161	0.966
M16	200	4	3	16					23	0.331	7.613
M8	70				0	4			4	0.033	0.132
M16	FLAT WASHER								82	0.014	1.148
M16	SPRING WASHER								82	0.009	0.738
M8	FLAT WASHER								8	0.005	0.040
M8	SPRING WASHER								8	0.002	0.016
TOTAL WEIGHT											12.261



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CENTRAL ODISHA DISTRIBUTION LTD.

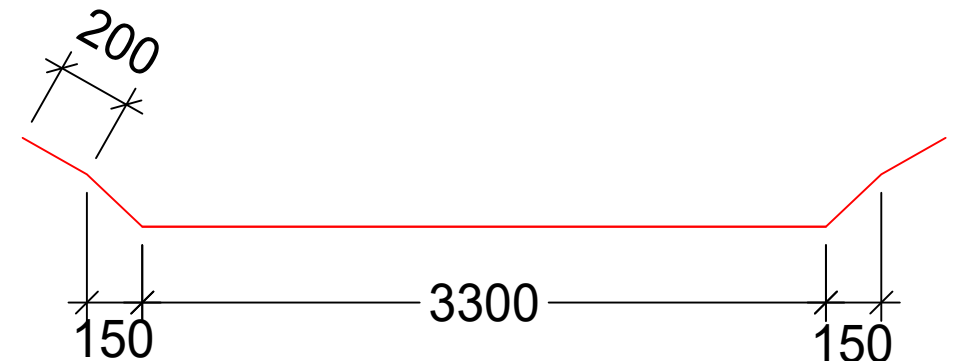
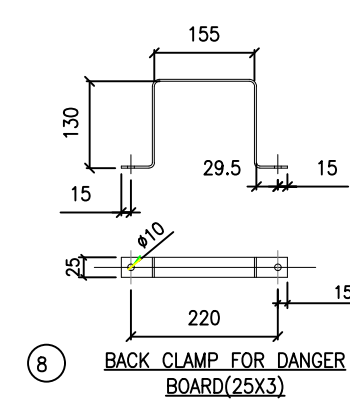
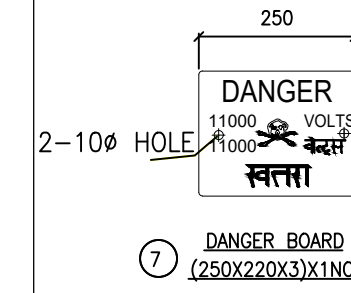
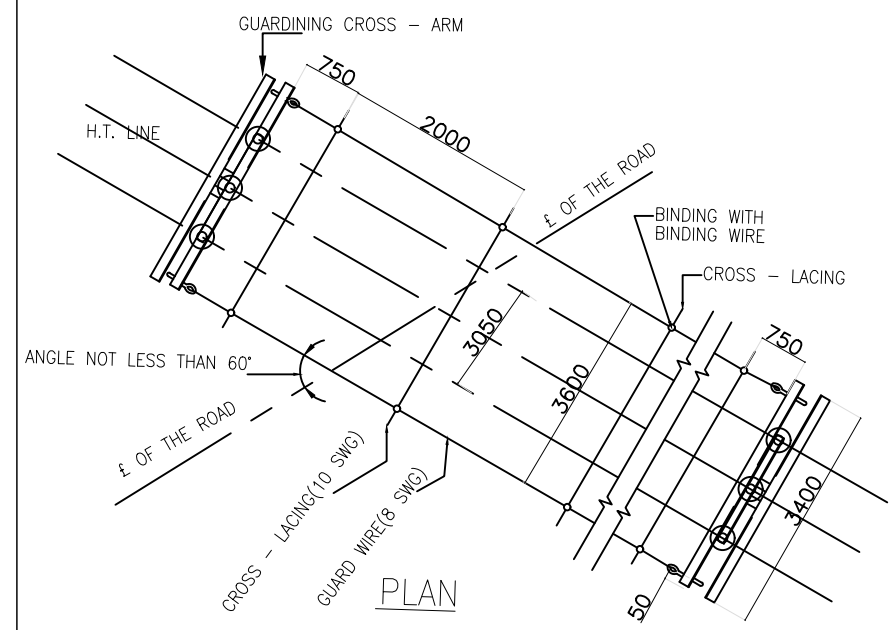
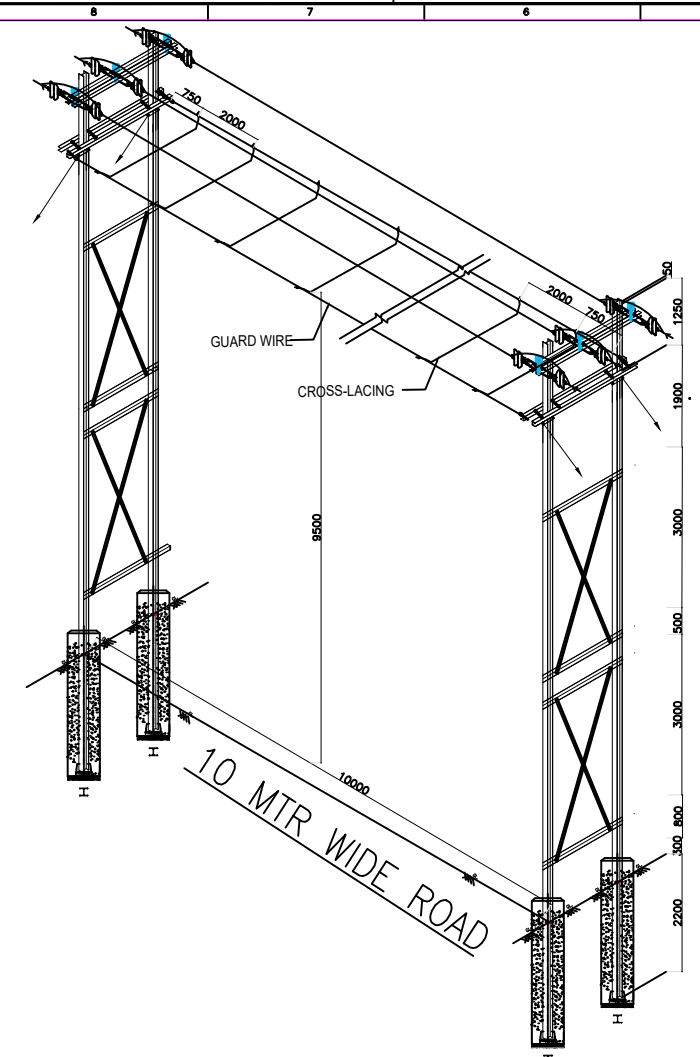
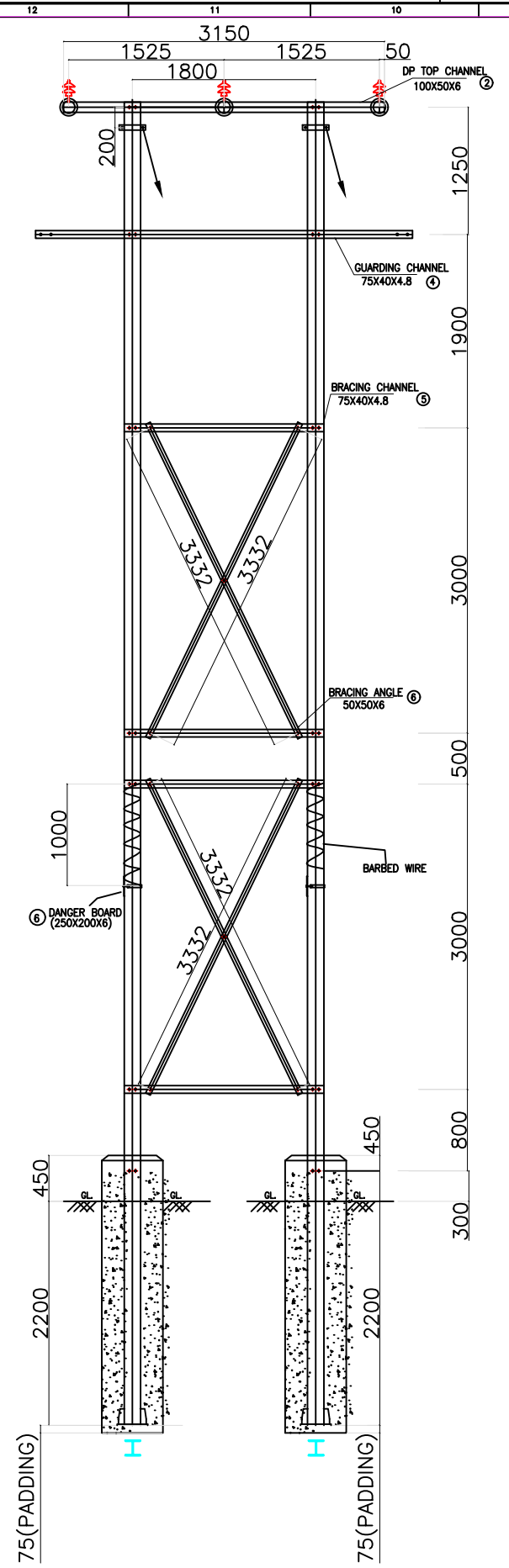
TITLE:-
33KV LINE DP USING 13 MTR 150X150 RSJ/WPB 160(FOR SPACE CONSTRAINT CASES)

SCALE: NTS ISSUE DT: 05/07/2021

NAME	
DRAWN BY:	J SANGRAM, E&Q
CHECKED BY:	PHIROJ UTTARAY, E&Q K.C.BHARDWAJ,E&Q
APPROVED BY:	P GARG, E&Q
ISSUED BY:	PARVEEN VERMA,COS

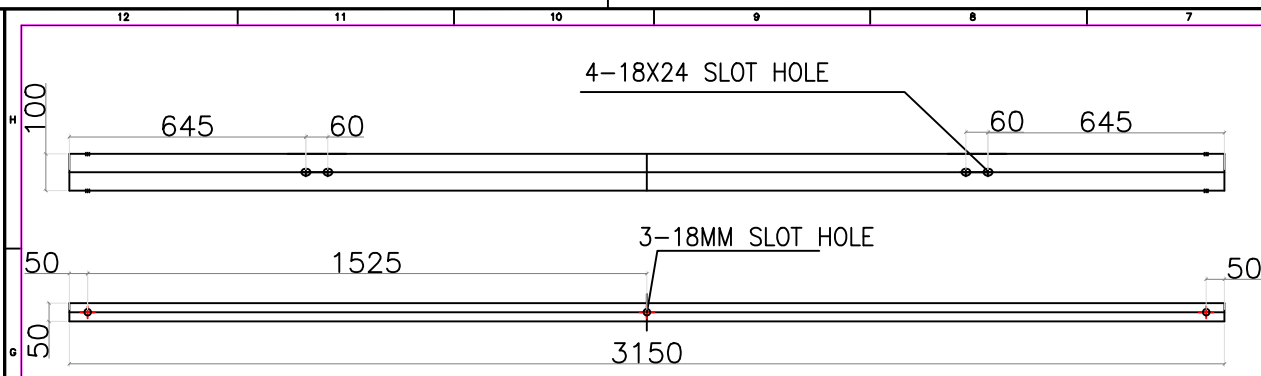
DRAWING NO: TPCODL-HVD-0004 REV NO:

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)

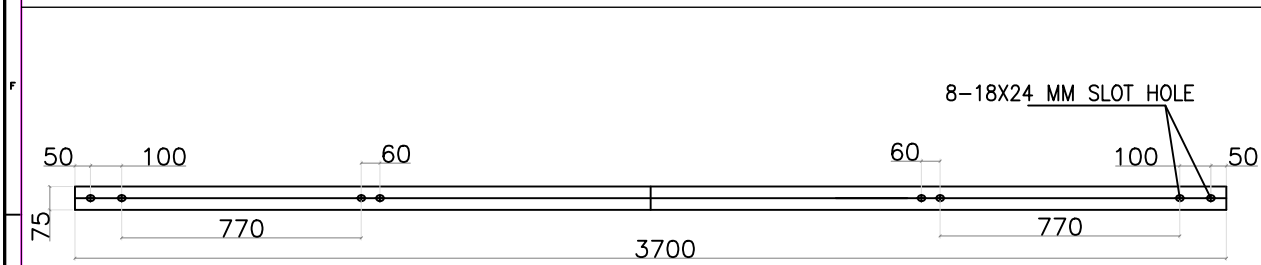


TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 33KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON DOUBLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME	
SCALE : NTS		DRAWN BY:	J SANGRAM, E&Q
ISSUE DT: 05/07/2021		CHECKED BY:	PHIROJ UTTARAY, E&Q K.C.BHARDWAJ,E&Q
DRAWING NO: TPCODL-HVD-0005 SHEET: 1 OF 2		APPROVED BY:	P GARG, E&Q
		ISSUED BY:	PARVEEN VERMA,COS

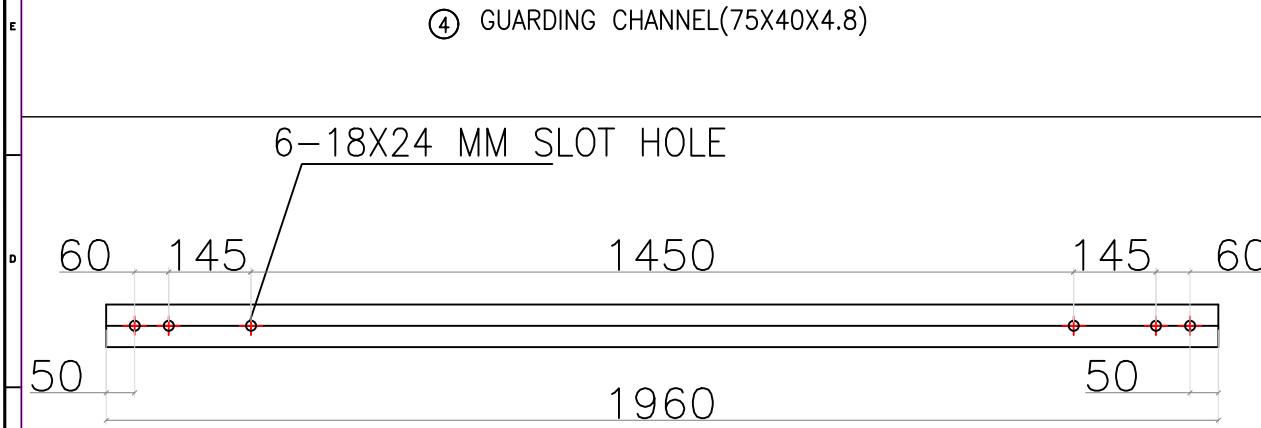
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



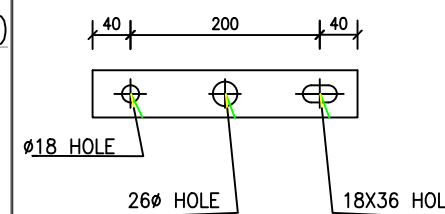
② TOP CHANNEL (100X50X6)



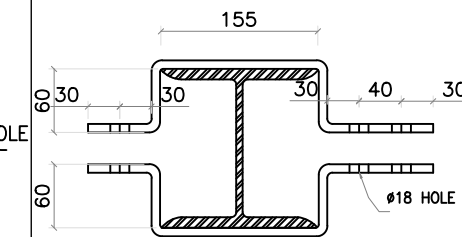
④ GUARDING CHANNEL(75X40X4.8)



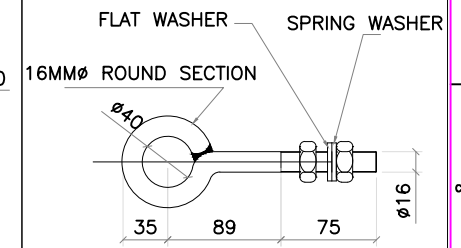
④ CROSS BRACING CHANNEL(75X40X4.8)



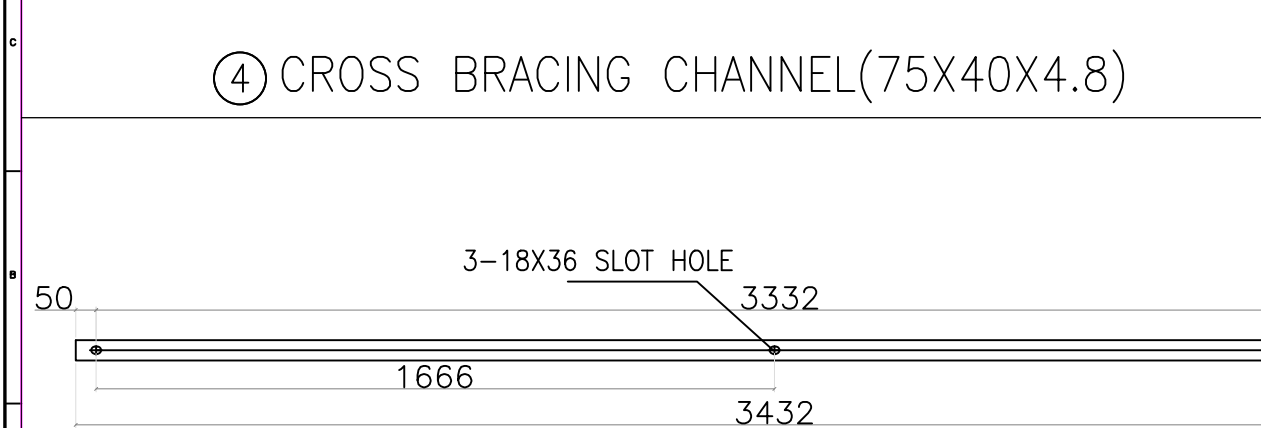
③ FISH PLATE (50x6)



⑨ Stay Clamp(50X8)



⑩ EYE HOOK

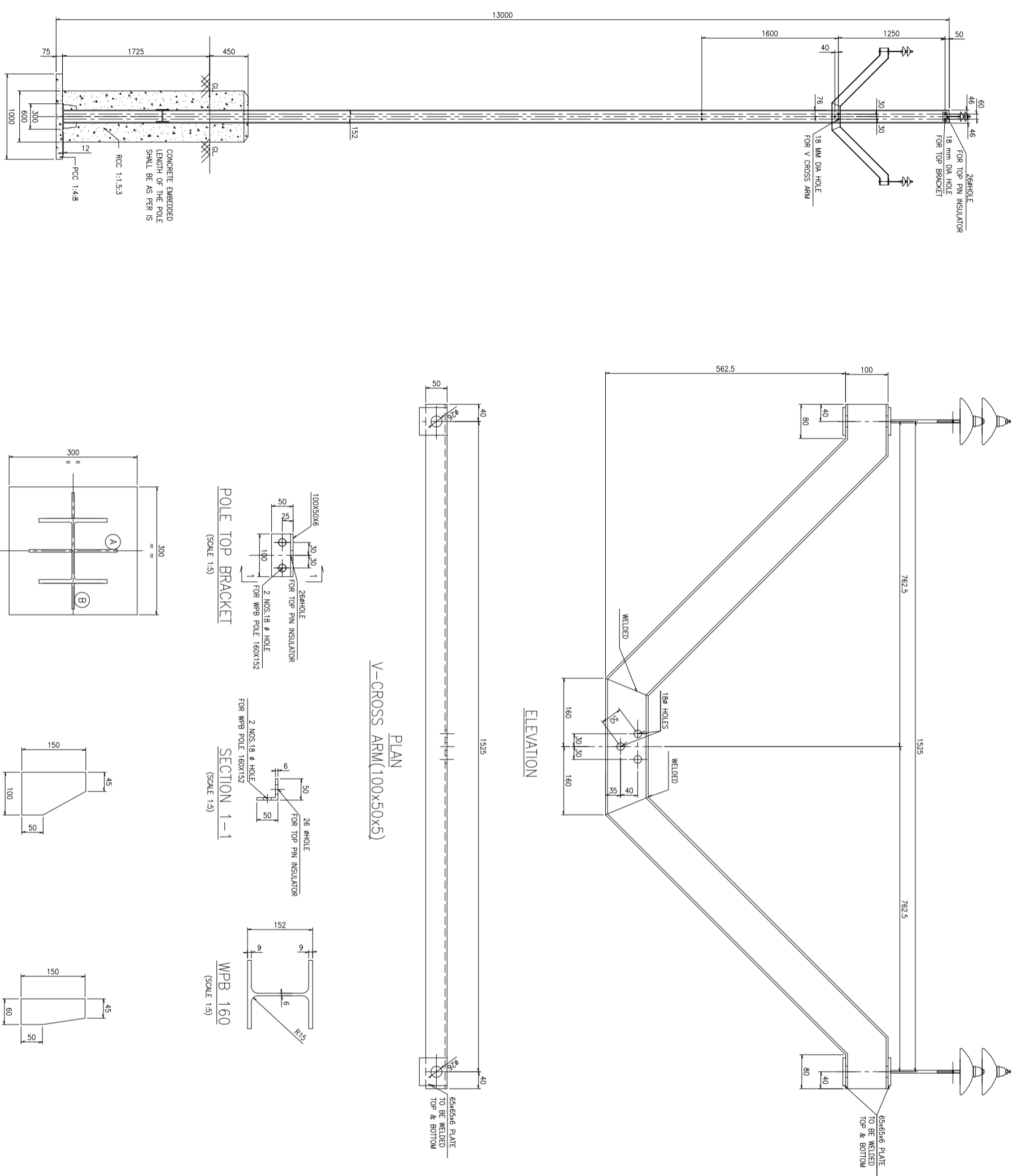


⑤ CROSS BRACING ANGLE(50X50X6)

BOM OF GI ITEMS OF 33KV ROAD CROSSING ON DOUBLE POLE							
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	4	34.6 / 30.44	449.8 / 395.72 / 1799.2 / 1582.88
2	DP TOP CHANNEL	100x50x6	CHANNEL	3150	4	9.56	30.114 / 120.456
3	FISH PLATE	50x6	FLAT	280	12	2.36	0.661 / 7.930
4	CHANNEL FOR GUARDING	75x40x4.8	CHANNEL	3700	4	7.14	26.418 / 105.672
5	CROSS BRACING	75x40x4.8	CHANNEL	1960	8	7.14	13.994 / 111.955
6	CROSS BRACING	50x50x6	ANGLE	3432	8	4.50	15.444 / 123.552
7	DANGER BOARD	200x6	FLAT	250	4	9.42	2.355 / 9.420
8	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	4	0.59	0.301 / 1.204
9	STAY CLAMP	50x8	FLAT	551	4	3.14	1.730 / 6.921
10	EYE HOOK(Along with 2nuts, 1 flat & spring washer each)		M16 ROD	305	4	1.57	0.479 / 1.915
10	8 SWG		WIRE	42000	1	0.13	5.502 / 5.502
11	10 SWG		WIRE	22200	1	0.08	1.820 / 1.820
12	PIPE EARTHING		PIPE	3000	4	0.00	0.000 / 0.000
TOTAL WT EXCEPT POLE							496.347

NUT & BOLTS REQUIRED												
NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	GUARDING CROSS ARM	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				20				4	24	0.134	3.216
M16	90						12			12	0.161	1.932
M16	200	8		32				12		52	0.331	17.212
M8	70				0	8				8	0.033	0.264
M16	FLAT WASHER									176	0.014	2.464
M16	SPRING WASHER									176	0.009	1.584
M8	FLAT WASHER									16	0.005	0.080
M8	SPRING WASHER									16	0.002	0.032
TOTAL WEIGHT												26.784

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 33KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON DOUBLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME J SANGRAM, E&Q	
SCALE : NTS		CHECKED BY: PHIROJ UTTARAY, E&Q	
ISSUE DT: 05/07/2021		APPROVED BY: P GARG, E&Q	
DRAWING NO: TPCODL-HVD-0005 REV NO: SHEET: 2 OF 2		ISSUED BY: PARVEEN VERMA,COS	



NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
2. ALL HOLES ARE #18 MM UNLESS OTHERWISE SPECIFIED.
3. REFERENCE STANDARD - IS 2062, & IS-808

FOR RO ISSUE ONLY		ISSUE		REVISIONS		CLEARED		APPD DATE ISSUE		REVISIONS		CLEARED		APPD DATE	
DISC	SIGNATURE	DATE	NO	DESCRIPTION	DRN	CIVIL	ELEC	I&C	MECH	DRN	CIVIL	ELEC	I&C	MECH	DATE

33 KV LINE WITH WPB 160X152
SINGLE POLE STRUCTURE
(SCALE 1:25)

BASE PLATE
(300X300X12MM)
(SCALE 1:5)

STIFFENER PLATE-A
(150X100X6MM)
(SCALE 1:5)

STIFFENER PLATE-B
(150X60X6MM)
(SCALE 1:5)

POLE TOP BRACKET
(SCALE 1:5)

SECTION 1-1
(SCALE 1:5)

WPB 160
(SCALE 1:5)

V-CROSS ARM(100X50X5)
PLAN

FILE NAME :

PRELIMINARY ISSUES ARE NOT TO BE
RELEASED FOR CONSTRUCTION/WORK
UNLESS THE DESIGNER HAS REVIEWED
THE DRAWING AND CONFIRMED THE
CONSTRUCTION/WORK. ANY
REVISIONS TO THE DRAWING MUST
BE APPROVED BY THE DESIGNER.
REVISIONS TO THE DRAWING MUST
BE APPROVED BY THE DESIGNER.
REVISIONS TO THE DRAWING MUST
BE APPROVED BY THE DESIGNER.

SCALE: AS SHOWN

APPROVED

DATE (RO ISSUE)
20/04/2021

DATE (ORIGIN SS)
20/04/2021

ISSUE

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

TP CENTRAL ODISHA
DISTRIBUTION LIMITED

33KV LINE WITH WPB 160X152 SINGLE
POLE STRUCTURE

DO NOT SCALE

PRELIMINARY

DD NOT SCALE

PRELIMINARY

DD NOT SCALE

PRELIMINARY

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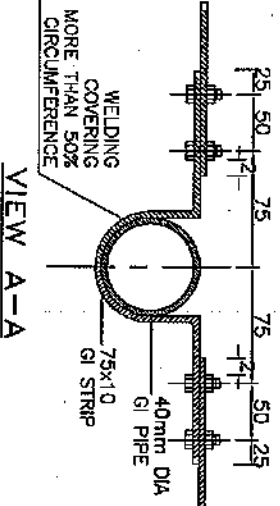
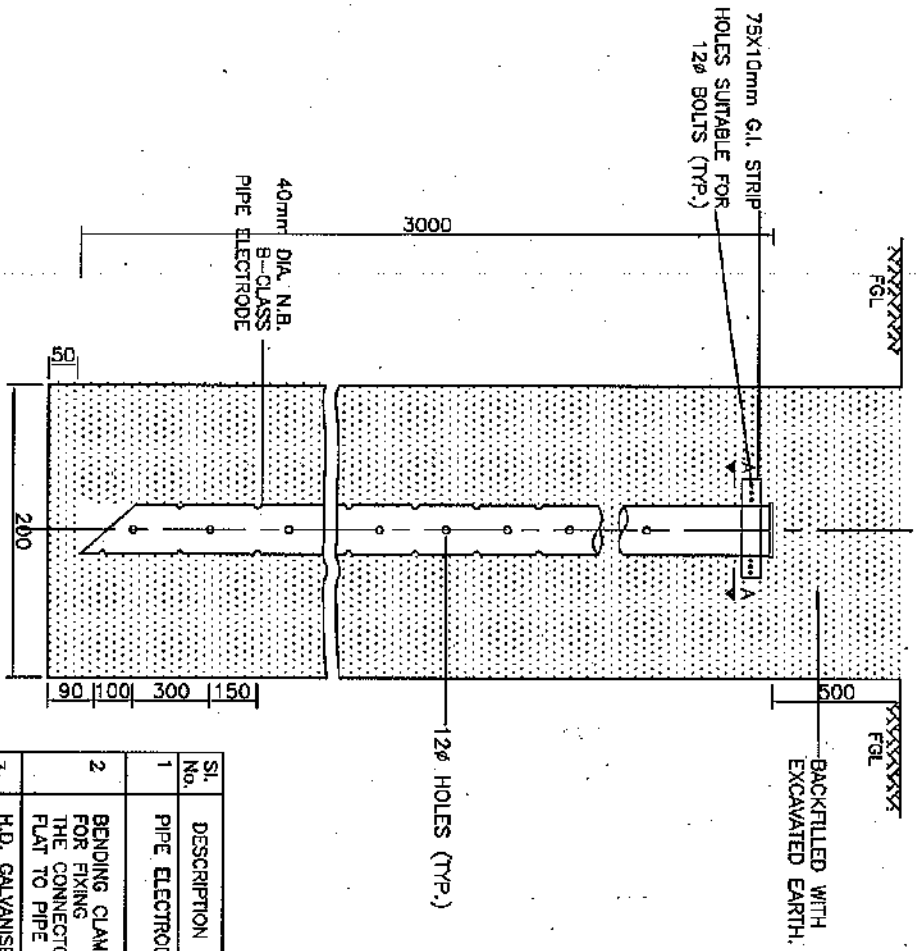
PRELIMINARY

DD NOT SCALE

PRELIMINARY

DD NOT SCALE

PRELIMINARY



Sl. No.	DESCRIPTION	MATERIAL	QTY.
1	PIPE ELECTRODE	40 N.B. CLASS-B PERFORATED GI PIPE ELECTRODE-3000mm	1 NO.
2	BENDING CLAMP FOR FIXING THE CONNECTOR FLAT TO PIPE	75MMX10MMX150MM LONG. GI FLAT	1 NO.
3	H.D. GALVANISED BOLTS, NUTS & WASHERS	120X35 LONG BOLT NUT AND WASHER ALL GALVANISED	8 NOS

- NOTES-
1. All dimensions are in mm.
 2. All necessary hardware required for installation of electrode shall be provided by bidder.
 3. Minimum distance required between two consecutive earthing pits shall not be less than 3.0 mts.
 4. Galvanising must be done after welding.
 5. After providing holes the hot-dip galvanising to be done for the pipe.

REVISIONS-

NO.	DATE	BY	REASON
1			
2			

TATA POWER DELHI DISTRIBUTION LIMITED
 (A TATA POWER AND STATE GOVERNMENT JOINT VENTURE)
 GND SSB STATION BUILDING, BUDHINI LANE
 KINGSWAY CAMP, DELHI-110000

PROJECT:- MISCELLANEOUS

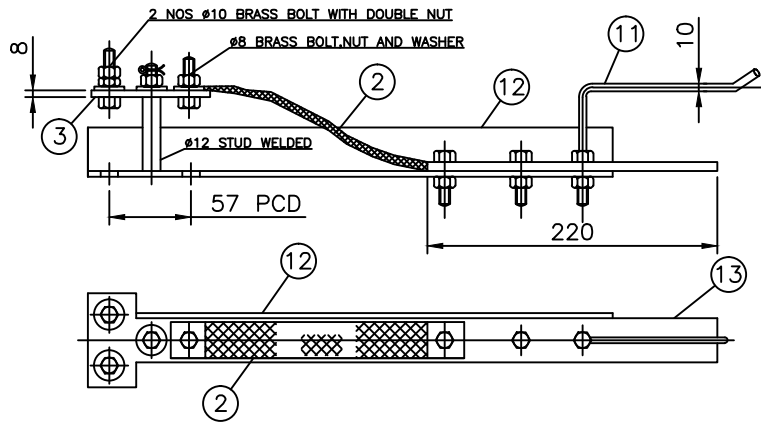
DESIGN:- TYPICAL DETAILS OF 40mm B PIPE EARTH ELECTRODE FOR 11KV & LT DISTRIBUTION

SCALE: 1:0=1

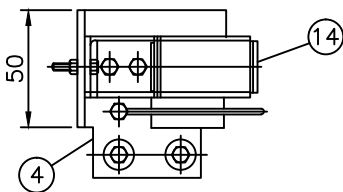
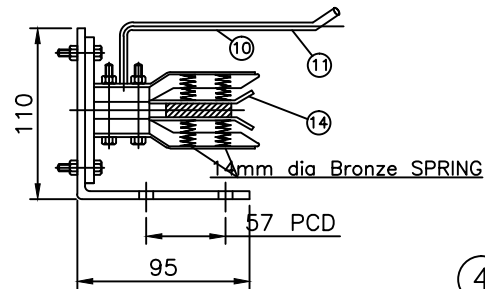
DRAWING NO. PD-3-HC-E-066

DATE: 0

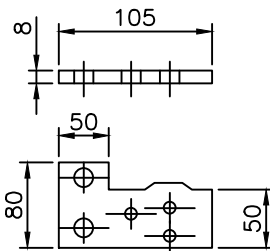
This drawing and any information or description contained hereon are the confidential property of TPL, and shall not be disclosed, loaned, copied, or used for manufacturing, marketing or any other purpose without written permission.



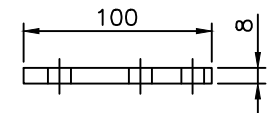
MOVING CONTACT ASSLY.



FIXED CONTACT ASSLY.



4 CONNECTOR (FIXED)



3 CONNECTOR (MOVING)

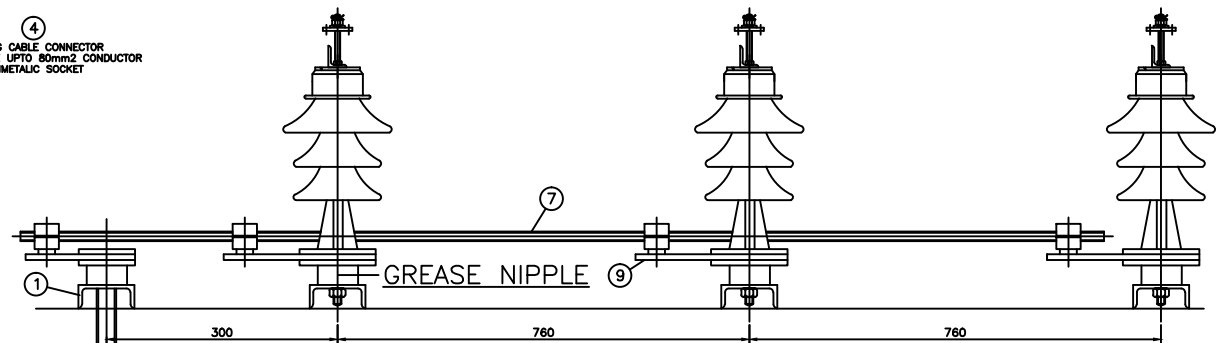
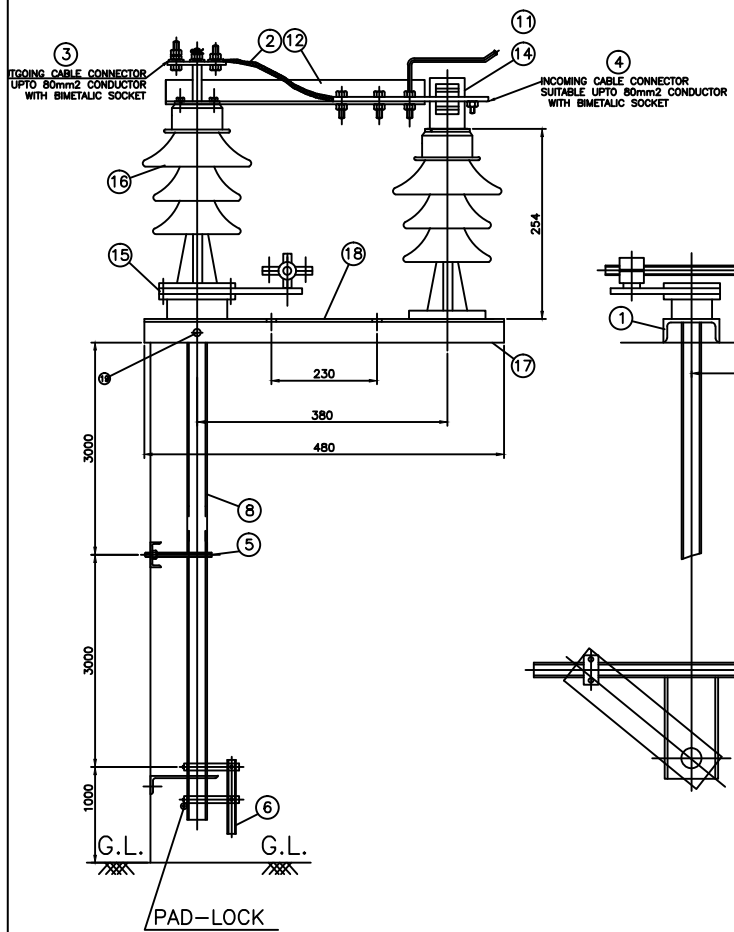
NOTES :-

01. ALL DIMENSIONS ARE IN mm.
02. TOLERANCE $\pm 5\%$
03. ALL FERROUS PARTS SHALL BE HOT-DIP GALVANISED
04. ALL NON-FERROUS PARTS SHALL BE HEAVILY SILVER-PLATED.

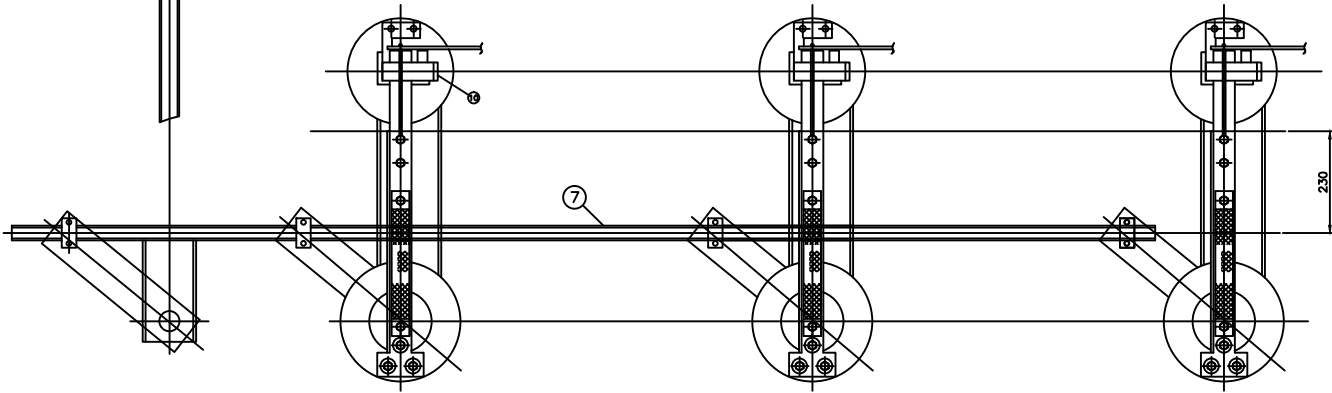
BILL OF MATERIALS

SL.NO.	DESCRIPTION	QTY.	MATERIAL
19	EARTH TERMINAL	3	NUT & BOLT
18	NAME PLATE	3	ALUMINIUM
17	BASE CHANNEL 75x40x6mm 480mm long	3	M.S. GALVD.
16	POST INSULATOR 11KV 254mm HT. 320 C.D.	6	PORCELAIN
15	BEARING ASSEMBLY	3	M.S. GALVD.
14	FIXED CONTACT 80x50x8mm LONG	3	HD-EC-Cu
13	MOVING CONTACT 220x50x8mm	3	HD-EC-Cu
12	MOVING CONTACT SUPPORT 50x50x6mm	3	M.S. ANGLE
11	ARCING HORN $\phi 10$ mm	3/3	M.S. GALVD.
10	CONTACT LEVER	3/3	M.S. GALVD.
09	PHASE OPERATING LEVER (BAT)	3	M.S. GALVD.
08	OPERATING DOWN PIPE 32NB 'B' CLASS x 6MTR. LG	1	G.I. PIPE
07	PHASE COUPLING PIPE 25NB 'B' CLASS x 2500mm LG	1	G.I. PIPE
06	OPERATING HANDLE 32NB x 450mm LG	1	G.I. PIPE
05	INTERMEDIATE "I" BOLT	1	M.S. GALVD.
04	CONNECTOR (FIXED) 80x50x8mm	3	BRASS/GM
03	CONNECTOR (MOVING) 80x50x8mm	3	BRASS/GM
02	BRAIDED TAPE 320x25x5mm	3	TINNED COPPER
01	FOURTH BEARING	1	M.S. GALVD.

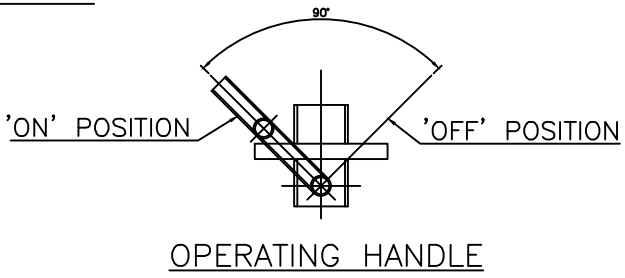
DEG	S.DEY	02.04.13	SPARE DETAILS OF 11 KV 3 PHASE SINGLE BREAK ROTATING TYPE A.B. SWITCH
DRN	P.ROY	04.04.13	
CHD			
APPD			
SCALE : N.T.S.			



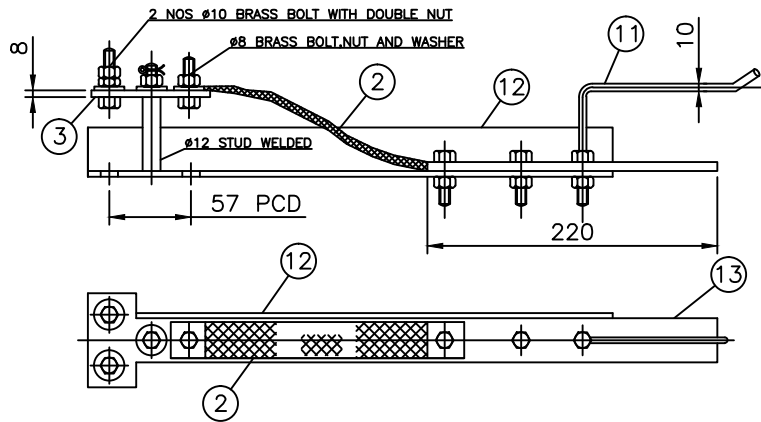
ELEVATION



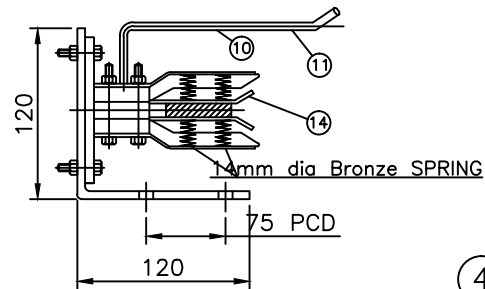
PLAN



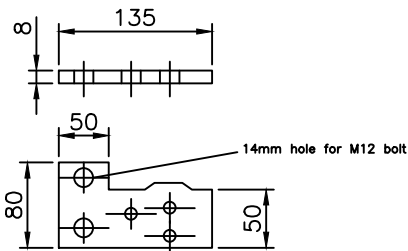
G.A. OF 11 KV 400 AMPS
3 PHASE A.B. SWITCH



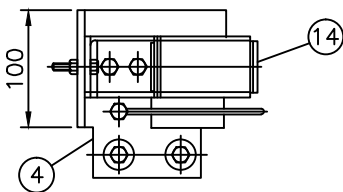
MOVING CONTACT ASSLY.



FIXED CONTACT ASSLY.



4 CONNECTOR (FIXED)



3 CONNECTOR (MOVING)

NOTES :-

- 01. ALL DIMENSIONS ARE IN mm.
- 02. TOLERANCE ±5%
- 03. ALL FERROUS PARTS SHALL BE HOT-DIP GALVANISED
- 04. ALL NON-FERROUS PARTS SHALL BE HEAVILY SILVER-PLATED.

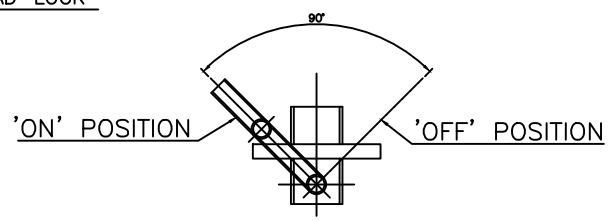
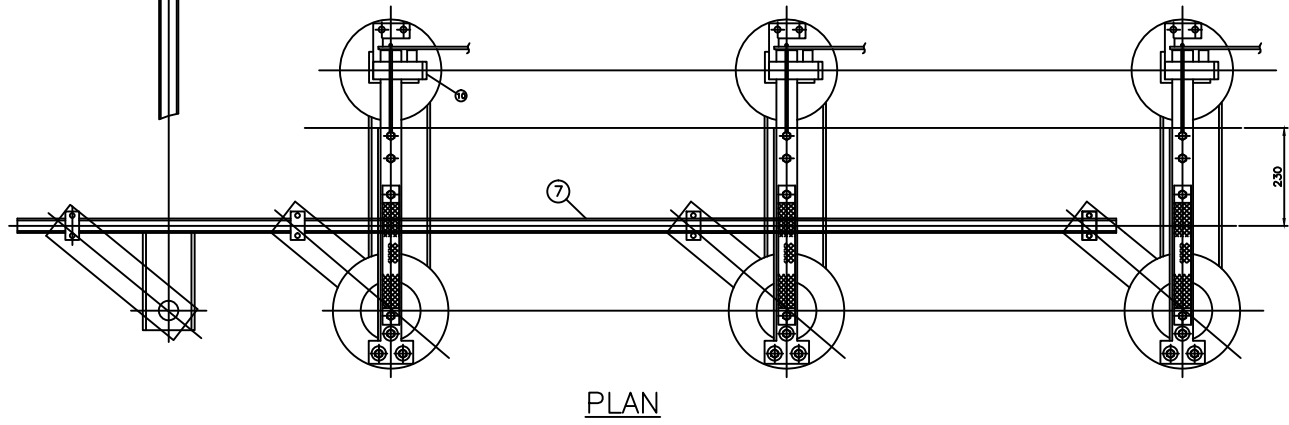
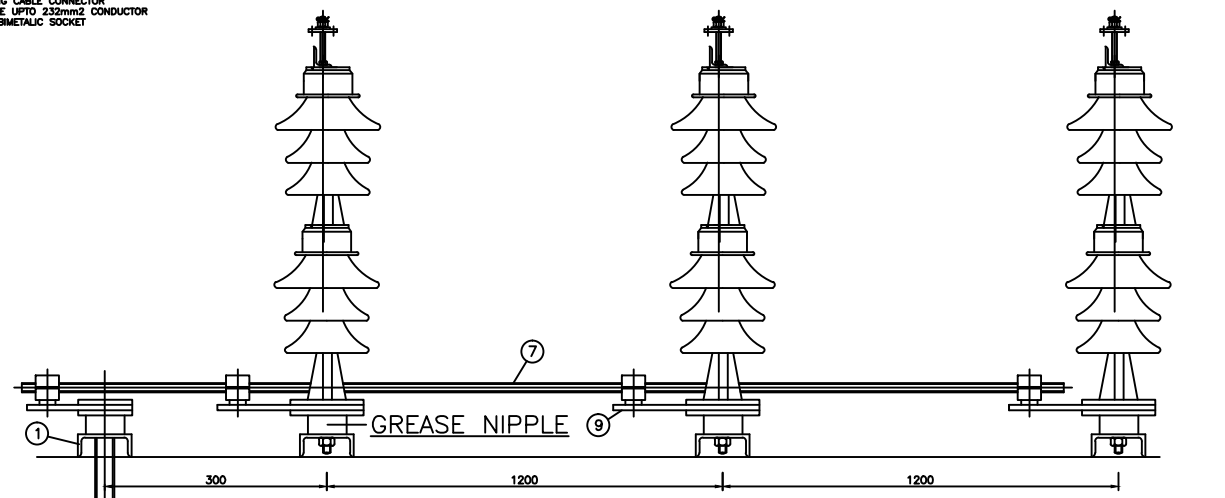
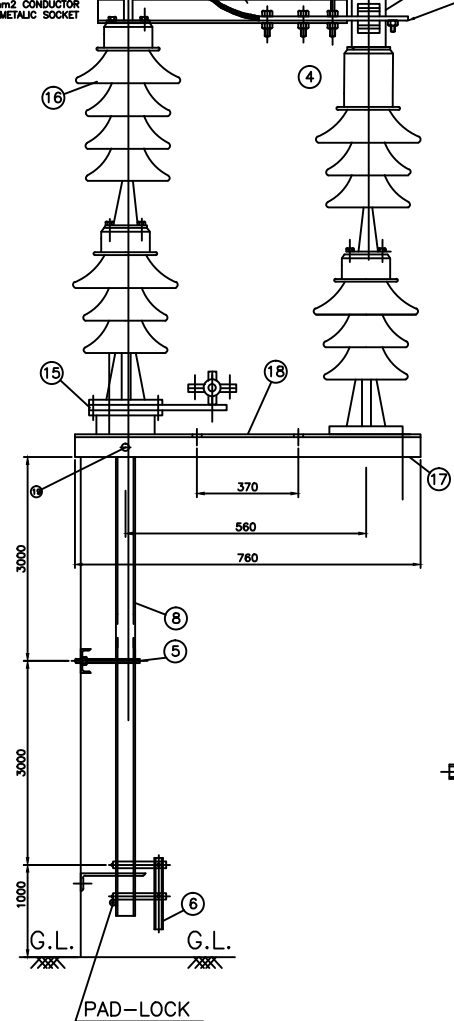
BILL OF MATERIALS

SL.NO.	DESCRIPTION	QTY.	MATERIAL
19	EARTH TERMINAL	3	NUT & BOLT
18	NAME PLATE	3	ALUMINIUM
17	BASE CHANNEL 100x50x6mm 760mm Long	3	M.S. GALVD.
16	POST INSULATOR 22KV 254mm HT. 430 C.D.	12	PORCELAIN
15	BEARING ASSEMBLY	3	M.S. GALVD.
14	FIXED CONTACT 80x50x8mm LONG	3	HD-EC-Cu
13	MOVING CONTACT 250x50x8mm	3	HD-EC-Cu
12	MOVING CONTACT SUPPORT 50x50x6mm	3	M.S. ANGLE
11	ARCING HORN ø10mm	3/3	M.S. GALVD.
10	CONTACT LEVER	3/3	M.S. GALVD.
09	PHASE OPERATING LEVER (BAT)	3	M.S. GALVD.
08	OPERATING DOWN PIPE 32NB 'B' CLASS x 6MTR. LG	1	G.I. PIPE
07	PHASE COUPLING PIPE 25NB 'B' CLASS x 2500mm LG	1	G.I. PIPE
06	OPERATING HANDLE 32NB x 450mm LG	1	G.I. PIPE
05	INTERMEDIATE "I" BOLT	1	M.S. GALVD.
04	CONNECTOR (FIXED) 80x50x8mm	3	BRASS/GM
03	CONNECTOR (MOVING) 80x50x8mm	3	BRASS/GM
02	BRAIDED TAPE 450x35x8mm	3	TINNED COPPER
01	FOURTH BEARING	1	M.S. GALVD.

DEG	S.DEY	02.04.13	SPARE DETAILS OF 33 KV 3 PHASE SINGLE BREAK ROTATING TYPE A.B. SWITCH
DRN	P.ROY	04.04.13	
CHD			
APPD			
SCALE : N.T.S.			

③ OUTGOING CABLE CONNECTOR
SUITABLE UPTO 80mm² CONDUCTOR
WITH BIMETALIC SOCKET

⑪ INCOMING CABLE CONNECTOR
SUITABLE UPTO 232mm² CONDUCTOR
WITH BIMETALIC SOCKET



OPERATING HANDLE

G.A. OF 33 KV
3 PHASE A.B. SWITCH

LEGEND:-

NOTE:-

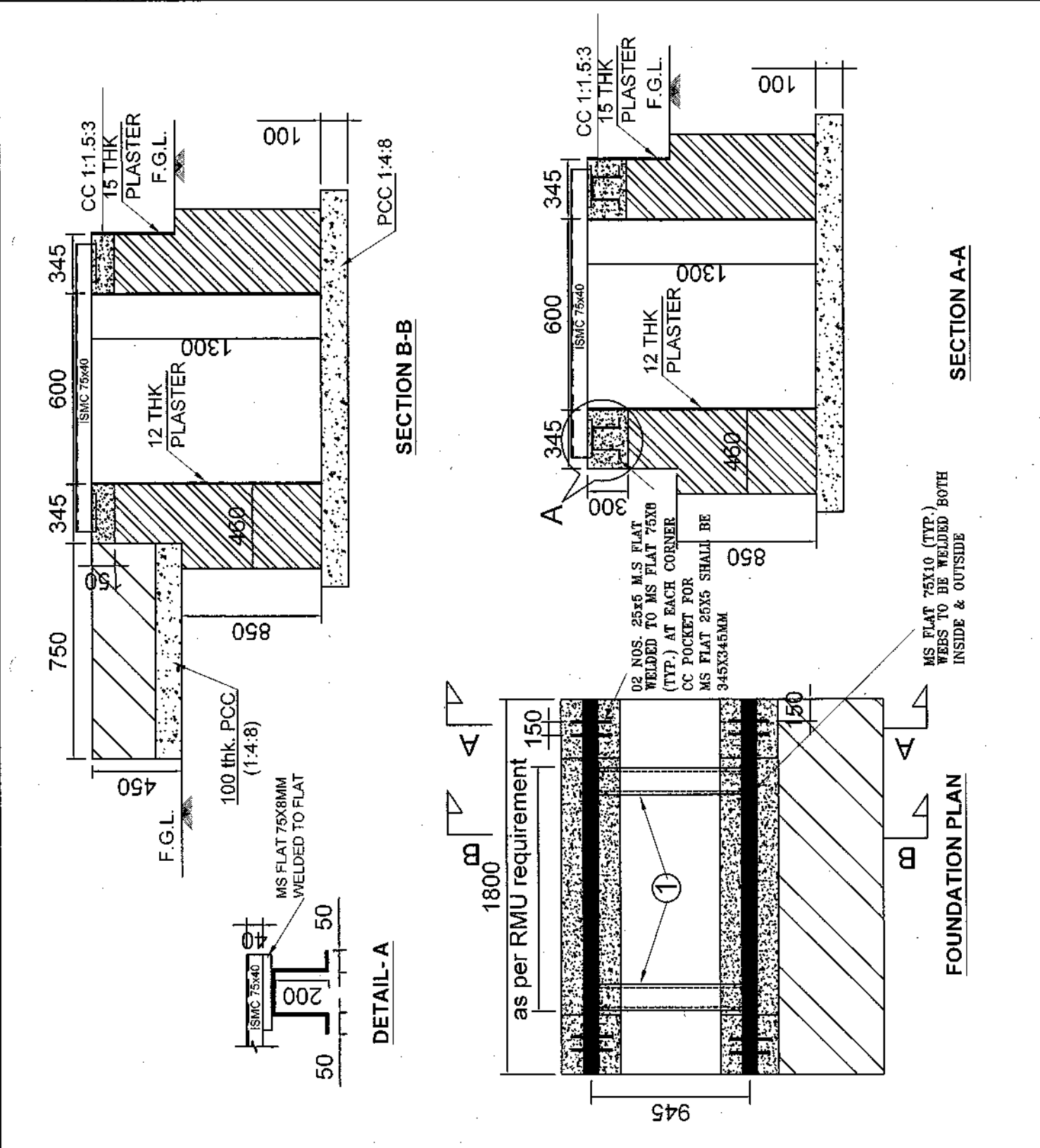
1. All Dimensions are in mm.
2. All brickwork shall be in cement mortar 1:6. The brickwork with cement and sand plaster (1:4) 12mm thick.
3. Do not scale follow written dimension only.
4. All weld shall be 6mm thick.
5. Channel marked at 1 to be welded as per RMU
6. Backfilling of earth upto FGL to be done after cable laying in the trench
7. Plaster shall be in CM 1:4
8. All exposed brick work shall be plastered with cement mortar 1:4 - 12mm thick and shall be painted with water proofing cement paint (2 or more coats)
8. All structural steel shall painted with a priming coat of steel primer.

REFERENCES:-

NO.	REVISION	DATE	BY	CHKD.	APPD.
1					
2					
3					

TATA POWER DELHI DISTRIBUTION LIMITED
 (A SECT. 25 COMP. UND. THE SECT. 25 COMP. ACT, 1944)
 TATA POWER DELHI DISTRIBUTION LIMITED
 TPD-S-202-C-040

NO.	REVISION	DATE	BY	CHKD.	APPD.
1					
2					
3					



LEGEND:-

NOTE:-

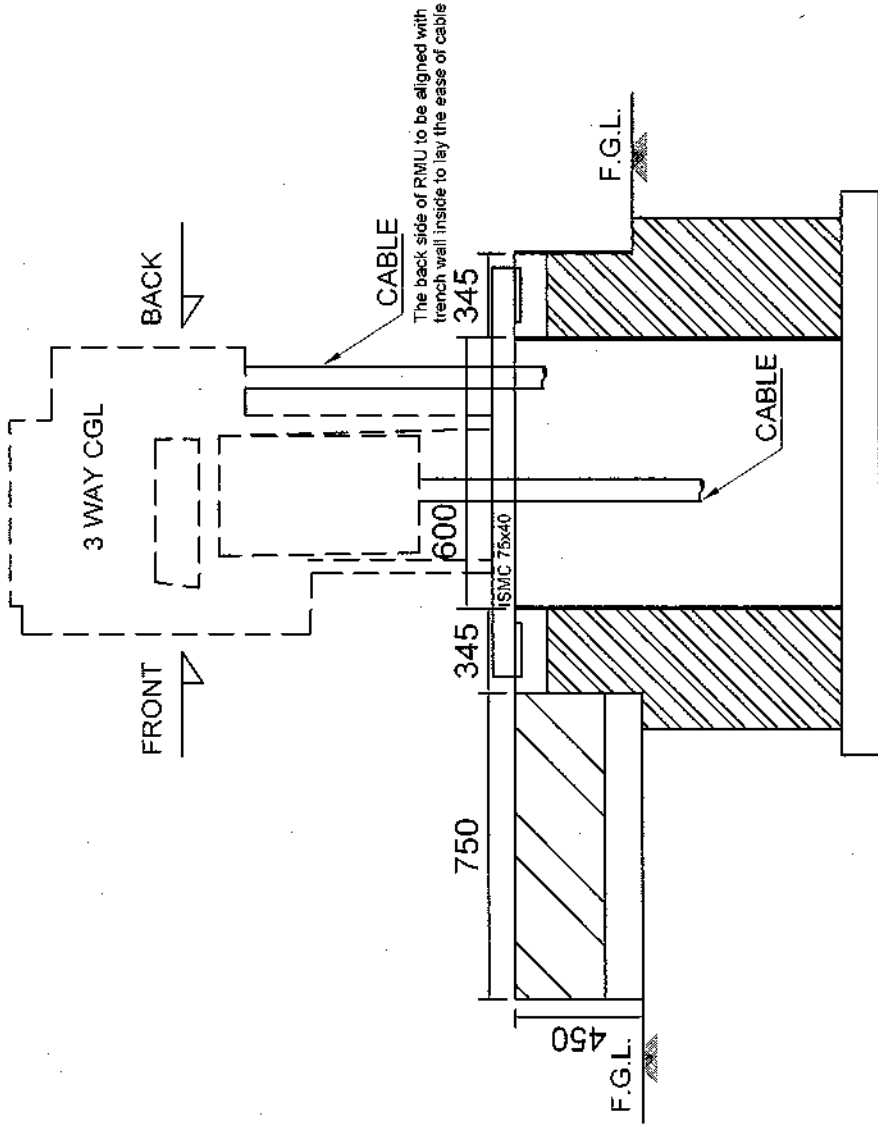
1. All Dimensions are in mm.
2. All brickwork shall be in cement mortar 1:5. The brickwork with cement and sand plaster (1:4) 12mm thick.
3. All Lean concrete shall be PCC (1:4:8) 75mm thick U.N.O. and 75mm projected beyond RCC face.
4. All Reinforcement for steel bars (denoted as T) shall conform to IS 1786-1985 of grade Fe 500D.
5. Do not scale follow written dimension only.
6. All weld shall be 6mm thick.
7. Channel marked at 1 to be welded as per RMU requirement
8. Backfilling of earth upto F.G.L to be done after cable laying in the trench

REFERENCES:-

NO.	DATE	BY	REVISION	CHKD.	APPD.	REMARKS
1						
2						
3	12.08.17		Revised for construction purpose			

TATA POWER DELHI DISTRIBUTION LIMITED
 (A TATA POWER AND MEREL GOVERNMENT JOINT VENTURE)
 GND 2ND STATION DELHI, DELHI
 DELHI-110009

NO.	DATE	BY	REVISION	CHKD.	APPD.	REMARKS
1						
2						
3						
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SIDE VIEW A-A

LEGEND:-

NOTE:-

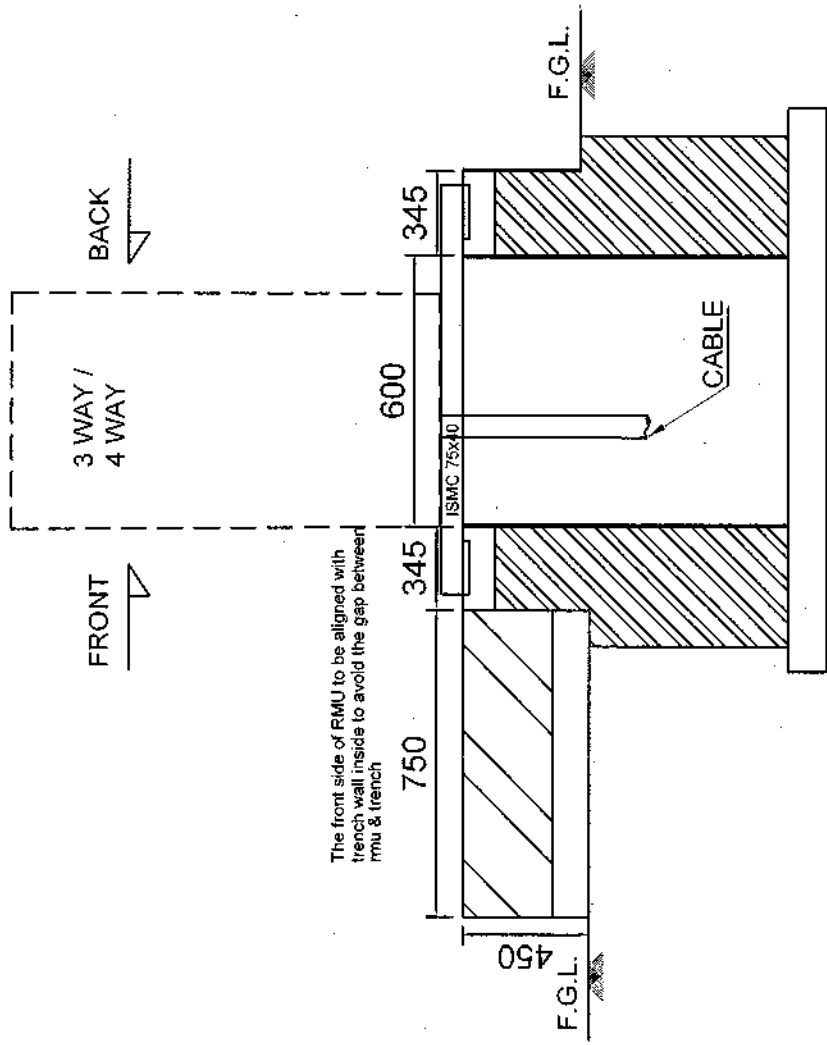
1. All Dimensions are in mm.
2. All brickwork shall be in cement mortar 1:6. The brickwork with cement and sand plaster (1:4) 12mm thick.
3. All Lean concrete shall be PCC (1:4:8) 75mm thick U.N.C. and 75mm projected beyond RCC face.
4. All Reinforcement for steel bars (denoted as T) shall conform to IS 1786-1985 of grade Fe 500D.
5. Do not scale follow written dimension only.
6. All weld shall be 6mm thick.
7. Channel marked at 1 to be welded as per RMU requirement
8. Backfilling of earth upto FGL to be done after cable laying in the trench

REFERENCES:-

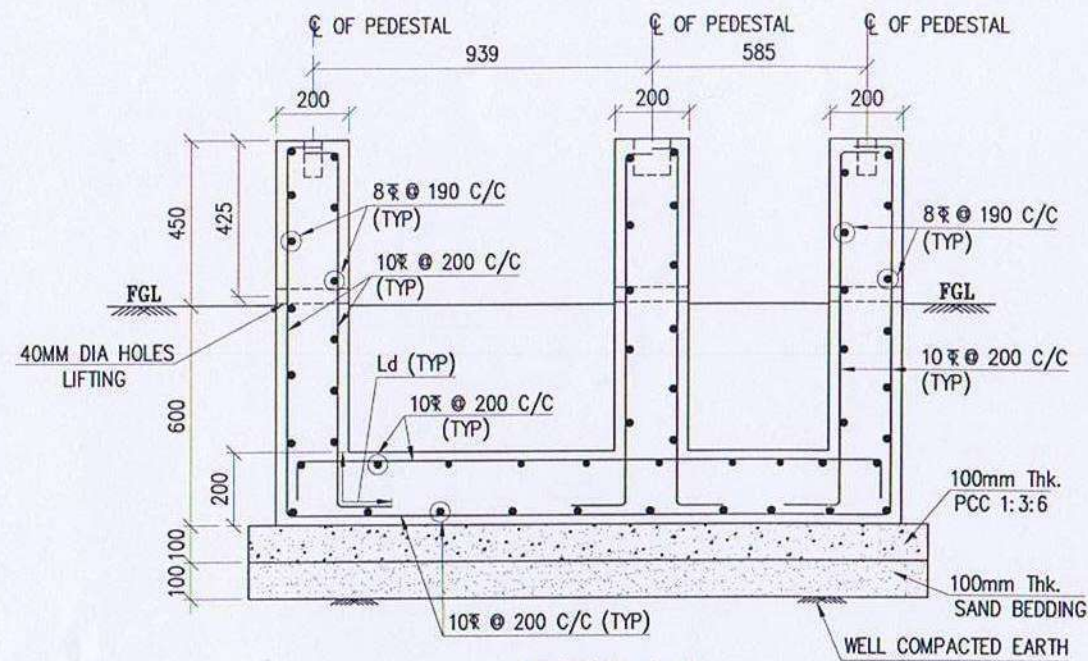
REV.	DATE	BY	CHKD	APPD.	REMARKS
12.05.17					Issued for construction purpose

TATA POWER DELHI DISTRIBUTION LIMITED
 (A TATA POWER AND DELHI GOVERNMENT JOINT VENTURE)
 COMMON RMU FOUNDATION - OUT DOOR
 (RMU MOUNTING ARRANGEMENT)

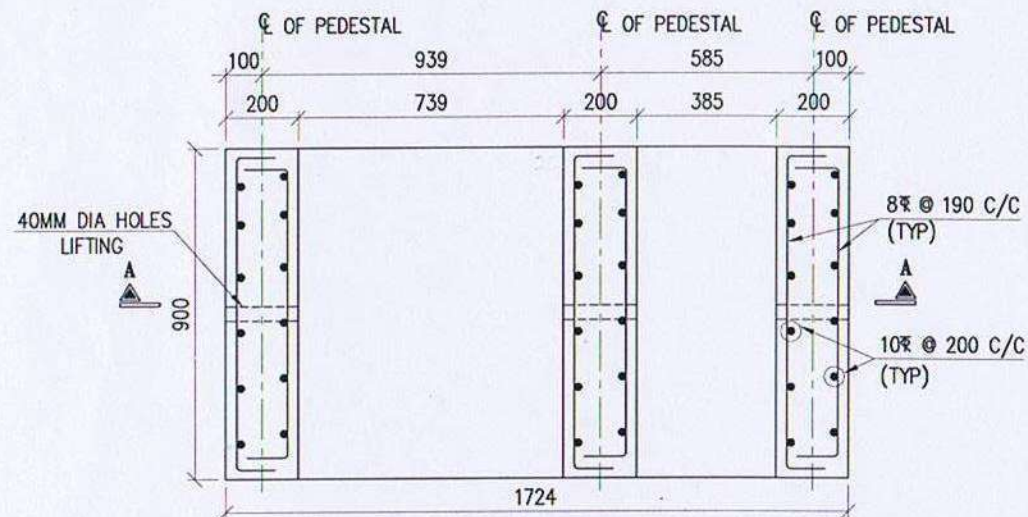
PROJECT NO.	TPD-S-202-C-040
REV.	00
DATE	
SCALE	
NO. OF SHEETS	3 OF 3



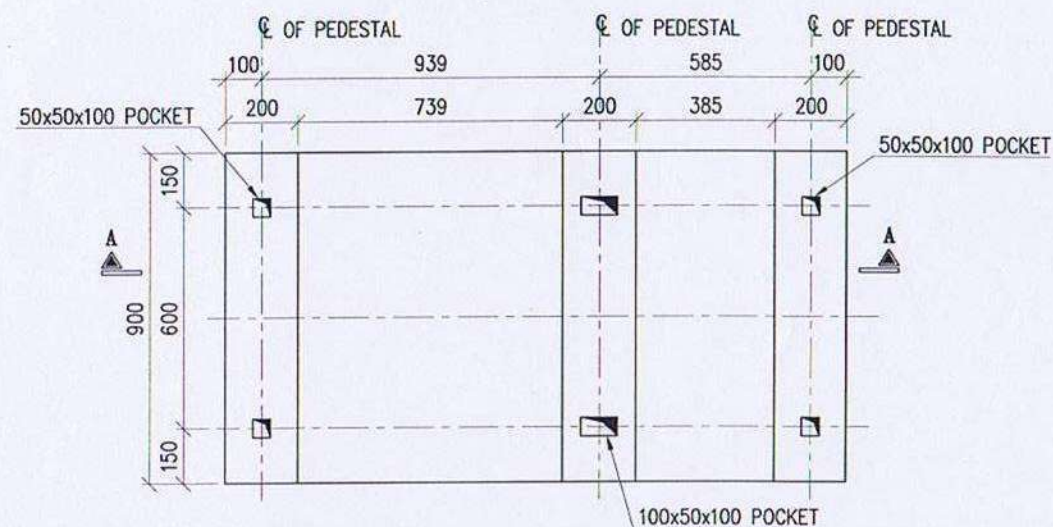
SIDE VIEW A-A



SECTION A-A



RMU (3WAY) WALL PLAN



RMU (3WAY) FOUNDATION PLAN

LEGEND:-

- - CENTER LINE
- FGL - FINISHED GROUND LEVEL
- ☉ - CENTER LINE
- Ld - DEVELOPMENT LENGTH
- TYP - TYPICAL

REINFORCEMENT IS DENOTED AS :
 10ϕ @ 200 C/C
 SPACING OF BAR IN mm
 HYSD BARS CONFORMING TO IS:1786
 DIA OF BAR IN mm

REFERENCE DRAWING:-

1. REFER DRG No. 502-8458-9 OF M/S SIEMENS & APPROVED BY PRDC.
2. REFER DRG No. 502-6934-3 OF M/S SIEMENS.

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. FGL CORRESPONDS TO FINISHED GROUND LEVEL.
3. ALL RCC USED SHALL BE OF GRADE M30 (DESIGN MIX)
4. LEAN CONCRETE SHALL BE OF GRADE 1:3:6 (P.C.C)
5. CLEAR COVER TO REINFORCEMENT SHALL BE = 40MM.
6. THE FOUNDATION SHALL BE PLACED ON COMPACTED EARTH.
7. ALL REINFORCEMENT STEEL SHALL BE HYSD (Fe 500) CONFORMING TO IS:1786/TMT BARS(EQUIVALENT GRADE)
8. LAP ANCHOR LENGTH/DEVELOPMENT LENGTH FOR REINFORCEMENT SHALL BE 50 TIMES THE DIAMETER OF THE BAR.
9. MINIMUM NET SAFE BEARING CAPACITY IS CONSIDERED AS 6 T/sq.m.(min) AT FOUNDING LEVEL.
10. MINOR ADJUSTMENTS MAY BE DONE AT SITE IN CONSULTATION WITH ENGINEER IN-CHARGE

TOTAL QUANTITY = 18Nos.

REV. No	DESCRIPTION	DESIGNED	DRAWN	CHECKED	APPROVED
C	REVISED AS PER EQUIPMENT DETAILS				
B	REVISED AS PER PRDC COMMENTS	TRP 21.07.16	RA 21.07.16	TRP 21.07.16	DA 21.07.16
A	ISSUED FOR APPROVAL	TRP	RA	SV	DA
		TRP 23.03.16	RA 23.03.16	SV 24.03.16	DA 24.03.16

REVISIONS



CLIENT: ODISHA POWER TRANSMISSION CORPORATION LIMITED (OPTCL) CONSULTANT: POWER RESEARCH & DEVELOPMENT CONSULTANTS PVT. LTD. (PRDC)

PROJECT: UNDERGROUND CABLING SYSTEM IN FOUR MAIN LANES AND CONNECTING ROADS OF BHUBANESWAR CITY (SACHIVALAYA MARG, BIDYUT MARG, JANAPATH AND CUTTACK ROAD WITH CONNECTING ROADS RAJAPATH, GOPABANDHU MARG, PATEL MARG) UNDER ADVANCE SCRIPS ON EPC CONTRACT BASIS

SUPPLIER / CONTRACTOR:

JOB No.: 015187-C-SY

TITLE:

DETAIL OF PRECAST 11kV RMU FOUNDATION (3WAY)

SCALE
1:20



SIZE
A3

REV.
C

NAME	SIGN	DATE
TRP	TRP	23.03.16
RA	RA	23.03.16
SV	SV	24.03.16
DA	DA	24.03.16

DRG. No. 015187-C-SY-FN-1028

SHEET 01 OF 04

RELEASED FOR PRELIMINARY TENDER INFORMATION APPROVAL CONSTRUCTION

APPROVED

[Signature]
27.07.16

PROJECT MANAGER
ADVANCE SCRIPS
PRDC, BHUBANESWAR



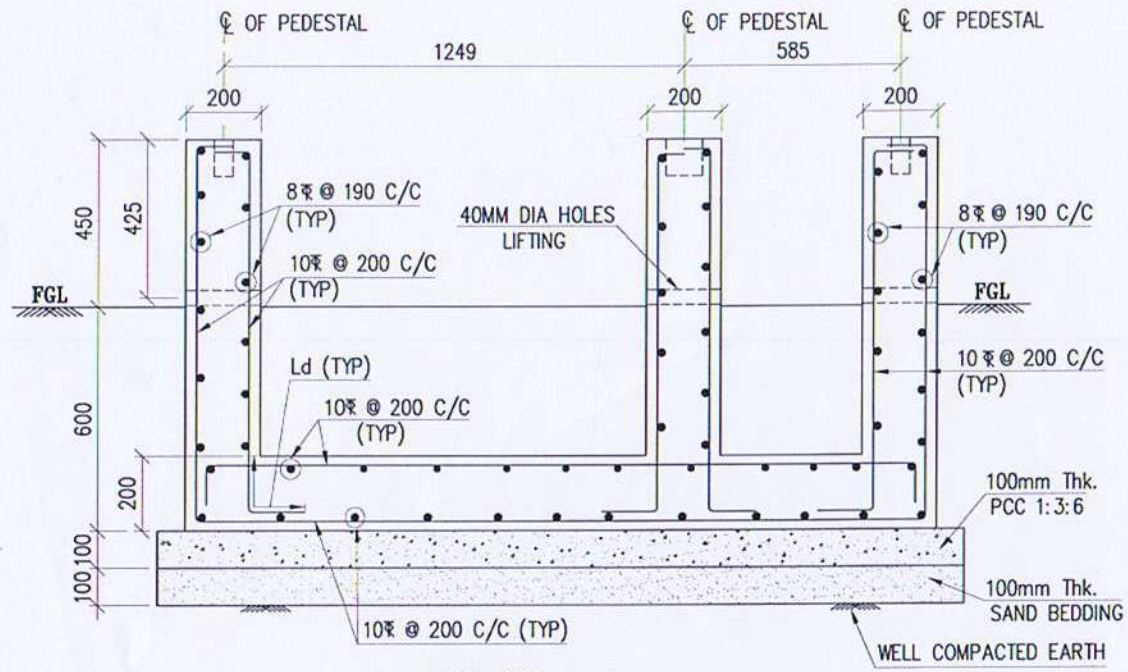
[Signature]
25/8/16

CHECKED BY	SIGN	DATE	CHKD	SV	SV	DATE
ARCHITECTURE	-	-	APPD	DA	DA	24.03.16
CIVIL & STRUCTURAL	-	-				
PLUMBING & SANITARY	-	-				
MECHANICAL	-	-				
ELECTRICAL	-	-				
INSTRUMENTATION	-	-				

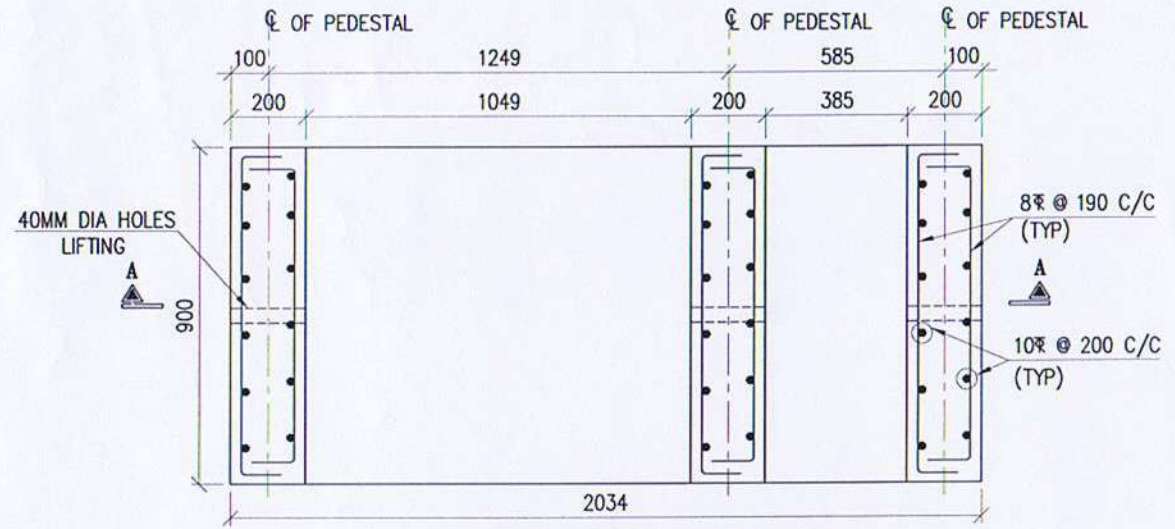
E:\SCRIPS BHUBANESWAR\CIVIL\RMU FOUNDATION\015187-C-SY-FN-1028-01-04-C.dwg This drawing is the property of L&T Construction, Power Transmission & Distribution and must not be passed on to any person or body not authorised by us to receive it nor be copied or otherwise made use either in full or in part by such person or body without our prior permission in writing

E:\SCRIPS BHUBANESWAR\CIVIL\RMU FOUNDATION\015187-C-SY-FN-1028-02-04-C.dwg

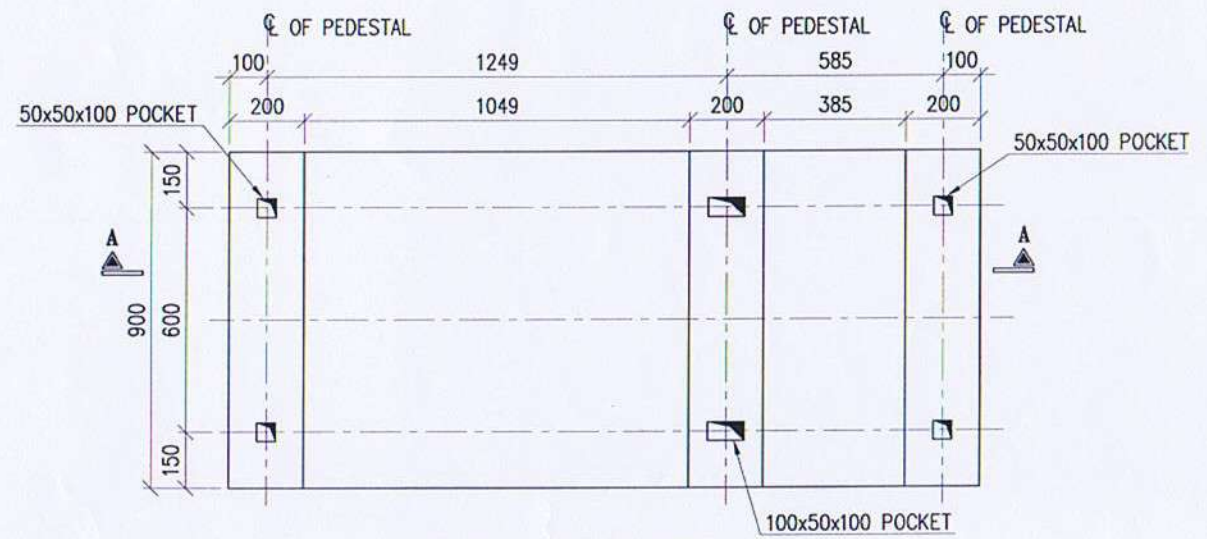
This drawing is the property of L&T Construction, Power Transmission & Distribution and must not be passed on to any person or body not authorised by us to receive it nor be copied or otherwise made use either in full or in part by such person or body without our prior permission in writing



SECTION A-A



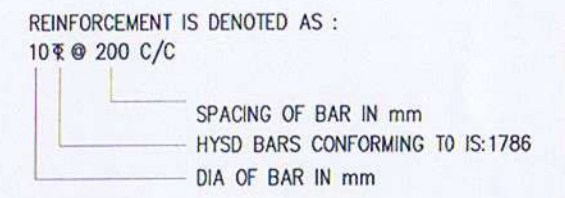
RMU (4WAY) WALL PLAN



RMU (4WAY) FOUNDATION PLAN

LEGEND:-

- - CENTER LINE
- FGL - FINISHED GROUND LEVEL
- ⊕ - CENTER LINE
- Ld - DEVELOPMENT LENGTH
- TYP - TYPICAL



REFERENCE DRAWING:-

1. REFER DRG No. 502-8583-9 OF M/S SIEMENS & APPROVED BY PRDC.
2. REFER DRG No. 502-6953-3 OF M/S SIEMENS.

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. FGL CORRESPONDS TO FINISHED GROUND LEVEL.
3. ALL RCC USED SHALL BE OF GRADE M30 (DESIGN MIX)
4. LEAN CONCRETE SHALL BE OF GRADE 1:3:6 (P.C.C)
5. CLEAR COVER TO REINFORCEMENT SHALL BE = 40MM.
6. THE FOUNDATION SHALL BE PLACED ON COMPACTED EARTH.
7. ALL REINFORCEMENT STEEL SHALL BE HYSD (Fe 500) CONFORMING TO IS:1786/TMT BARS(EQUIVALENT GRADE)
8. LAP ANCHOR LENGTH/DEVELOPMENT LENGTH FOR REINFORCEMENT SHALL BE 50 TIMES THE DIAMETER OF THE BAR.
9. MINIMUM NET SAFE BEARING CAPACITY IS CONSIDERED AS 6 T/sq.m.(min) AT FOUNDING LEVEL.
10. MINOR ADJUSTMENTS MAY BE DONE AT SITE IN CONSULTATION WITH ENGINEER IN-CHARGE

TOTAL QUANTITY = 56Nos.

APPROVED
07.07.16
PROJECT MANAGER
ADVANCE SCRIPS
PRDC, BHUBANESWAR



23/03/16

CHECKED BY	SIGN	DATE
ARCHITECTURE	-	-
CIVIL & STRUCTURAL	-	-
PLUMBING & SANITARY	-	-
MECHANICAL	-	-
ELECTRICAL	-	-
INSTRUMENTATION	-	-

REV. No	DESCRIPTION	DESIGNED	DRAWN	CHECKED	APPROVED
C	REVISED AS PER EQUIPMENT DETAILS				
B	REVISED AS PER PRDC COMMENTS	TRP 21.07.16	RA 21.07.16	TRP 21.07.16	DA 21.07.16
A	ISSUED FOR APPROVAL	TRP 23.03.16	RA 23.03.16	SV 24.03.16	DA 24.03.16

REVISIONS

L&T Construction
Power Transmission & Distribution

CLIENT: ODISHA POWER TRANSMISSION CORPORATION LIMITED (OPTCL) **CONSULTANT:** POWER RESEARCH & DEVELOPMENT CONSULTANTS PVT. LTD. (PRDC)

PROJECT: UNDERGROUND CABLING SYSTEM IN FOUR MAIN LANES AND CONNECTING ROADS OF BHUBANESWAR CITY (SACHIVALAYA MARG, BIDYUT MARG, JANAPATH AND CUTTACK ROAD WITH CONNECTING ROADS RAJAPATH, GOPABANDHU MARG, PATEL MARG) UNDER ADVANCE SCRIPS ON EPC CONTRACT BASIS

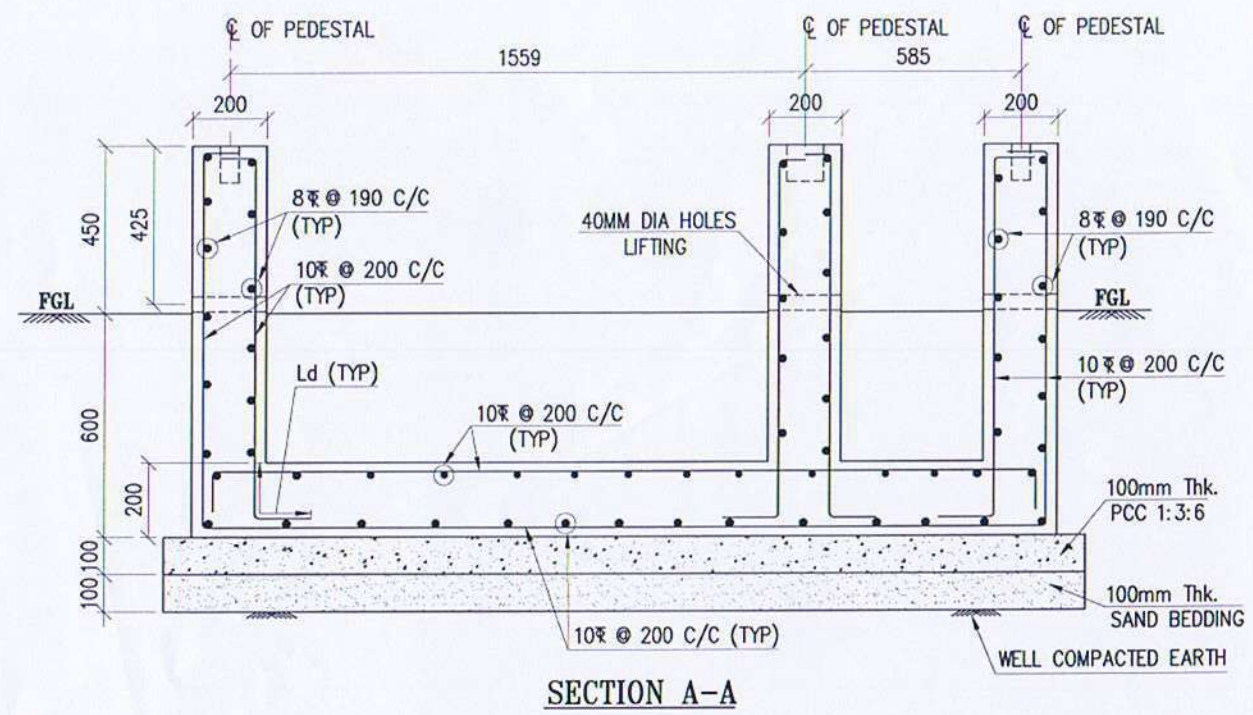
SUPPLIER / CONTRACTOR:		TITLE:		SCALE 1:20
JOB No.: 015187-C-SY		DETAIL OF PRECAST 11kV RMU FOUNDATION (4WAY)		
NAME	SIGN	DATE	PROJECTION 	SIZE A3
DSGN	TRP	23.03.16		
DRWN	RA	23.03.16		
CHKD	SV	24.03.16		
APPD	DA	24.03.16	REV. C	

DRG. No. 015187-C-SY-FN-1028

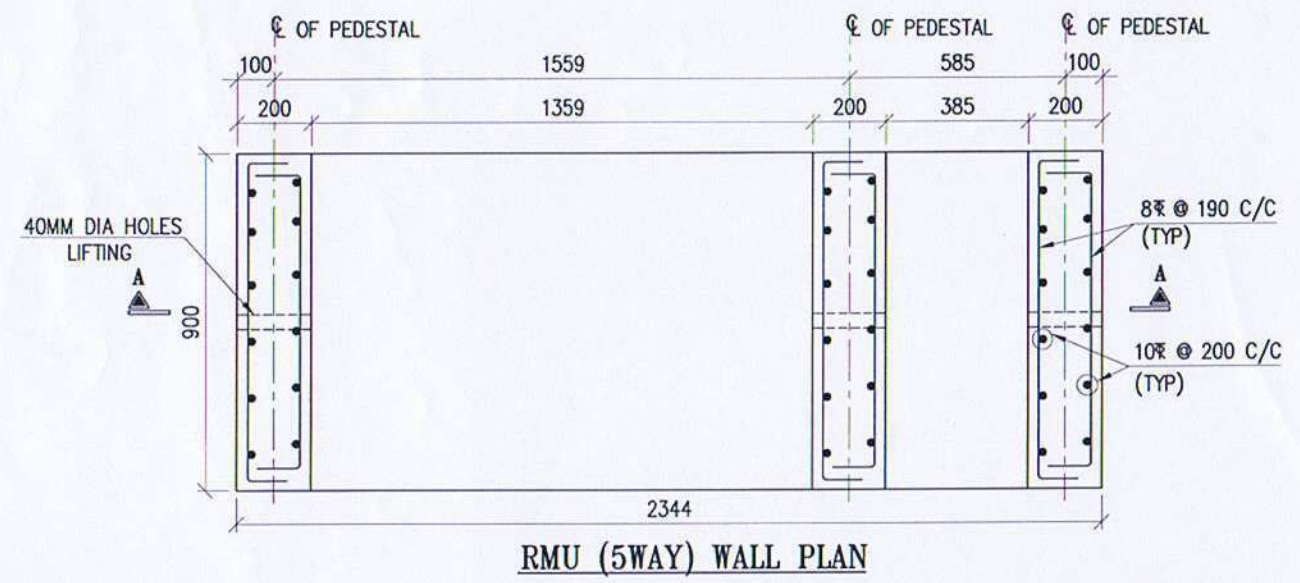
RELEASED FOR PRELIMINARY TENDER INFORMATION APPROVAL CONSTRUCTION

E:\SCRIPS BHUBANESWAR\CIVIL\RMU FOUNDATION\015187-C-SY-FN-1028-03-04-C.dwg

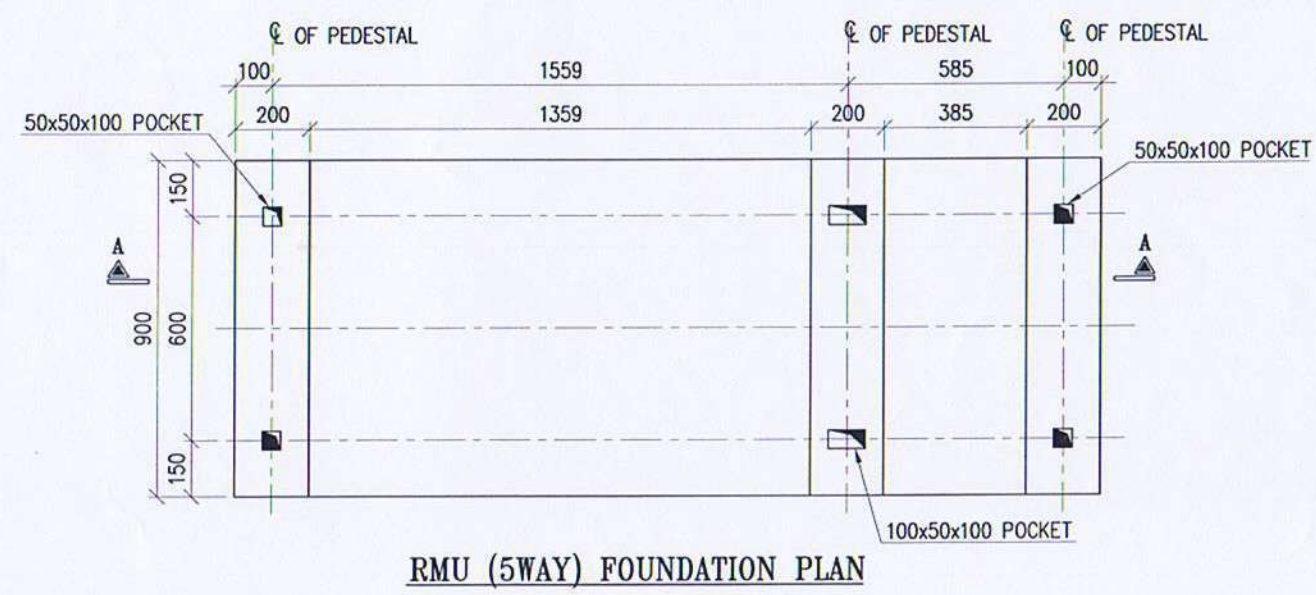
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SECTION A-A



RMU (5WAY) WALL PLAN



RMU (5WAY) FOUNDATION PLAN

LEGEND:-

- — — — — CENTER LINE
- FGL — FINISHED GROUND LEVEL
- ℄ — CENTER LINE
- Ld — DEVELOPMENT LENGTH
- TYP — TYPICAL

REINFORCEMENT IS DENOTED AS :
 10# @ 200 C/C
 SPACING OF BAR IN mm
 HYSD BARS CONFORMING TO IS:1786
 DIA OF BAR IN mm

REFERENCE DRAWING:-

1. REFER DRG No. 502-8462-9 OF M/S SIEMENS & APPROVED BY PRDC.
2. REFER DRG No. 502-6931-3 OF M/S SIEMENS.

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. FGL CORRESPONDS TO FINISHED GROUND LEVEL.
3. ALL RCC USED SHALL BE OF GRADE M30 (DESIGN MIX)
4. LEAN CONCRETE SHALL BE OF GRADE 1:3:6 (P.C.C)
5. CLEAR COVER TO REINFORCEMENT SHALL BE = 40MM.
6. THE FOUNDATION SHALL BE PLACED ON COMPACTED EARTH.
7. ALL REINFORCEMENT STEEL SHALL BE HYSD (Fe 500) CONFORMING TO IS:1786/TMT BARS(EQUIVALENT GRADE)
8. LAP ANCHOR LENGTH/DEVELOPMENT LENGTH FOR REINFORCEMENT SHALL BE 50 TIMES THE DIAMETER OF THE BAR.
9. MINIMUM NET SAFE BEARING CAPACITY IS CONSIDERED AS 6 T/sq.m.(min) AT FOUNDING LEVEL.
10. MINOR ADJUSTMENTS MAY BE DONE AT SITE IN CONSULTATION WITH ENGINEER IN-CHARGE

TOTAL QUANTITY = 29Nos.

APPROVED
[Signature]
 PROJECT MANAGER
 ADVANCE SCRIPS
 PRDC, BHUBANESWAR



CHECKED BY	SIGN	DATE
ARCHITECTURE	-	-
CIVIL & STRUCTURAL	-	-
PLUMBING & SANITARY	-	-
MECHANICAL	-	-
ELECTRICAL	-	-
INSTRUMENTATION	-	-

REV. No	DESCRIPTION	DESIGNED	DRAWN	CHECKED	APPROVED
C	REVISED AS PER EQUIPMENT DETAILS				
B	REVISED AS PER PRDC COMMENTS	TRP 21.07.16	RA 21.07.16	TRP 21.07.16	DA 21.07.16
A	ISSUED FOR APPROVAL	TRP 23.03.16	RA 23.03.16	SV 24.03.16	DA 24.03.16

REVISIONS

L&T Construction
Power Transmission & Distribution

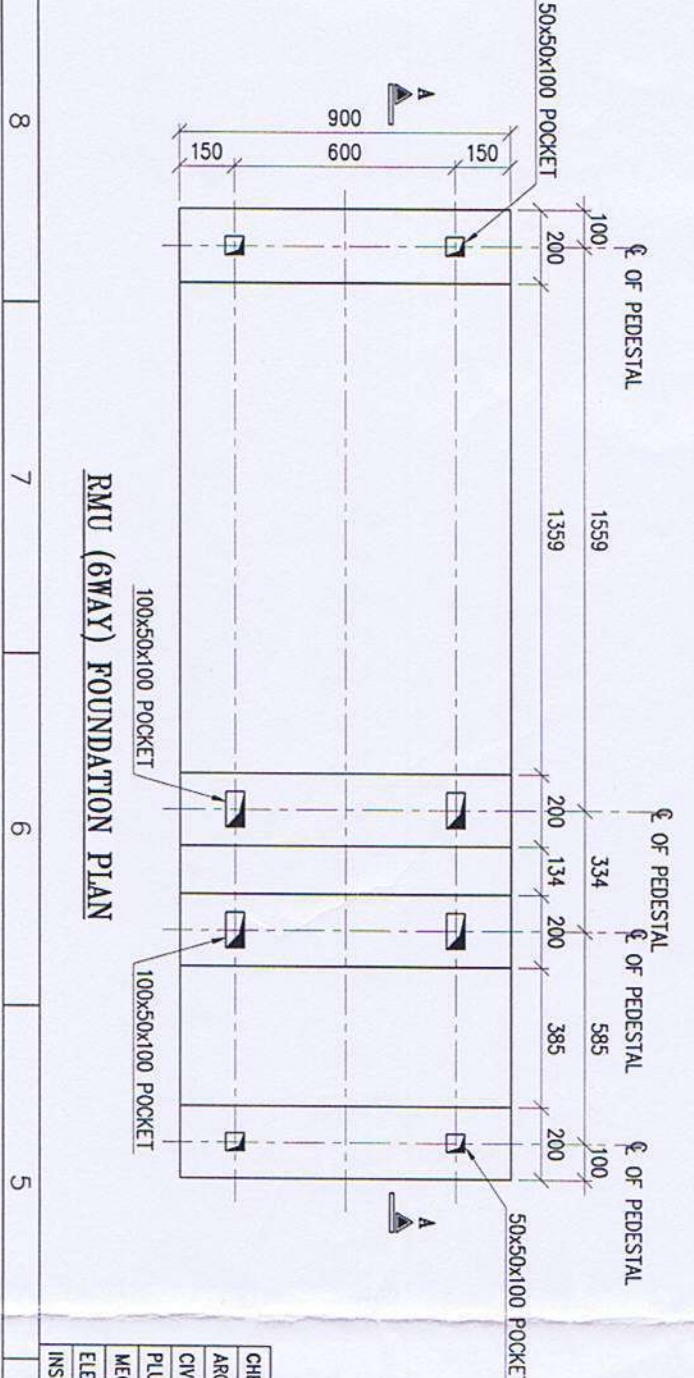
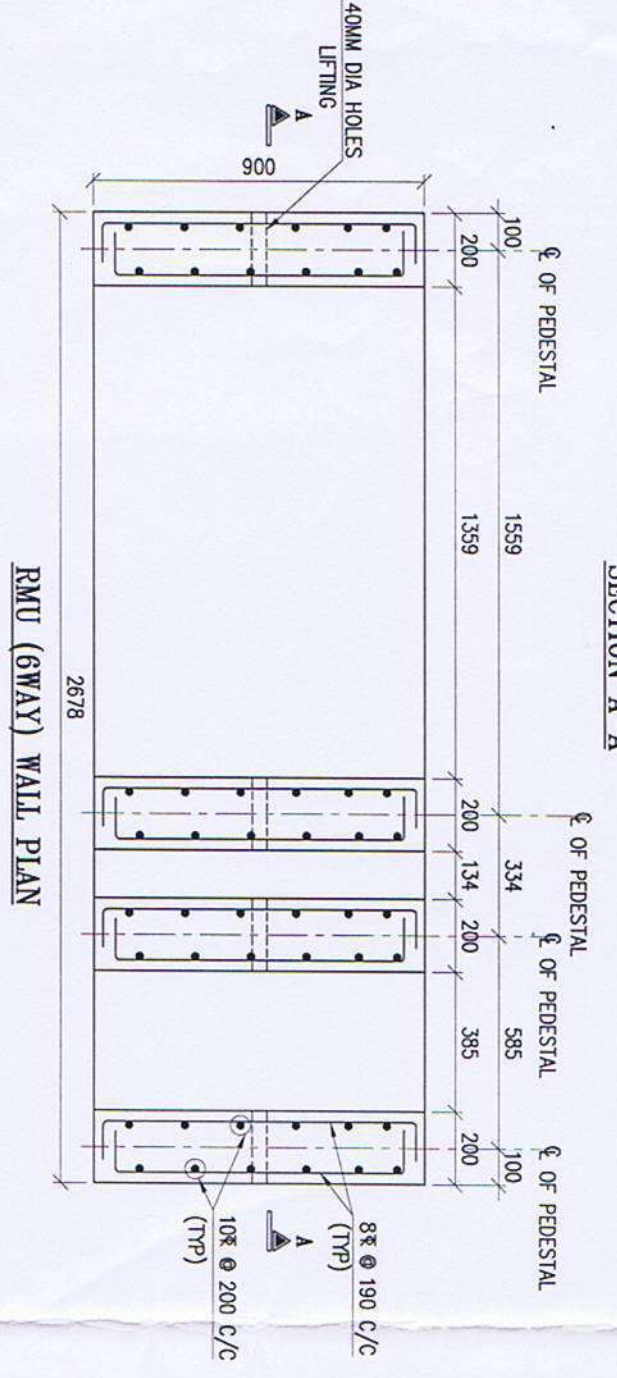
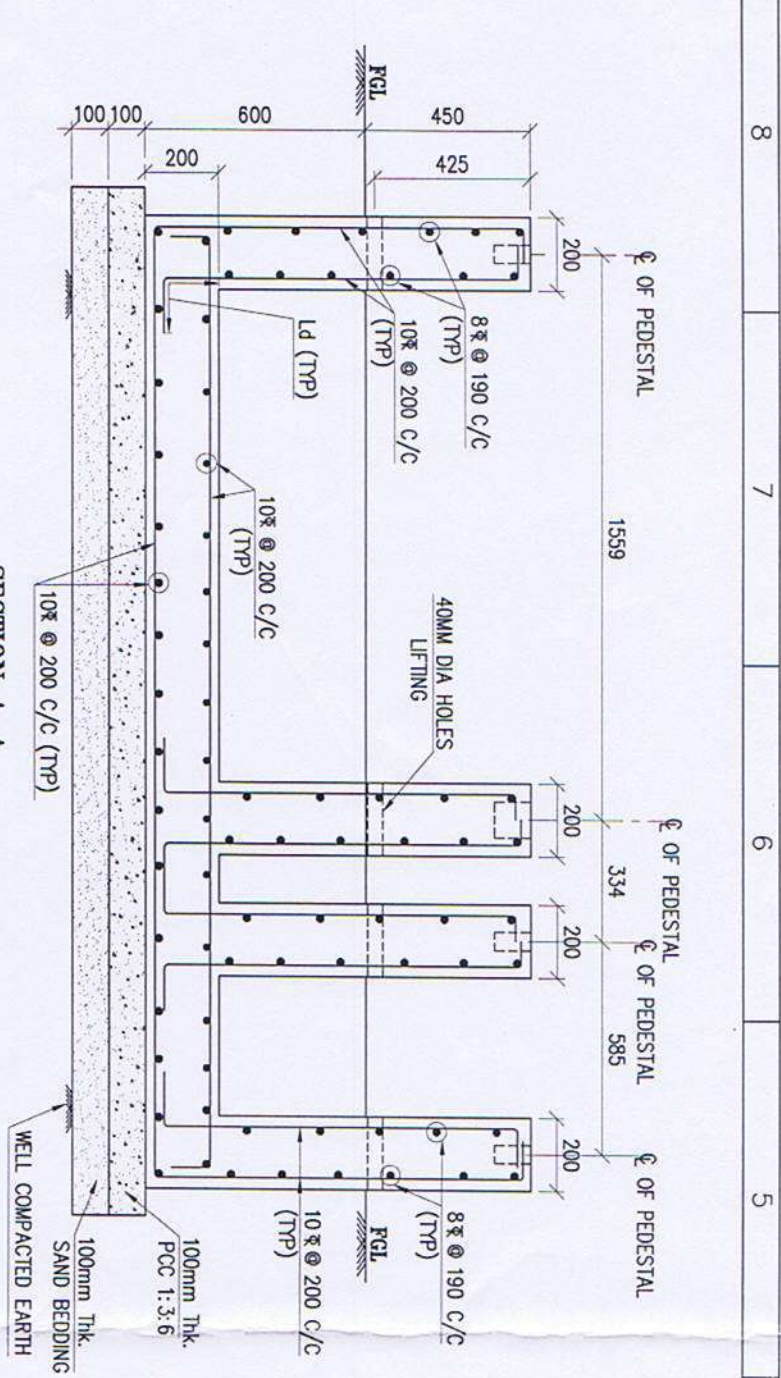
CLIENT: ODISHA POWER TRANSMISSION CORPORATION LIMITED (OPTCL) CONSULTANT: POWER RESEARCH & DEVELOPMENT CONSULTANTS PVT. LTD. (PRDC)

PROJECT: UNDERGROUND CABLING SYSTEM IN FOUR MAIN LANES AND CONNECTING ROADS OF BHUBANESWAR CITY (SACHIVALAYA MARG, BIDYUT MARG, JANAPATH AND CUTTACK ROAD WITH CONNECTING ROADS RAJAPATH, GOPABANDHU MARG, PATEL MARG) UNDER ADVANCE SCRIPS ON EPC CONTRACT BASIS

SUPPLIER / CONTRACTOR:		TITLE:		SCALE:
JOB No.: 015187-C-SY		DETAIL OF PRECAST 11KV RMU FOUNDATION (5WAY)		1:20
NAME	SIGN	DATE	PROJECTION	
DSGN	TRP	TRP 23.03.16		
DRWN	RA	RA 23.03.16		
CHKD	SV	SV 24.03.16		
APPD	DA	DA 24.03.16	SIZE	REV.
DRG. No. 015187-C-SY-FN-1028			A3	C

RELEASED FOR	<input type="checkbox"/> PRELIMINARY	<input type="checkbox"/> TENDER	<input type="checkbox"/> INFORMATION	<input checked="" type="checkbox"/> APPROVAL	<input type="checkbox"/> CONSTRUCTION
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APPROVED
 PROJECT MANAGER
 ADVANCE SCRIPS
 PRDC, BHUBANESWAR



(Handwritten signature)
 23/03/16

LEGEND:-

- CENTER LINE
- FINISHED GROUND LEVEL
- CENTER LINE
- DEVELOPMENT LENGTH
- TYPICAL

REINFORCEMENT IS DENOTED AS :
 10Ø200 C/C

SPACING OF BAR IN mm
 HYSD BARS CONFORMING TO IS:1786
 DIA OF BAR IN mm

REFERENCE DRAWING:-

- REFER DRG No. 502-8703-9 OF M/S SIEMENS & APPROVED BY PRDC.

NOTES:-

- ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
- FGL CORRESPONDS TO FINISHED GROUND LEVEL.
- ALL RCC USED SHALL BE OF GRADE M30 (DESIGN MIX)
- LEAN CONCRETE SHALL BE OF GRADE 1:3:6 (P.C.C)
- CLEAR COVER TO REINFORCEMENT SHALL BE = 40MM.
- THE FOUNDATION SHALL BE PLACED ON COMPACTED EARTH.
- ALL REINFORCEMENT STEEL SHALL BE HYSD (Fe 500) CONFORMING TO IS:1786/TMT BARS(EQUIVALENT GRADE)
- LAP ANCHOR LENGTH/DEVELOPMENT LENGTH FOR REINFORCEMENT SHALL BE 50 TIMES THE DIAMETER OF THE BAR.
- MINIMUM NET SAFE BEARING CAPACITY IS CONSIDERED AS 6 T/sqm.(min) AT FOUNDING LEVEL.
- MINOR ADJUSTMENTS MAY BE DONE AT SITE IN CONSULTATION WITH ENGINEER IN-CHARGE

TOTAL QUANTITY = 2Nos.

REV No	DESCRIPTION	DESIGNED	DRAWN	CHECKED	APPROVED
C	REVISED AS PER EQUIPMENT DETAILS				
B	REVISED AS PER PRDC COMMENTS				
A	ISSUED FOR APPROVAL				



CLIENT : ODISHA POWER TRANSMISSION CORPORATION LIMITED (OPTCL)
 CONSULTANT : ADVANCE SCRIPS POWER RESEARCH & DEVELOPMENT CONSULTANTS PVT. LTD. (PRDC)

PROJECT : UNDERGROUND CABLING SYSTEM IN FOUR MAIN LANES AND CONNECTING ROADS OF BHUBANESWAR CITY (SACHIVALAYA MARG, BIDYUT MARG, JANAPATH AND CUTTACK ROAD WITH CONNECTING ROADS RAJAPATH,GOPABANDHU MARG , PATEL MARG) UNDER ADVANCE SCRIPS ON EPC CONTRACT BASIS

SUPPLIER/CONTRACTOR :
 JOB No. : 015187-C-SY
 TITLE :
 DETAIL OF PRECAST 11KV
 RMU FOUNDATION (6WAY)

CHKD	SV	SV	DA	DATE
DA	SV	SV	DA	24.03.16
DA	SV	SV	DA	24.03.16
DA	SV	SV	DA	24.03.16

DRG. No. 015187-C-SY

RELEASED FOR: PRELIMINARY TENDER INFORMATION APPROVAL CONSTRUCTION

SCALE: 1:20

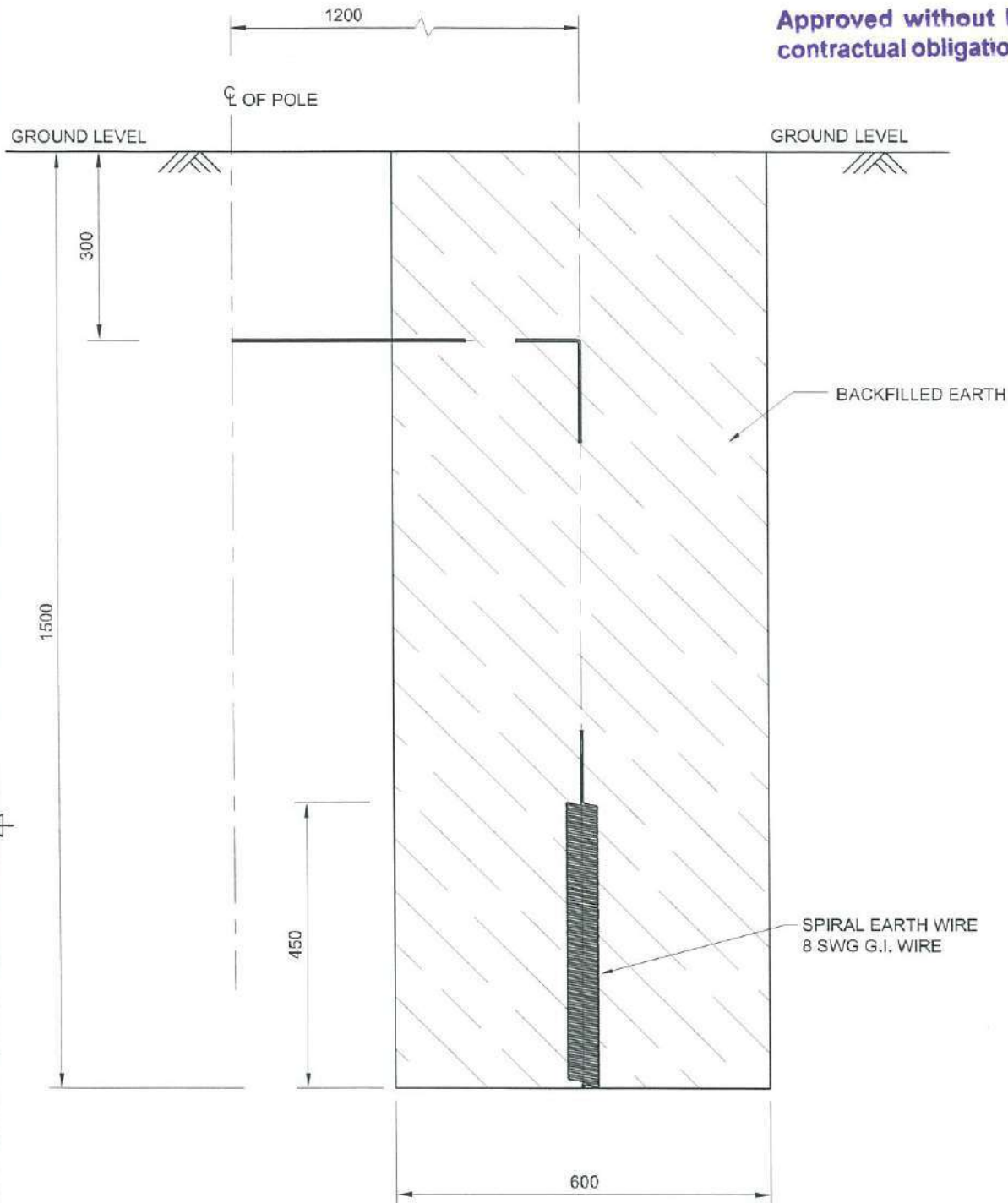
PROJECTION:

SIZE: A3

REV: C

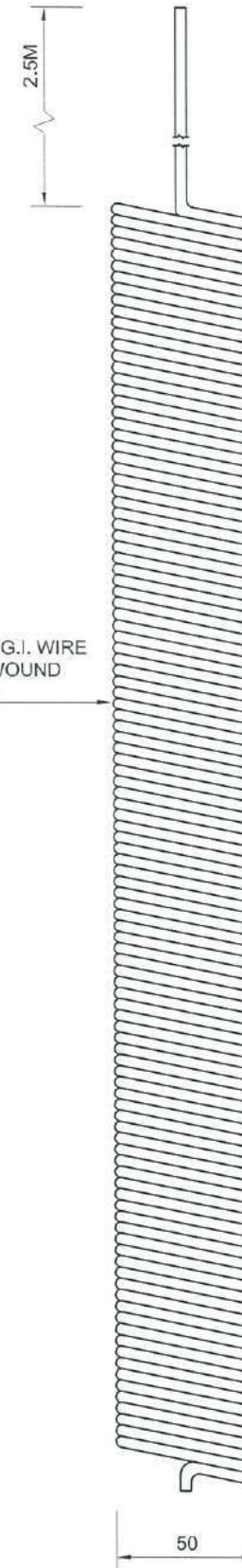
SHEET 04 OF 04

Approved without Prejudice to contractual obligation & liabilities



COIL EARTHING DETAIL
(SCALE-1:10)

NO. 8 SWG G.I. WIRE
CLOSELY WOUND
115 TURNS.






SPIRAL EARTH WIRE (COIL)
(SCALE-1:2.5)

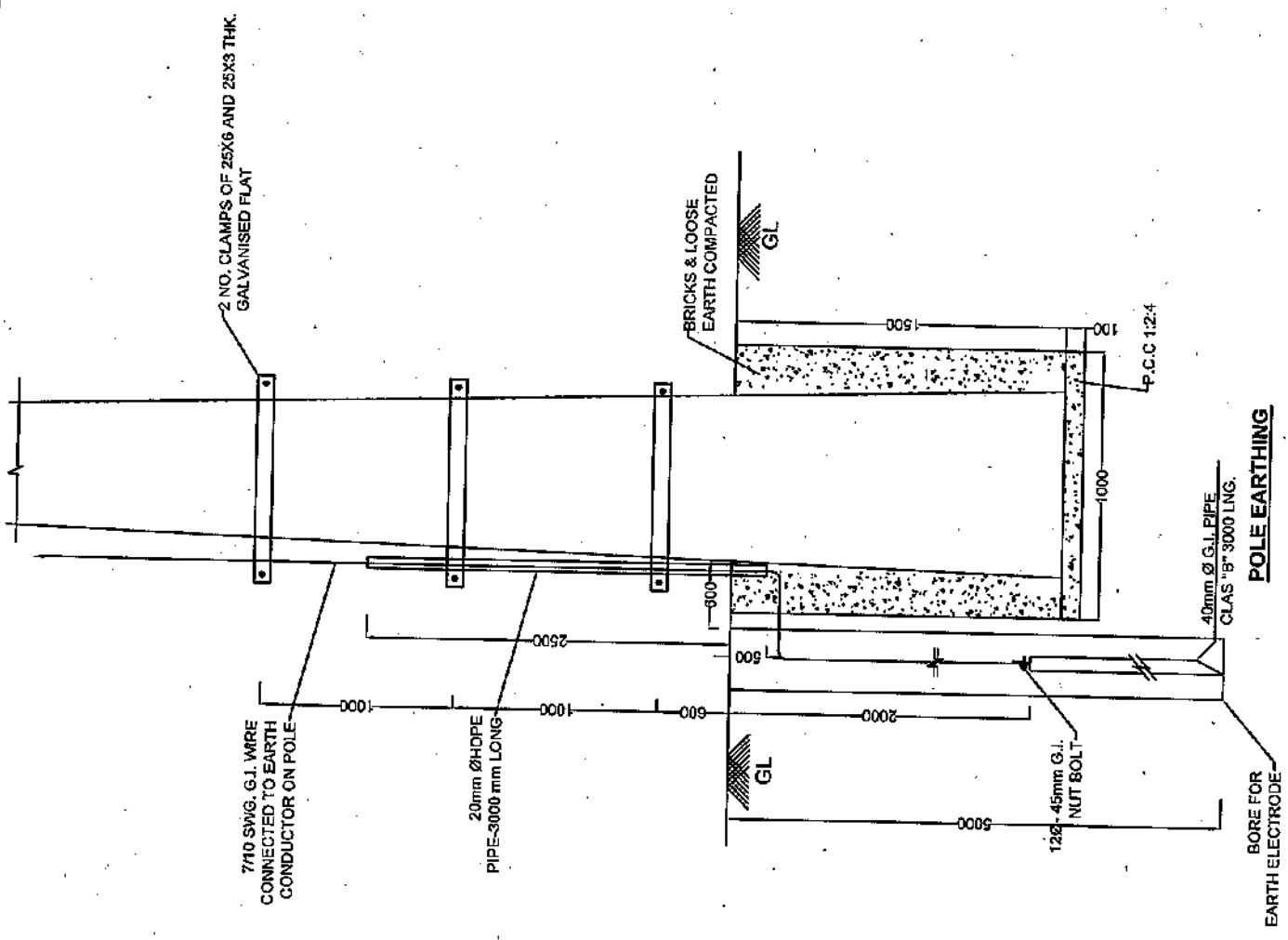
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. G.I. WIRE USED FOR EARTHING SHALL CONFORM TO RELEVANT I.S. AND REC SPECIFICATION.
3. WEIGHT OF EARTHING COIL WILL BE 1.85 Kg (approx).
4. MANUFACTURING TOLERANCE:
 UPTO 50 mm - $\pm 5\%$
 51 TO 100 mm - $\pm 4\%$
 101 TO 300 mm - $\pm 3\%$
 ABOVE 300 mm - $\pm 2\%$
5. IN ROCKY AREAS WHERE DIGGING UPTO 1500 mm IS NOT POSSIBLE, EARTHING ARRANGEMENT IN HORIZONTAL CONFIGURATION BURIED AT A DEPTH NOT LRSS THAN 800 mm SHALL BE USED.
6. WEIGHT MENTIONED IS FOR PACKING & FORWARDING PURPOSE ONLY.

STATUS:
11.04.2017-REVISION 0 ISSUED FOR APPROVAL

REV.NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
PROJECT		ELECTRICATION WORKS IN SOUTHCO UTILITY OF ODISHA UNDER INTEGRATED POWER DEVELOPMENT SCHEME (PKG.- 03)			
LOA NO.		OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/SUPPLY- 42 DATED 25.10.2016. OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/ERECTION - 43 DATED 25.10.2016.			
CLIENT	 ODISHA POWER TRANSMISSION CORPORATION LIMITED				
PMA	 केन्द्रीय विद्युत अनुसंधान संस्थान Central Power Research Institute				
CONTRACTOR	 STERLING AND WILSON PVT. LTD., KOLKATA				
DRAWN		TKC	SIGN	DATE	GENERAL ARRANGMENT OF COIL EARTHING.
CHECKED		RNB		11.04.17	
APPROVED		ABC		11.04.17	
				SCALE: AS NOTED	
CONTRACTOR DRG. NO.: K2016EL004A-06-DRG-036					SHEET REV.
DRG. NO.: IPDS/CESU/S&W/LINE/LT/036					01 OF 01 0
					DRG. SIZE- A3


 Project Consultant
 Cum
 Co-ordinator
 Central Power Research Institute
 Camp:-Bhubaneswar
 22.5.17



2 NO. CLAMPS OF 25X6 AND 25X3 THK GALVANISED FLAT

7/10 SWG. G.I. WIRE CONNECTED TO EARTH CONDUCTOR ON POLE

20mm Ø HDPE PIPE-3000mm LONG

BRICKS & LOOSE EARTH COMPACTED

GL

GL

122-45mm G.I. NUT BOLT

40mm Ø G.I. PIPE CLAS "B" 3000 LNG.

POLE EARTHING

BORE FOR EARTH ELECTRODE

P.C.C 1:2:4

NOTES

1. All dimensions are in mm and the drawing is not in scale
2. The cleat type clamp for holding earthwire at 1000mm interval (typ.) to be provided.
3. Drawing for clamps to be submitted for TPDIL approval.
4. The ohmic resistance of the earth should not exceed 5 ohms for LT poles

REFERENCES

1. REFER CODE IS:3043-1987 AND THEB HANDBOOK FOR EARTHING DESIGN.
2. REFER IS:4759, 1993 FOR GALVANISATION REQUIREMENT FOR STRUCTURAL STEEL.
3. REFER IS:1367, PART XIII, 1983 FOR GALVANISED COATINGS ON BOLTS, NUTS AND WASHERS.
4. REFER IS:2633, 1986 FOR UNIFORMITY OF ZINC COATING.
5. REFER IS:4894-1995 FOR HDPE PIPE.
6. MIN. VALUE OF ZINC COATING FOR STRUCTURAL STEEL SHALL BE 610 g/m sq. AND 275 g/m sq. FOR NUTS, BOLTS AND WASHERS.

REV.	NO.	DESCRIPTION	DATE	BY	APPD.	REMARKS
04.01.13	1	20mm G.I. pipe changed to HDPE pipe				
12.08.05	2	Issued with specification				



TATA POWER DELHI DISTRIBUTION LIMITED
 (A TATA POWER AND DELHI CORPORATION JOINT VENTURE)
 WIND AND SOLAR DIVISION, SUBSTATION, SUBCUT LINES
 EXTENSIVE CARE, INDIA-110008

PROJECT
 TITLE: EARTHING

DESIGN
 DRAWING NO. TPO-5-232-E-001

SCALE
 1:1

DATE
 01

This Drawing and any information or descriptive matter set out herein is a confidential property of TPDIL and must not be disclosed, loaned, copied, or used for manufacturing, tendering or any other purpose without written permission.



EPP COMPOSITES PVT LTD.

GUARANTEED TECHNICAL PARTICULARS OF FRP FENCING

Project: FRP Fencing for 11KV Distribution Sub Station in TPCODL area

CLIENT :- Tata Power Central Odisha Distribution Limited

Contractor:- M/s EPP Composites Pvt. Ltd.

LOI. No. :- TPCODL/P&S /54/2020-21/03

DATE :- 12/10/2020

Doc No. :-

Sr.No.	Particulars	Detailed Particulars	Offered
1 ✓	Manufacturer Name	EPP Composites Pvt. Ltd.	EPP Composite Pvt. Ltd.
2 ✓	Material	FRP	Confirm
3 ✓	Properties of Material of Construction of FRP fencing.	FRP Pultruded Section UV & Fire Resistant conforming to specification as per IS 6746	Required.
4 ✓	Total dimensions of FRP Fencing	i. Width	2400 mm
		ii. Length	3000 mm
		iii. Height	2050 mm
5 ✓	Glass Content	60%	Confirm
6 ✓	Resin Content	40%	Confirm
7 ✓	Density	1.8 to 2.1 gm/cm ³	Confirm
8 ✓	Water Absorption	0.6% Max	Confirm
9 ✓	Impact Strength	45 KJ/m ²	Confirm
10 ✓	Tensile Strength	206 MPa	Confirm
11 ✓	Flexural Strength	210 MPa	Confirm
12 ✓	Modulus of Elasticity	12x10 ³ to 15x10 ³ MPa	Confirm
13 ✓	Power Arc Resistance	120 sec. Min	Confirm
14 ✓	Dielectric strength at 90°C in oil kV/mm	25kV/inch	Confirm

Confirm as per site
Confirm ✓
Required ✓
Confirm ✓

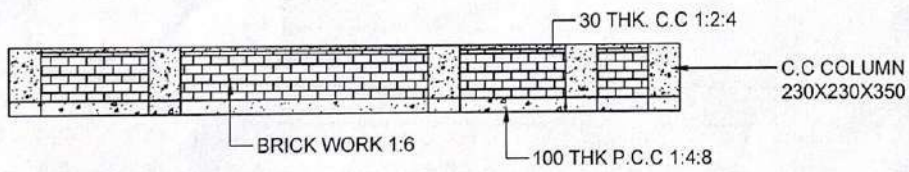
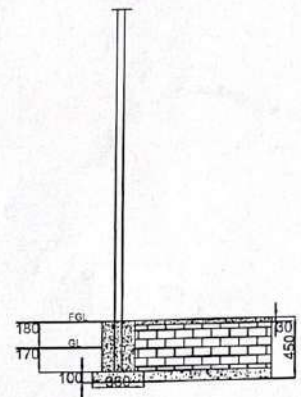
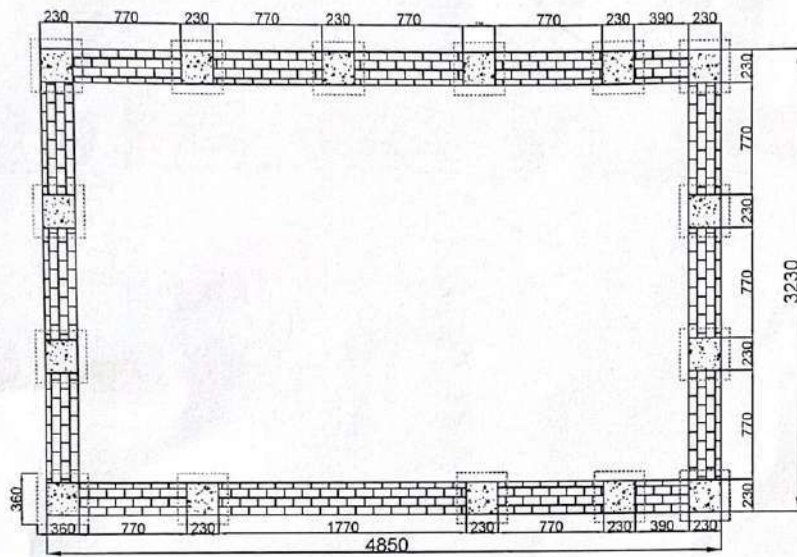
Note: Installation supervision to be provided for all fencing work/installation.

15	✓	Heat Distortion Temperature	125°C Min	Confirm
16	✓	Oxygen Index	23% Min	Confirm
17		Material type test certificate	* type test certificate should not be older than 5 years as on the date of tender opening	Confirm
18		Foundation drawing details	* Provided	Confirm
19		Name Plate	Name plate with P.O. no. & date to be provided on door	Confirm
20		Colour of Sections	Brilliant Blue (RAL 5007)	Confirm - Blue.
21		Sides Sections with 2.4 m length	Side of 2.4 m length should have three sections	Confirm
22		Grouting pipes	The grouting pipes load bearing should have stopper arrangement for fixing in the civil work	Confirm
23		Fluorescent tape permanent type	on all side of frame	Required.
Components of Fencing -				
1		FRP Picket	Flat 35 x 5 mm	Confirm
2		Box Section (Hollow Square Section)	50.8 x 50.8 x 3.175 mm	Confirm
3		Sub Frame Rec. Section	50.8 x 25.4 x 3.175 mm	Confirm
4		Rail - FRP Notch & Groove Bar	12 mm dia	Confirm
5		Hinges	SS304.	Confirm
6		Door Stopper	SS	Confirm
7		Name Plate	FRP	Confirm
8		TPCODL Logo	Painted on FRP surface	Confirm
9		Danger Board	MS plate of 250x200 mm	Confirm
10		Fasteners	SS304	Confirm

22/10/2020
 9 MEO
 S. S. Sam

One FRP Based fencing to be installed as prototype at TPCODL side, for after quality evaluation, further decision would be taken.

FOR NORMAL SOIL

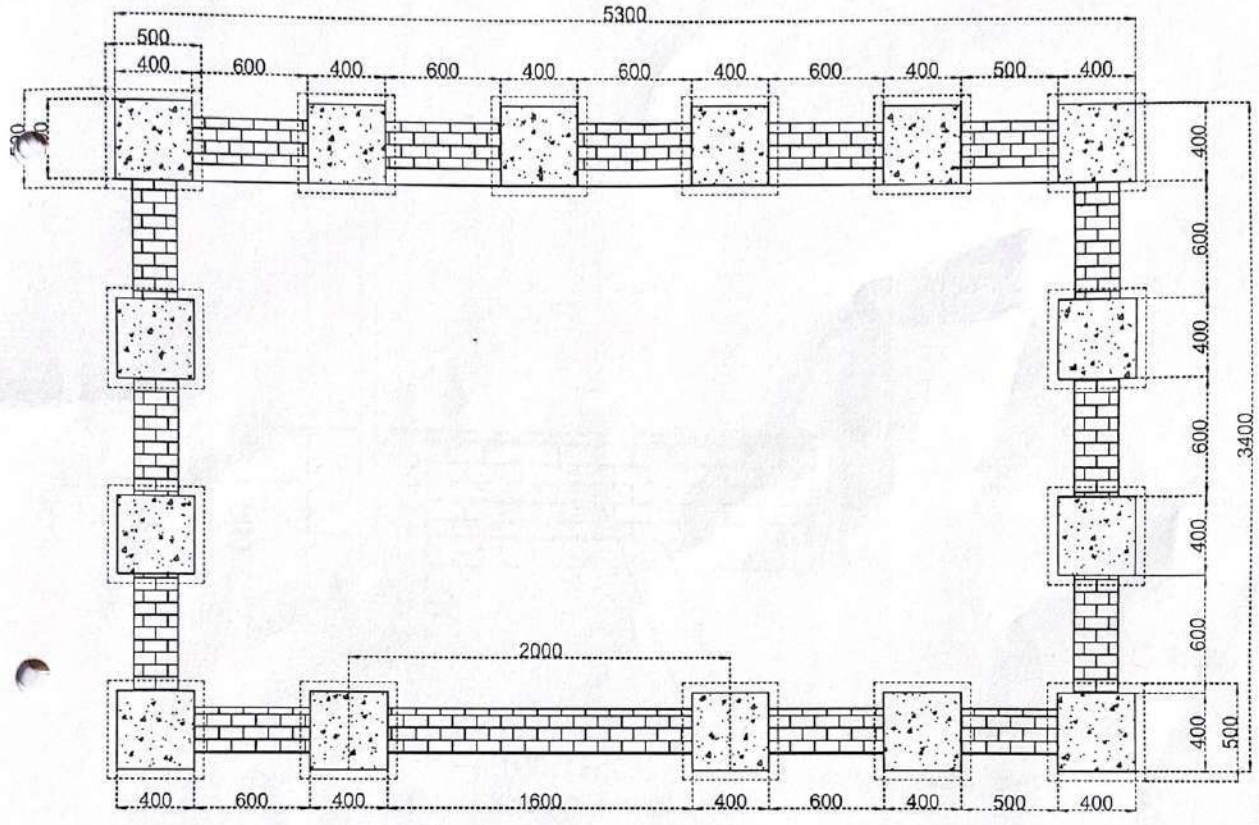


OK.

[Signature]

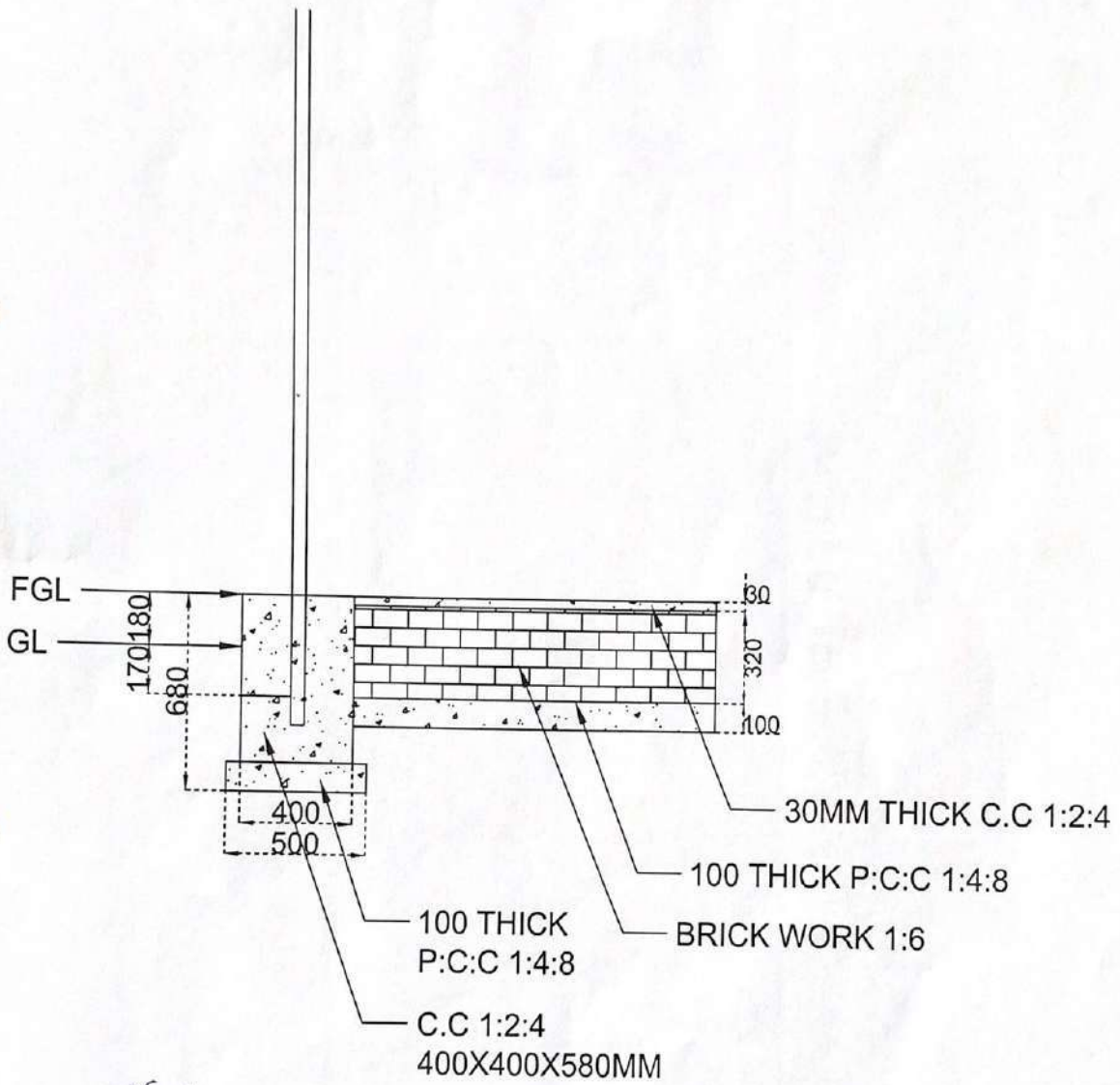
A.B. Pradhan
TPC/DL

FOR SANDY SOIL



OK.
G.B. Pradhan,
TPCODL

SECTION OF FOUNDATION PLAN
(SANDY SOIL)



OK.

[Signature]
G. B. Pradhan
TPCOOL

TPC/CODL/TP&S/54/2020-21/02

250

TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

CUSTOMER NAME :-
~~CONTRACTOR NAME~~

LOI NO. :- TPCODL/P&S/54/2020-21/02

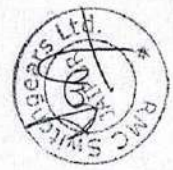
MANUFACTURER NAME :- RMC SWITCHGEARS LTD.

Property of T P COAL
(Restricted Area)



YOTI :- MONTH/YEAR

200



NAME PLATE

TOLERANCE: ± 0.25	
PAGE NO. 05	TOTAL PAGE NO. 07
PO. NO. : LOA NO. TPCODL/P&S/54/2020-21/02	UTILITY BOARD : TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.
SIGN & DATE	
MATERIAL FRP	
WT.	REV.00
DATE	SCALE
DATE	N.T.S.
DATE	LAST INSTRUCTION
DATE	MAKER
DATE	ORIGINAL
DATE	DRG. No.: RMC/FRP/FENCING/736-5
DATE	PROJECT DETAILS : SUPPLY & INSTALLATION OF FRP FENCING
DATE	TITLE : FRP FENCING FOR DISTRIBUTION SUBSTATION
DATE	ITEM CODE:
DATE	CUSTOMER : TATA POWER
DATE	SIZE: A4
DATE	MODIFICATION: NEW

YOTI 7 YEAR OF INSTALLATION

Regd. Off. : Gram - Berozoya, Taluka - Choudhary, District - Bhubaneswar, Odisha.
Tata Road - Bhubaneswar - 751029



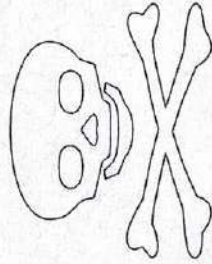
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200

DANGER

415

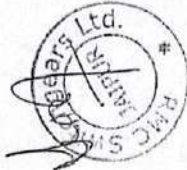
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VOLTS

बोल्ट

खतरा



DANGER BOARD

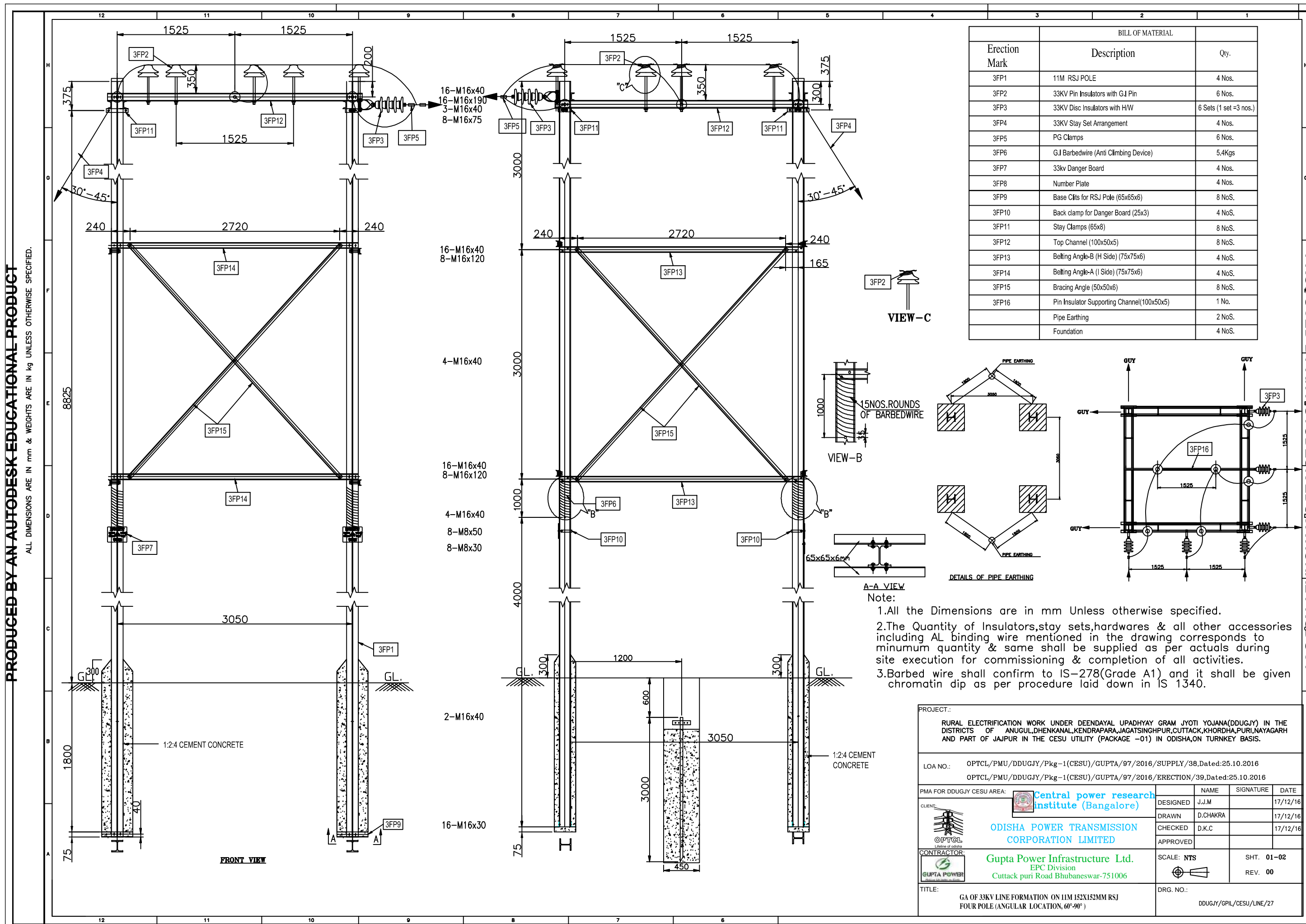
△	PO. NO. : LOA NO. TPOODL/P&S/5+/2020-21/02	TOLERANCE: ± 5%
	JUNITY BOARD : TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	PAGE NO. 06
	TITLE : FRP FENCING FOR DISTRIBUTION SUBSTATION	TOTAL PAGE NO. 07
	PROJECT DETAILS : SUPPLY & INSTALLATION OF FRP FENCING	MATERIAL: FRP
	DRG No.: RMC/FRP/FENCING/736-6	WT.
		REV. NO
		DATE
		SCALE
		KEY INSTRUCTION
		N.T.S.

DATE	SIGN.
DRN. BY. 03.10.20	L.S.
CRD. BY.	
APPD. BY.	
MODEL: FRP FENCING	
CUSTOMER : TATA POWER	
SIZE: As MODIFICATION: NEW	

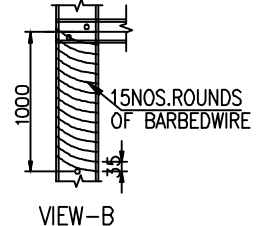
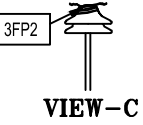
REDA OF Odisha Rajadhyaya Takshak Chikitsa,
Ward No. 02, Bhubaneswar, Odisha-751004.
Tata Power - July 27 2020



ITEM CODE:



BILL OF MATERIAL		
Erection Mark	Description	Qty.
3FP1	11M RSJ POLE	4 Nos.
3FP2	33KV Pin Insulators with G.I Pin	6 Nos.
3FP3	33KV Disc Insulators with HW	6 Sets (1 set =3 nos.)
3FP4	33KV Stay Set Arrangement	4 Nos.
3FP5	PG Clamps	6 Nos.
3FP6	G.I Barbedwire (Anti Climbing Device)	5.4Kgs
3FP7	33kv Danger Board	4 Nos.
3FP8	Number Plate	4 Nos.
3FP9	Base Clts for RSJ Pole (65x65x6)	8 NoS.
3FP10	Back clamp for Danger Board (25x3)	4 NoS.
3FP11	Stay Clamps (65x8)	8 NoS.
3FP12	Top Channel (100x50x5)	8 NoS.
3FP13	Beltting Angle-B (H Side) (75x75x6)	4 NoS.
3FP14	Beltting Angle-A (I Side) (75x75x6)	4 NoS.
3FP15	Bracing Angle (50x50x6)	8 NoS.
3FP16	Pin Insulator Supporting Channel(100x50x5)	1 No.
	Pipe Earthing	2 NoS.
	Foundation	4 NoS.



A-A VIEW
Note:

- 1.All the Dimensions are in mm Unless otherwise specified.
- 2.The Quantity of Insulators,stay sets,hardwares & all other accessories including AL binding wire mentioned in the drawing corresponds to minimum quantity & same shall be supplied as per actuals during site execution for commissioning & completion of all activities.
- 3.Barbed wire shall confirm to IS-278(Grade A1) and it shall be given chromatin dip as per procedure laid down in IS 1340.

PROJECT:
RURAL ELECTRIFICATION WORK UNDER DEENDAYAL UPADHYAY GRAM JYOTI YOJANA(DDUGJY) IN THE DISTRICTS OF ANUGUL,DHENKANAL,KENDRAPARA,JAGATSinghpur,CUTTACK,KHORDHA,PURI,NAYAGARH AND PART OF JAJPUR IN THE CESU UTILITY (PACKAGE -01) IN ODISHA,ON TURNKEY BASIS.

LOA NO.: OPTCL/PMU/DDUGJY/Pkg-1(CESU)/GUPTA/97/2016/SUPPLY/38,Dated:25.10.2016
OPTCL/PMU/DDUGJY/Pkg-1(CESU)/GUPTA/97/2016/ERECTION/39,Dated:25.10.2016

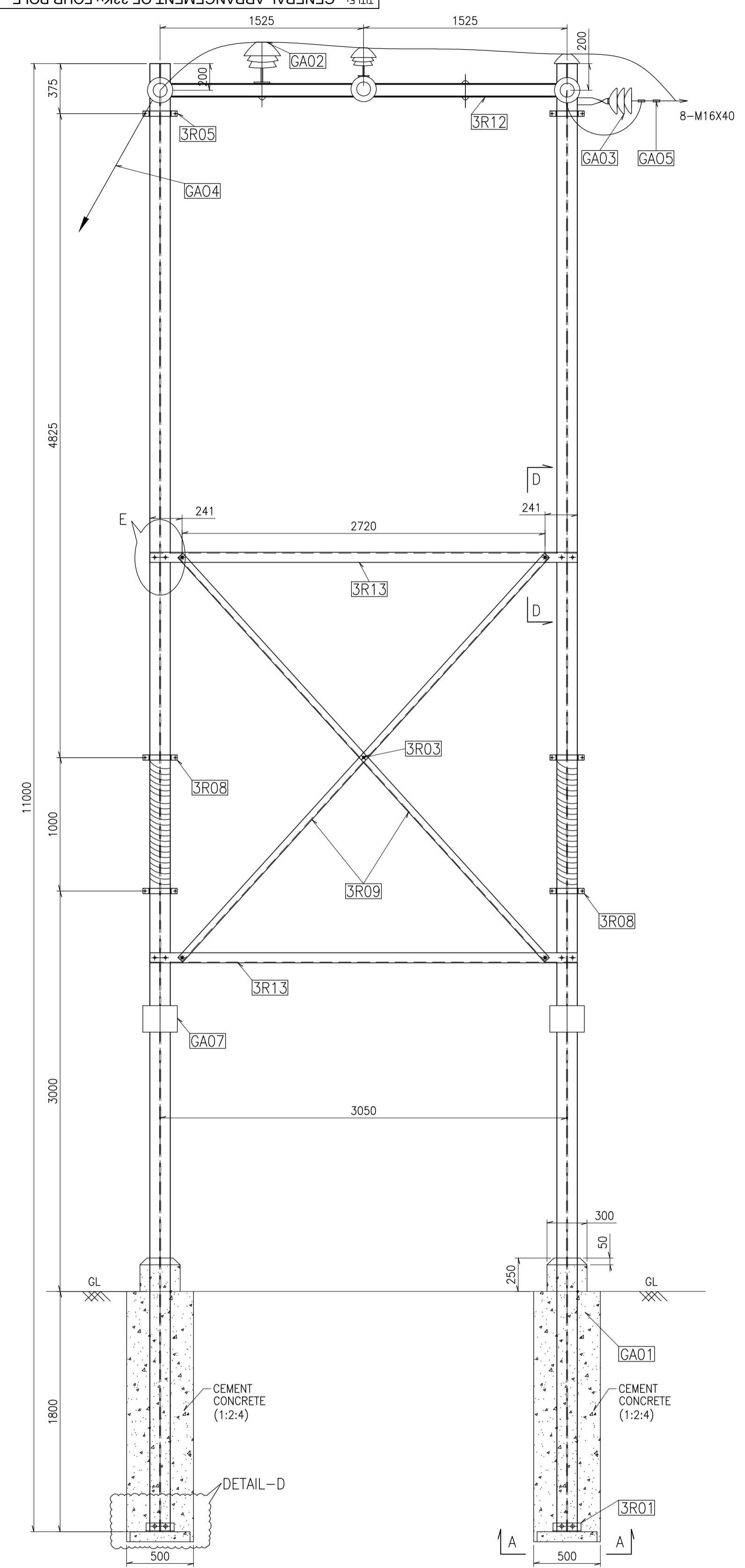
DESIGNED	NAME	SIGNATURE	DATE
J.J.M			17/12/16
D.CHAKRA			17/12/16
D.K.C			17/12/16

CONTRACTOR: **Gupta Power Infrastructure Ltd.**
EPC Division
Cuttack puri Road Bhubaneswar-751006

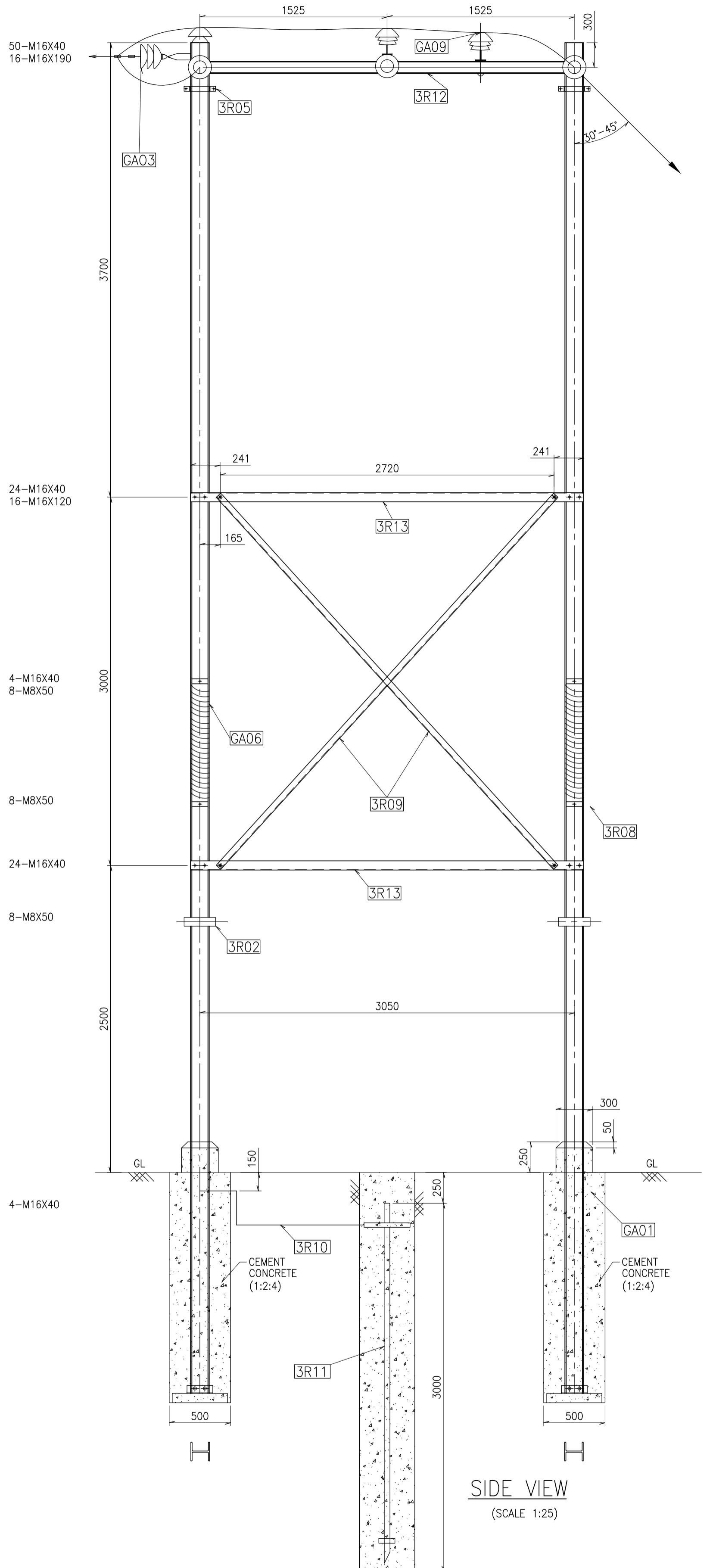
SCALE: NTS
SHT. 01-02
REV. 00

TITLE: GA OF 33KV LINE FORMATION ON 11M 152X152MM RSJ
FOUR POLE (ANGULAR LOCATION, 60°-90°)

DRG. NO.: DDUGJY/GPIL/CESU/LINE/27



FRONT VIEW
(SCALE 1:25)



SIDE VIEW
(SCALE 1:25)

LEGENDS

NIL

NOTES

- FOR NOTES REFER SHT.2 OF 3.
- FOR PART DETAILS REFER SHT.2 OF 3 & SHT 3 OF 3

REDRAW FROM DWG. NO.
IPDS/CESU/S&W/LINE/33KV/014, SH 01 OF 03,
REV-2, DATE: 27.06.2017

DO NOT SCALE PRELIMINARY
TPC0DL TP CENTRAL ODISHA DISTRIBUTION LIMITED
TP CENTRAL ODISHA DISTRIBUTION LIMITED

GENERAL ARRANGEMENT OF 33kv FOUR POLE STRUCTURE WITH 11m GI RS JOIST

SHEET 01 OF 03
TATA CONSULTING ENGINEERS LIMITED MUMBAI

FOR RO ISSUE ONLY			ISSUE	REVISIONS	DRN	CLEARED				APPD	DATE	ISSUE	REVISIONS	DRN	CLEARED				APPD	DATE		
DISC.	SIGNATURE	DATE				CIVIL	ELEC	I&C	MECH						CIVIL	ELEC	I&C	MECH				
1																						

FILE NAME :
TP (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK AT THE TOP RIGHT HAND CORNER OF THE TITLE BLOCK.
CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.
INFORMATION CONTAINED WITHIN 'HOLD' IS NOT RELEASED FOR CONSTRUCTION/ FABRICATION. FIELD MUST GET DESIGN OFFICE TO 'CLEAR' 'HOLD' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION/FABRICATION WORK RELATED TO 'HOLDS'.

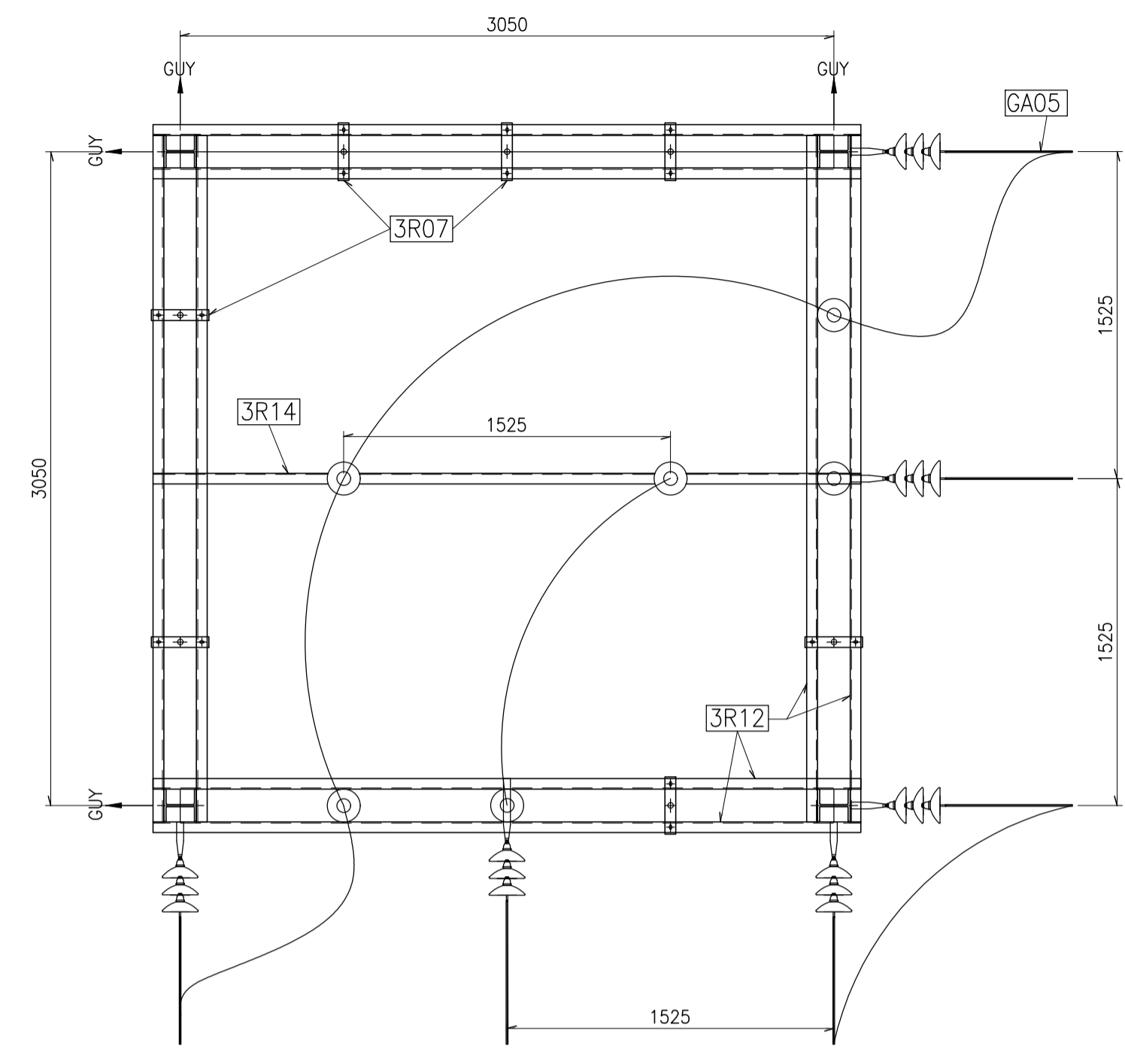
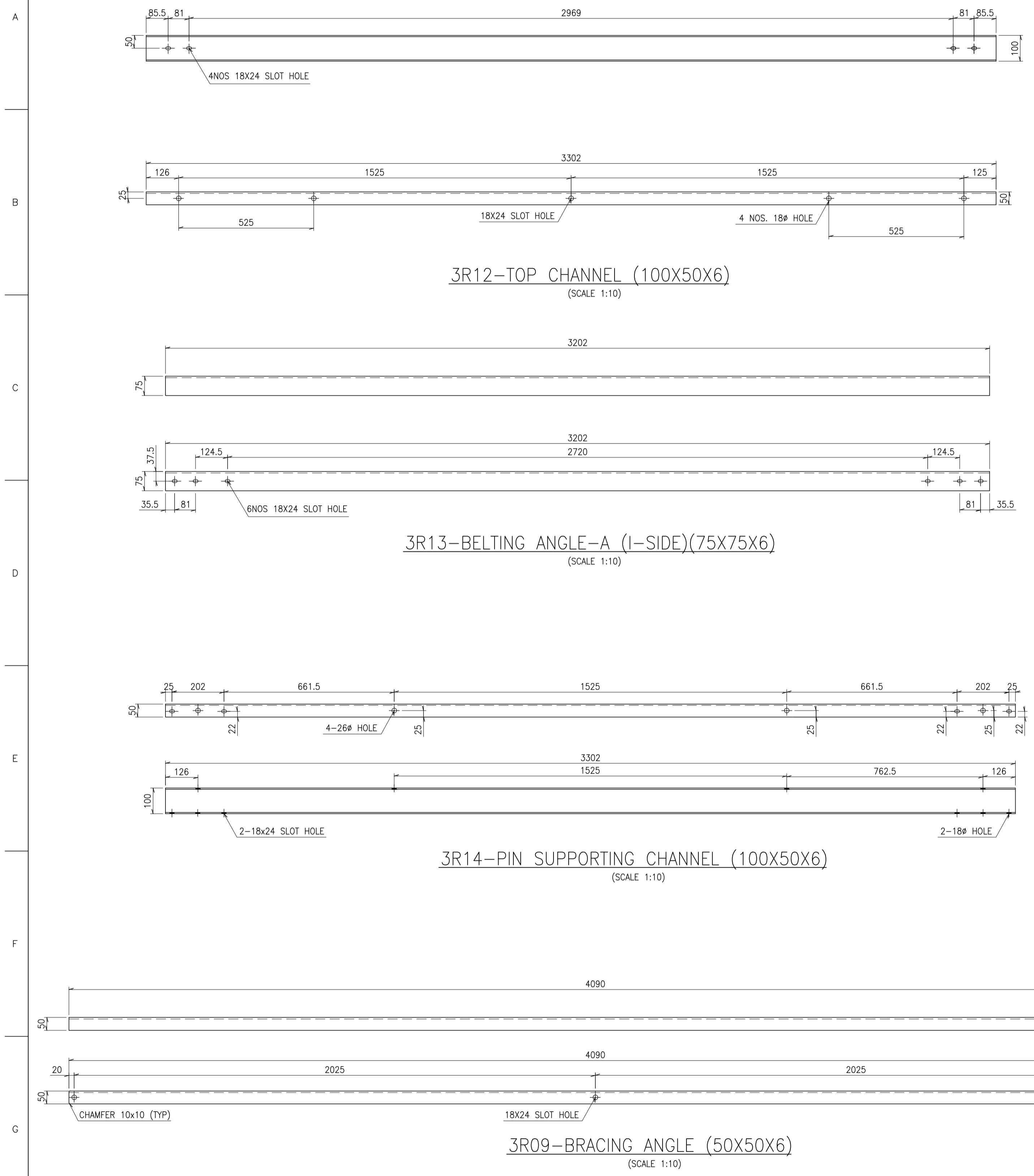
SCALE: AS SHOWN APPROVED DATE (RO ISSUE) 24/03/2021
 DEL.CENTRE-DISC-EL DATE (CURRENT ISSUE) 24/03/2021
 DRN: RF
 CHD: SS DWG NO TCE ISSUE -

LEGENDS

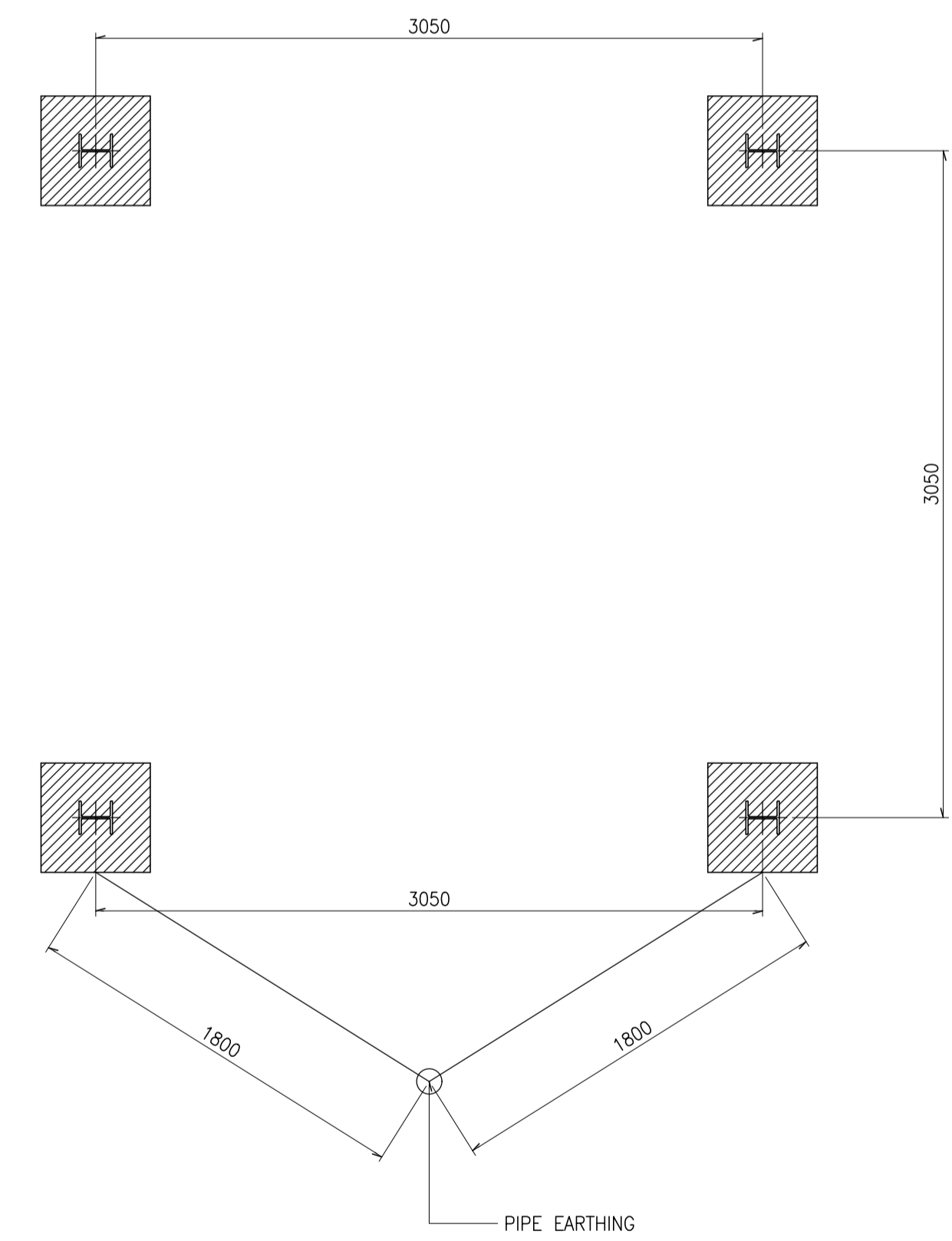
NIL

NOTES

- ALL DIMENSIONS ARE IN mm OTHERWISE SPECIFIED.
- THE QUALITY OF INSULATORS, STAY, HARDWARES & ALL OTHER ACCESSORIES INCLUDING AL. BINDING WIRE MENTIONED IN THE DRAWING CORRESPONDING TO MINIMUM QUANTITY & SAME WILL BE SUPPLIED AS PER ACTUAL REQUIREMENT FOR COMPLETION OF WORK.
- BARBED WIRE SHALL CONFORM TO IS-278 (GRADE A1).
- ALL CHANNELS, ANGLES, PLATES, & CLAMP WILL BE HOT DIP GALVANIZED AS PER IS-2629/1985 & 4759 FOR COASTAL AREA AND MILD STEEL FOR NON-COASTAL AREA.
- THE INSULATORS WILL BE PORCELAIN TYPE FOR COASTAL AREA AND POLYMER TYPE FOR NON-COASTAL AREA AS PER BOQ SL. NO. A-7.
- INSULATORS AND FIXING HOLES SHOWN IN THIS DRAWING ARE BASED ON DIMENSION OF SIMILAR ITEM. THIS DRAWING WILL BE REVISED, IF REQUIRED, AFTER RECEIPT OF PROJECT SPECIFIC INSULATOR DRAWINGS.
- IN ELEPHANT CORRIDOR IN ADDITION TO ANTICLIMBING DEVICE SPIKE CLAMP WILL BE PROVIDED.
- RSJ AND ALL STRUCTURAL ITEMS WILL BE OF GI FOR COASTAL AREA, AND MILD STEEL FOR NON-COASTAL AREA.
- POLE NUMBERING WILL BE PAINTED AT SITE.
- THE DRG. HAS BEEN PREPARED IN LINE WITH BOQ. AND TECHNICAL MEETING MOM DATED 13.12.2016.



TOP VIEW
 (SCALE 1:25)



DETAILS OF PIPE EARTHING
 (SCALE 1:25)

REDRAW FROM DWG. NO. IPDS/CESU/S&W/LINE/33KV/014, SH 02 OF 03, REV-2, DATE: 27.06.2017

DO NOT SCALE PRELIMINARY
TPC0DL TP CENTRAL ODISHA DISTRIBUTION LIMITED

GENERAL ARRANGEMENT OF 33kv FOUR POLE STRUCTURE WITH 11m GI RS JOIST
 SHEET 02 OF 03

TATA CONSULTING ENGINEERS LIMITED
 MUMBAI

FOR RO ISSUE ONLY			ISSUE	REVISIONS	DRN	CLEARED				APPD	DATE	ISSUE	REVISIONS	DRN	CLEARED				APPD	DATE	
DISC.	SIGNATURE	DATE				CIVIL	ELEC	I&C	MECH						CIVIL	ELEC	I&C	MECH			
1																					
2																					
3																					
4																					
5																					
6																					
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8																					
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10																					
11																					
12																					

FILE NAME :
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SCALE: AS SHOWN	APPROVED	DATE (NO ISSUE) 24/03/2021
DEL.CENTRE-DISC.EL		DATE (CURRENT ISSUE) 24/03/2021
DRN: RF		
CHD: SS	DWG NO. TCE.....	ISSUE -

GENERAL ARRANGEMENT OF 33KV FOUR POLE STRUCTURE WITH 11m GI RS JOIST
 DWG NO. TCE

**BOM FOR
 (GENERAL ARRANGEMENT OF 33 KV FOUR POLE STRUCTURE WITH 11m GI RS JOIST)
 (STERLING AND WILSON PVT.LTD.KOLKATA)
 (DWG NO.(IPDS/CESU/S&W/LINE/33KV/014))**

WEIGHT OF PARTS

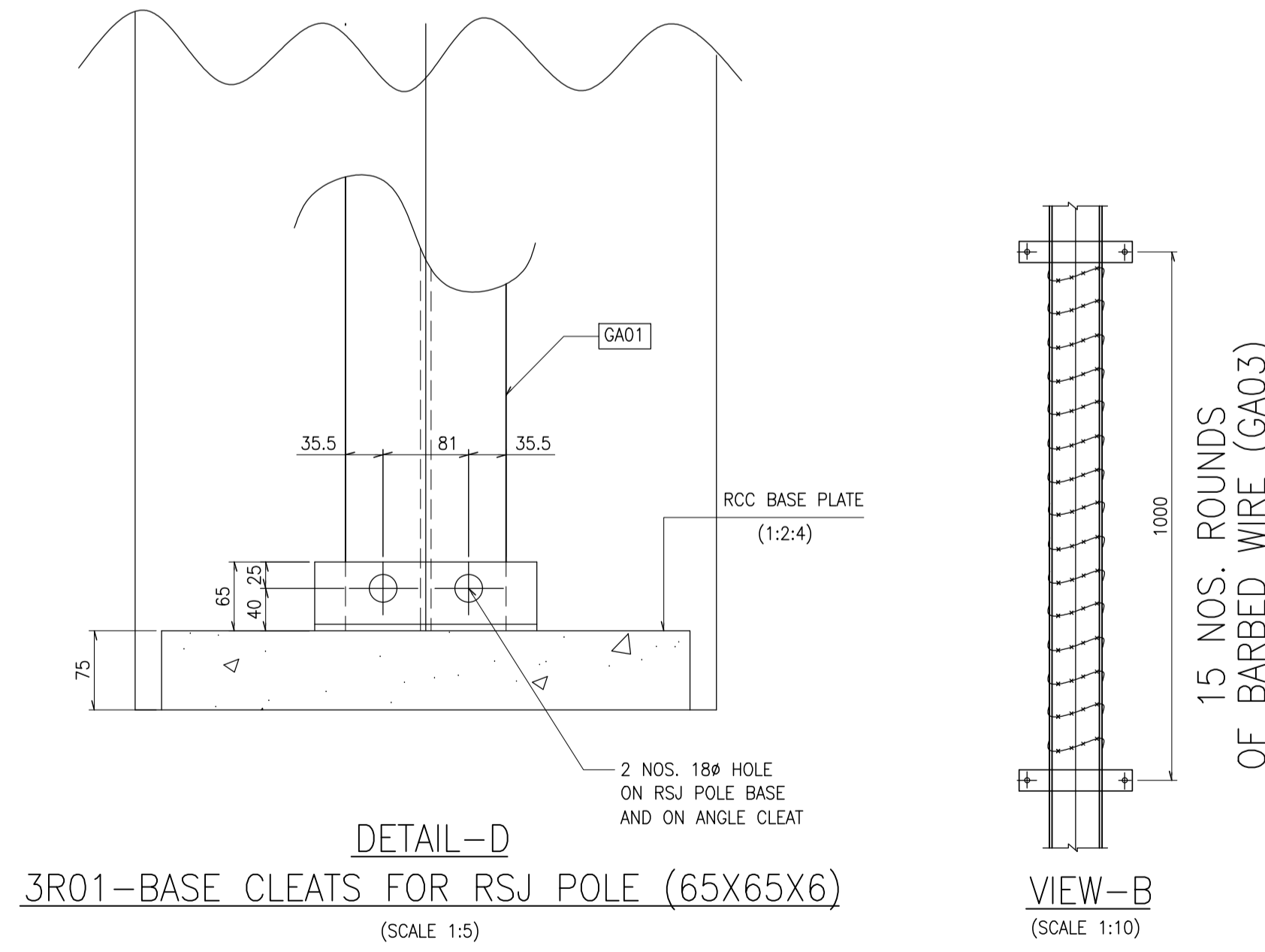
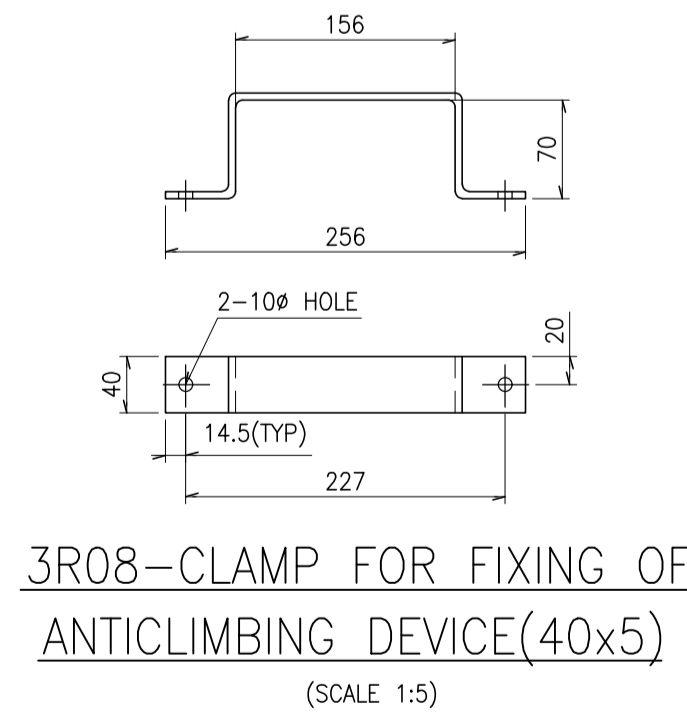
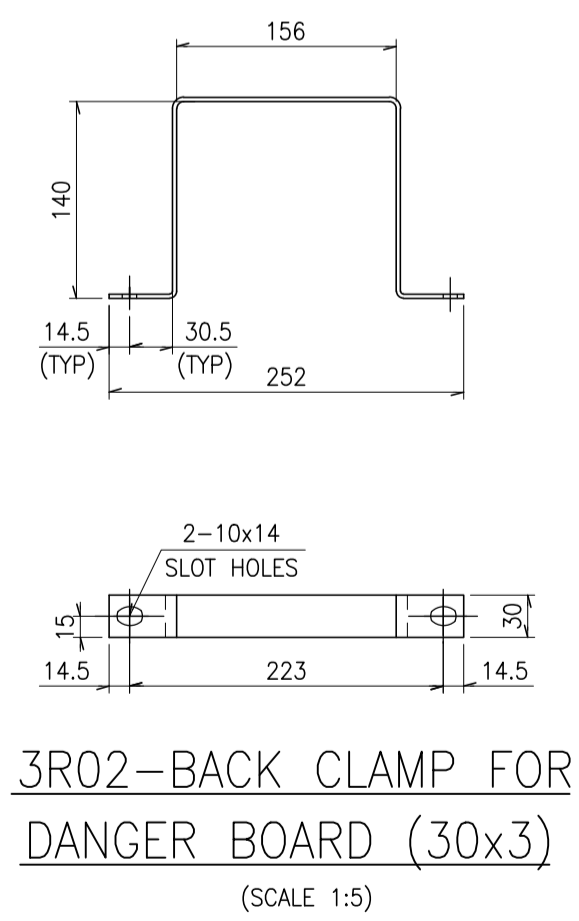
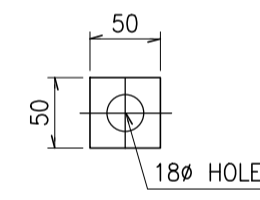
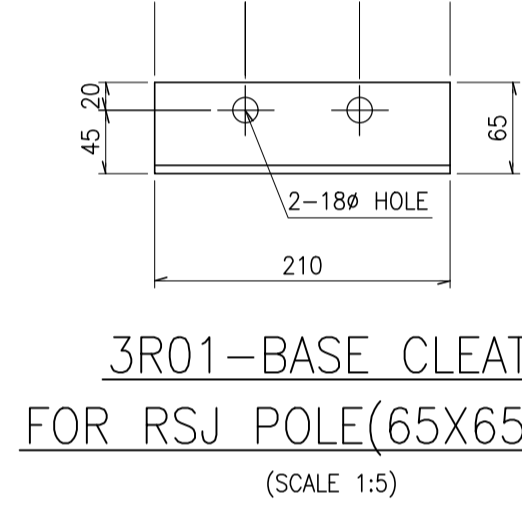
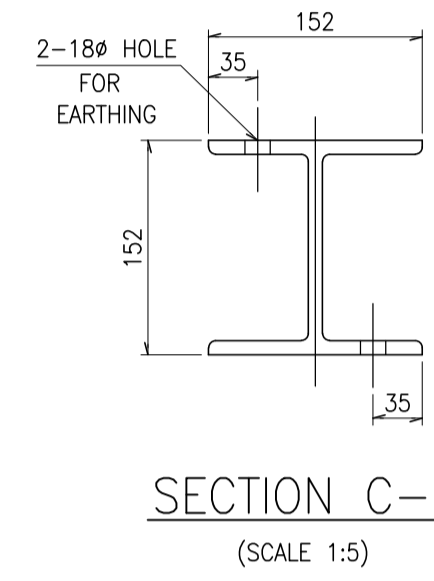
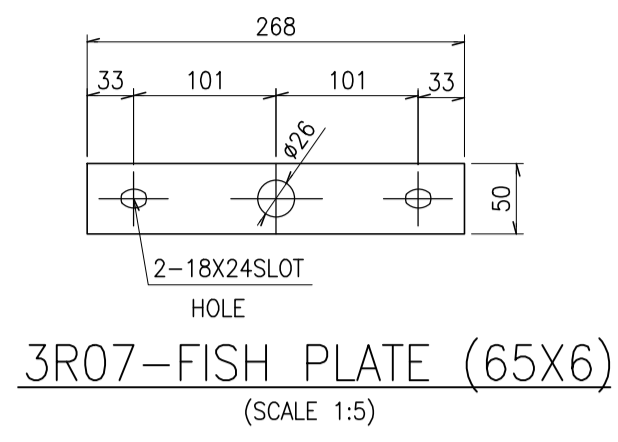
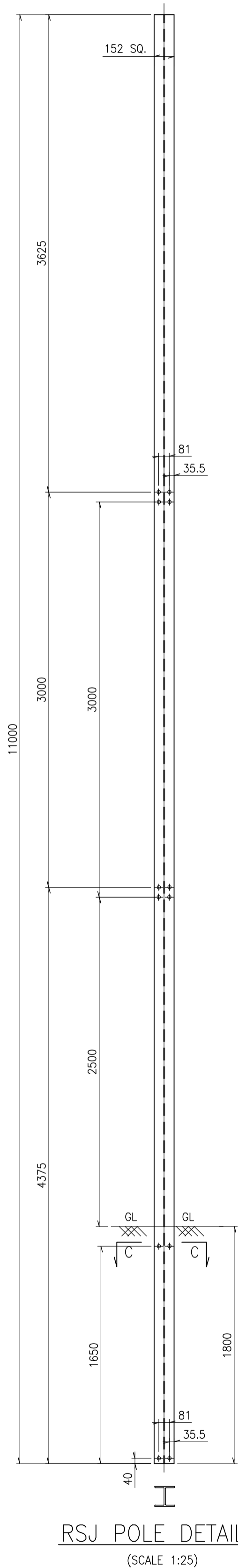
ERECTION MARK	DESCRIPTION	SECTION	MATERIAL	LENGTH (mm)	QTY. (NOS.)	WT (Kg/m)	WT/ITEM (Kg)	TOTAL WT. / ARGMT (Kg)	REF. DRG. NO.
GA01	RSJS POLE	152X152	JOIST	11000	4	37.1	408.1	1632.4	
GA02	33KV PIN INSULATOR WITH HW		PORCELAIN/POLYMER		6 SETS				
GA03	33KV DISC INSULATOR WITH HW		PORCELAIN/POLYMER		6 SETS				
GA04	33KV STAY SET ARRANGEMENT (ANGULAR LOCATION)				4 SETS				K2016EL005A-02-DRG-015
GA05	PG CLAMPS FOR AAAC 148 SQ mm				6				
GA06	GI BARBED WIRE				1			14.0	
GA07	33KV DANGER BOARD				4				K2016EL005A-02-DRG-020
GA09	3.53mm DIA AI BINDING WIRE				1			0.27	
3R01	BASE CLEAT FOR RSJS POLE	65X65X6	ANGLE	210	8	5.8	1.218	9.744	
3R02	BACK CLAMP FOR DANGER BOARD	30X3	FLAT	532	4	0.701	0.372	1.49	
3R03	SQUARE WASHER	50X6	FLAT	50	4	2.4	0.12	0.48	
3R05	STAY CLAMPS (ANGULAR LOCATION)	50X8	FLAT	440	8	3.1	1.364	10.912	K2016EL005A-02-DRG-015
3R07	FISH PLATE	50X8	FLAT	268	22	3.1	0.83	18.28	
3R08	CLAMP FOR FIXING OF ANTI CLIMBING DEVICE	40X5	FLAT	396	16	1.58	0.63	10.08	
3R09	BRACING ANGLES	50X50X6	ANGLE	4090	8	4.5	18.405	147.24	
3R10	6 SWG G.I. WIRE FOR EARTHING								
3R11	PIPE EARTHING								K2016EL005A-02-DRG-016
3R12	TOP CHANNEL	100X50X6	CHANNEL	3302	8	9.56	31.57	252.53	
3R13	BELTING ANGLE	75X75X6	ANGLE	3302	8	6.8	21.77	174.2	
3R14	PIN INSULATOR SUPP. CHANNEL	100X50X6	CHANNEL	3302	1	9.56	31.57	31.57	
TOTAL WEIGHT ANGULOR LOCATION								670.80	
A	BOLT & NUTS	M16		40	104		0.121	12.58	
B	BOLT & NUTS	M16		120	8		0.246	1.97	
C	BOLT & NUTS	M16		190	16		0.360	5.76	
D	BOLT & NUTS	M8		50	24		0.029	0.696	
E	FLAT WASHER	M16			128		0.014	1.792	
F	SPRING WASHER	M16			128		0.009	1.152	
G	FLAT WASHER	M8			24		0.005	0.12	
H	SPRING WASHER	M8			24		0.002	0.048	
TOTAL WEIGHT								22.15	

LEGENDS

NIL

NOTES

NIL



REDRAW FROM DWG. NO. IPDS/CESU/S&W/LINE/33KV/014, SH 03 OF 03, REV-2, DATE: 27.06.2017

DO NOT SCALE PRELIMINARY

TCP0DL TP CENTRAL ODISHA DISTRIBUTION LIMITED

GENERAL ARRANGEMENT OF 33kv FOUR POLE STRUCTURE WITH 11m GI RS JOIST

SHEET 03 OF 03

TATA CONSULTING ENGINEERS LIMITED MUMBAI

SCALE: AS SHOWN	APPROVED	DATE (RO ISSUE) 24/03/2021
DEL CENTRE-DISC: EL		DATE (ERRORT ISSUE) 24/03/2021
DRN: RF		
CHD: SS	DWG NO TCE.....	ISSUE -

FOR RO ISSUE ONLY			ISSUE	REVISIONS	DRN	CLEARED					APPD	DATE	ISSUE	REVISIONS	DRN	CLEARED					APPD	DATE	
DISC.	SIGNATURE	DATE				CIVIL	ELEC	I&C	MECH										CIVIL	ELEC			I&C

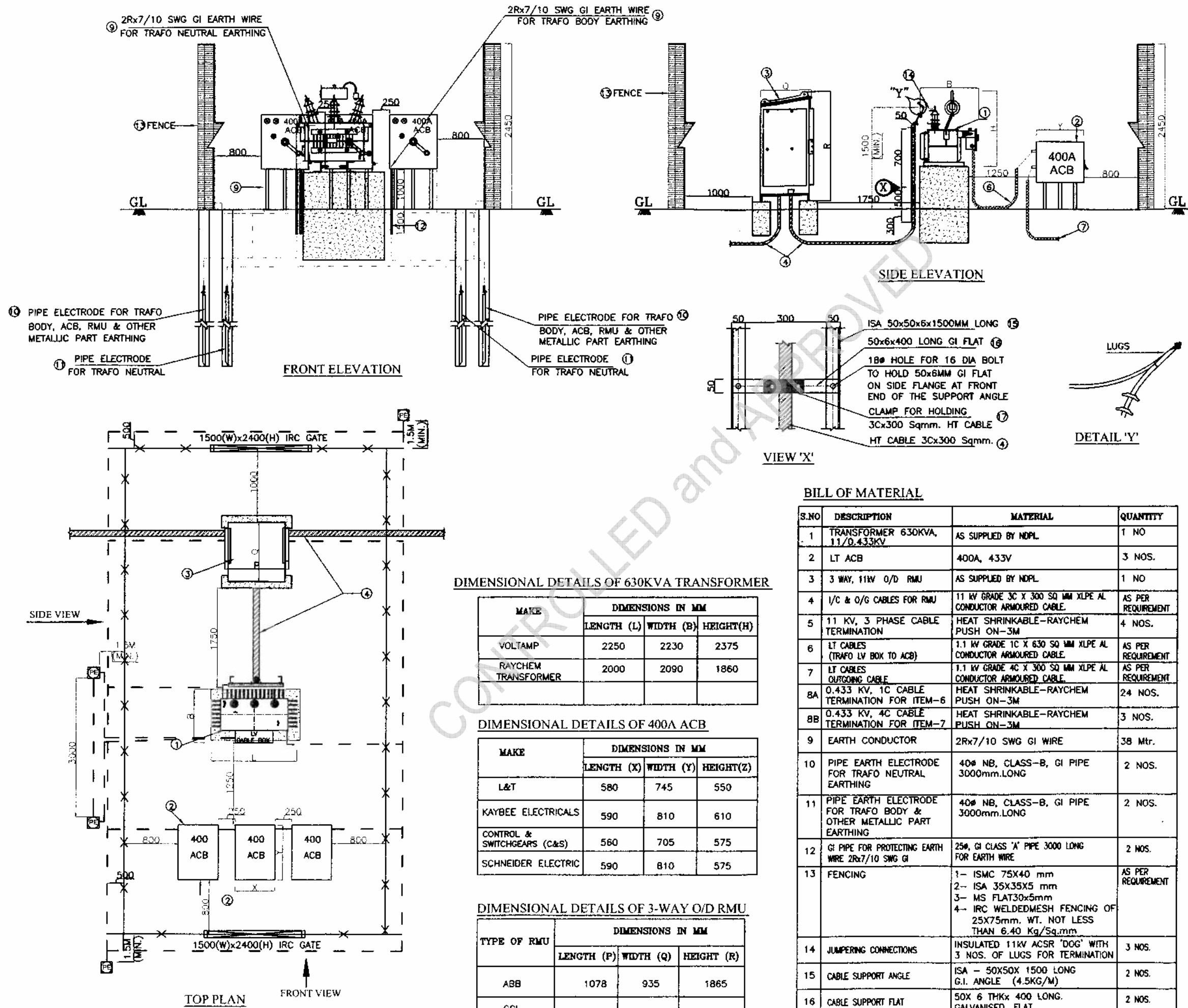
FILE NAME :

"P" (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSES ONLY AS INDICATED IN THE SMALL BLOCK AT THE TOP RIGHT HAND CORNER OF THE TITLE BLOCK

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11/12/2021



- LEGEND:-**
- FENCING
 - PLINTH
 - 3PH CABLE (HT)
 - 3PH CABLE (LT)
 - PIPE ELECTRODE
 - 2 x 7/10 SWG EARTH WIRE

- NOTES:-**
1. ALL DIMENSIONS ARE IN mm
 2. THIS DRAWING IS FOR INSTALLATION OF 630KVA TRANSFORMER WITH 400A LT ACB FOR ANY ONE OF APPROVED BIDDERS OF NDPL THE MINIMUM CLEARANCES AS INDICATED HERE SHALL BE MET WITH FOR THE EQUIPMENT BEING INSTALLED.
 3. THE DIMENSIONS OF ALL THE EQUIPMENT ARE INDICATIVE ONLY & SUBJECT TO CHANGE WITH THE EQUIPMENT THAT NEED TO BE INSTALLED AS ON DATE.
 4. THE I/C & O/G CABLES FOR RMU SHALL BE DIRECTLY BURIED IN GROUND SUCH THAT THE BOTTOM OF THE CABLE IS AT 1000 MM BELOW FGL.
 5. THE PIPE STATED ON SI. No. 12 SHALL BE MADE IN TWO PIECES OF 1500mm LONG EACH AND SHALL BE USED FOR PROTECTING SWG WIRE.
 6. ALL METALLIC PARTS TO BE CONNECTED TO TRANSFORMER BODY EARTHING THROUGH 2R_x7/10 SWG GI WIRE.
 7. TRANSFORMER NEUTRAL SHALL BE EARTHED THROUGH TWO NOS. OF INDEPENDENT GI WIRE EACH WITH 2R_x7/10 SWG CONNECTED TO SEPARATE PIPE ELECTRODES.
 8. THE EARTH PIT SHALL BE MADE AT THE CLEAR DISTANCE OF 1.5MTR. AWAY FROM THE FOUNDATION AND WITH A MINIMUM DISTANCE OF 3MTR. BETWEEN ANY TWO PITS.
 9. THE EARTH FLAT SHALL BE LAID 0.5 MTR. AWAY FROM THE FENCE.
 10. THE OHMIC RESISTANCE OF EARTH PIT SHOULD NOT EXCEED 1.0 OHM.
 11. THE ORIENTATION OF THE DRAWING SHALL BE AS PER THE SITE REQUIREMENT/AS PER HT FEEDER LOCATION.

- REFERENCES:-**
1. REFER IS 5613, PART-I, 1985 FOR ELECTRICAL CLEARANCES.
 2. REFER IS:3043:1987 AND TNEB HANDBOOK FOR EARTHING DESIGN
 3. REFER DRG. NO. ND-S-308-C-023 FOR TYPICAL FENCING DETAILS.
 4. REFER BIDDER'S DATA/CIVIL DRAWINGS FOR FOUNDATION DETAILS OF RMU/TRANSFORMER/LT ACB.
 5. REFER PRE-GEN-94 FOR HV CABLE LAYING WORKS.
 6. REFER DRG. NO. ND-S-232-E-002 FOR CONSTRUCTION ARRANGEMENT FOR BURIED EARTH ELECTRODE.

DIMENSIONAL DETAILS OF 630KVA TRANSFORMER

MAKE	DIMENSIONS IN MM		
	LENGTH (L)	WIDTH (B)	HEIGHT(H)
VOLTAMP	2250	2230	2375
RAYCHEM TRANSFORMER	2000	2090	1860

DIMENSIONAL DETAILS OF 400A ACB

MAKE	DIMENSIONS IN MM		
	LENGTH (X)	WIDTH (Y)	HEIGHT(Z)
L&T	580	745	550
KAYBEE ELECTRICALS	590	810	610
CONTROL & SWITCHGEARS (C&S)	560	705	575
SCHNEIDER ELECTRIC	590	810	575

DIMENSIONAL DETAILS OF 3-WAY O/D RMU

TYPE OF RMU	DIMENSIONS IN MM		
	LENGTH (P)	WIDTH (Q)	HEIGHT (R)
ABB	1078	935	1865
CGL	936	995	1871
SCHNEIDER	771	670	1510

BILL OF MATERIAL

S.NO	DESCRIPTION	MATERIAL	QUANTITY
1	TRANSFORMER 630KVA, 11/0.433KV	AS SUPPLIED BY NDPL	1 NO
2	LT ACB	400A, 433V	3 NOS.
3	3 WAY, 11KV O/D RMU	AS SUPPLIED BY NDPL	1 NO
4	I/C & O/G CABLES FOR RMU	11 KV GRADE 3C X 300 SQ MM XLPE AL CONDUCTOR ARMoured CABLE.	AS PER REQUIREMENT
5	11 KV, 3 PHASE CABLE TERMINATION	HEAT SHRINKABLE-RAYCHEM PUSH ON-3M	4 NOS.
6	LT CABLES (TRAFU LV BOX TO ACB)	1.1 KV GRADE 1C X 630 SQ MM XLPE AL CONDUCTOR ARMoured CABLE.	AS PER REQUIREMENT
7	LT CABLES OUTGOING CABLE	1.1 KV GRADE 4C X 300 SQ MM XLPE AL CONDUCTOR ARMoured CABLE.	AS PER REQUIREMENT
8A	0.433 KV, 1C CABLE TERMINATION FOR ITEM-6	HEAT SHRINKABLE-RAYCHEM PUSH ON-3M	24 NOS.
8B	0.433 KV, 4C CABLE TERMINATION FOR ITEM-7	HEAT SHRINKABLE-RAYCHEM PUSH ON-3M	3 NOS.
9	EARTH CONDUCTOR	2R _x 7/10 SWG GI WIRE	38 Mtr.
10	PIPE EARTH ELECTRODE FOR TRAFU NEUTRAL EARTHING	40# NB, CLASS-B, GI PIPE 3000mm.LONG	2 NOS.
11	PIPE EARTH ELECTRODE FOR TRAFU BODY & OTHER METALLIC PART EARTHING	40# NB, CLASS-B, GI PIPE 3000mm.LONG	2 NOS.
12	GI PIPE FOR PROTECTING EARTH WIRE 2R _x 7/10 SWG GI	25# GI CLASS 'A' PIPE 3000 LONG FOR EARTH WIRE	2 NOS.
13	FENCING	1- ISMC 75X40 mm 2- ISA 35X35X5 mm 3- MS FLAT30x5mm 4- IRC WELDED MESH FENCING OF 25X75mm. WT. NOT LESS THAN 6.40 Kg/Sq.m	AS PER REQUIREMENT
14	JUMPING CONNECTIONS	INSULATED 11KV ACSR 'DOG' WITH 3 NOS. OF LUGS FOR TERMINATION	3 NOS.
15	CABLE SUPPORT ANGLE	ISA - 50X50X 1500 LONG G.I. ANGLE (4.5KG/M)	2 NOS.
16	CABLE SUPPORT FLAT	50X 6 THKx 400 LONG GALVANISED. FLAT	2 NOS.
16A	H.D.GALVANISED BOLTS, NUTS & WASHERS FOR ITEM 16	16# X 65 LONG BOLT WITH NUTS AND WASHERS	2Nos. EACH
17	CLEAT TYPE CLAMPS FOR SUPPORTING 11KV CABLE	WOODEN OR FRP TO SUIT ITEM 4	2 NOS.

REVISION STATUS:-

DATE	REV. NO.	REMARKS	DGN.	REV.	APPD.	ISSD.
22.01.09	00	ISSUED FOR CONSTRUCTION PURPOSE.	S.R.P.			

NDPL

NORTH DELHI POWER LIMITED
(A TATA POWER AND DELHI GOVERNMENT JOINT VENTURE)
GRID SUB STATION BUILDING, HUDSON LINES
KINGSWAY CAMP, DELHI-110009

PROJECT:- STANDARD INSTALLATION DRAWINGS.

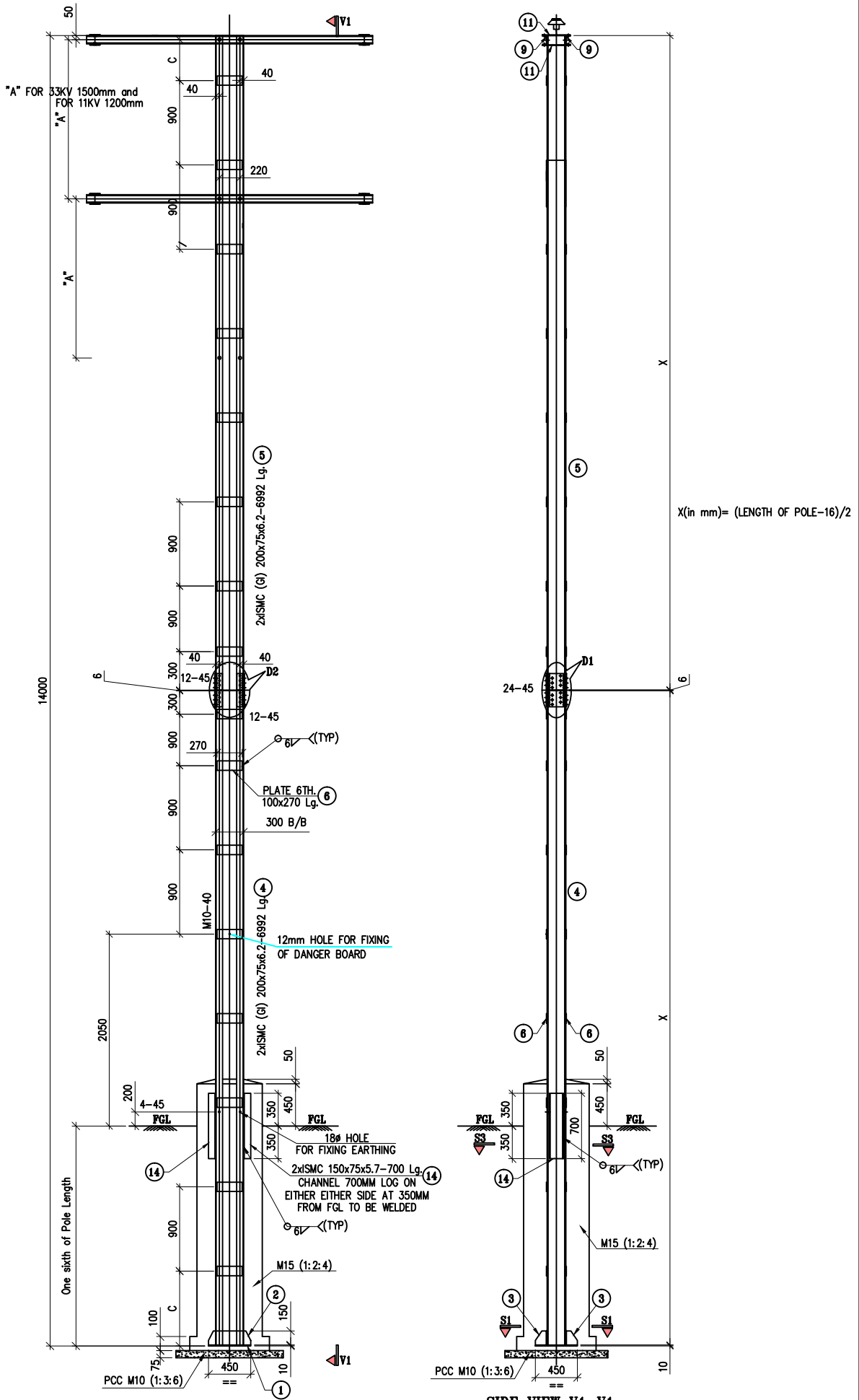
DESIGN	S.R.P.	TITLE:-
DRWN	HKV	INSTALLATION ARRANGEMENT FOR 630 KVA TRF (FED FROM RMU) ON PLINTH WITH LT ACBS
REV.		
APPD.		
ISSD.		
SCALE	1:55	

DRAWING NO. ND-S-220-E-008

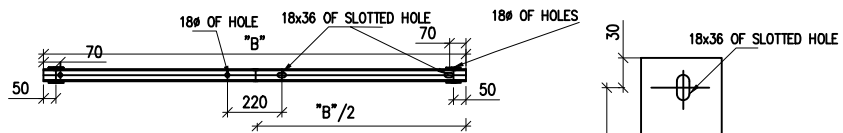
1 OF 1

REV. 00

14.0M H-PLOE STRUCTURE DESIGN

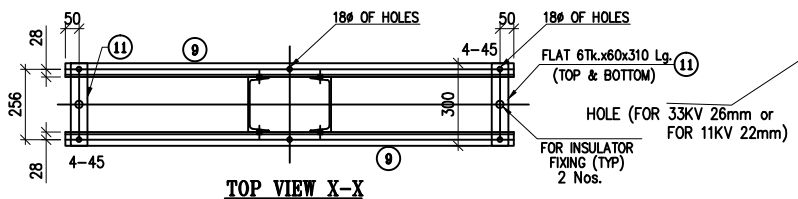
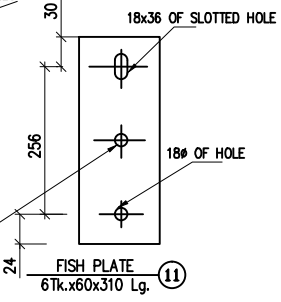


LEGENDS:-
 FGL - FINISHED GROUND LEVEL
 TYP. - TYPICAL

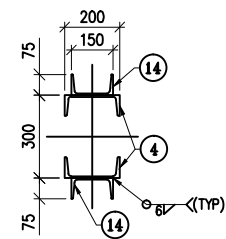


DETAILS OF X-ARM

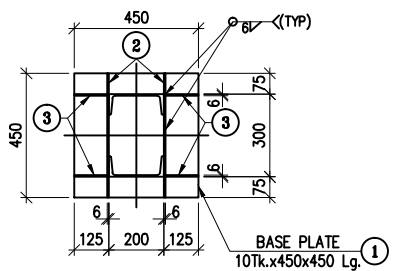
"B" FOR 33KV 1820 and FOR 11KV 1620mm



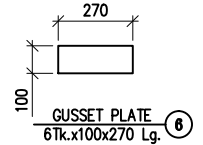
TOP VIEW X-X



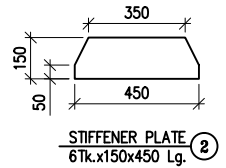
SECTION S3-S3



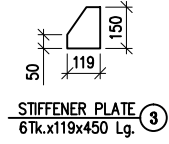
SECTION S1-S1



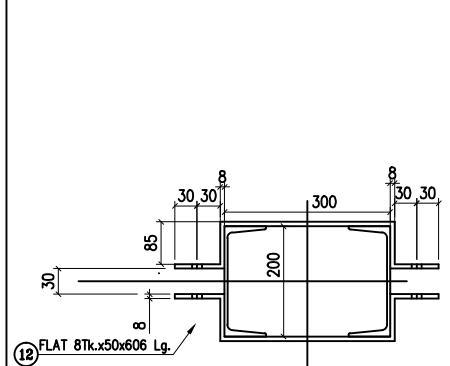
GUSSET PLATE
6Tk.x100x270 Lg. (6)



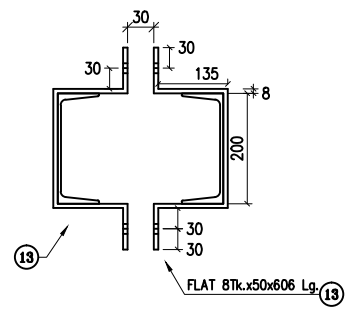
STIFFENER PLATE
6Tk.x150x450 Lg. (2)



STIFFENER PLATE
6Tk.x119x450 Lg. (3)



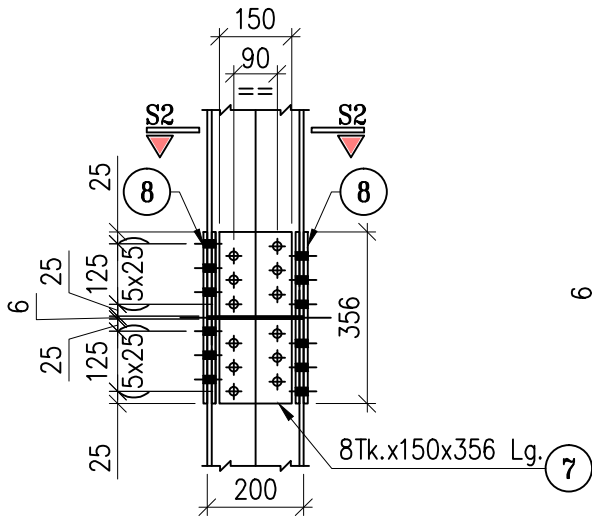
STAY CLAMP ACROSS LINE



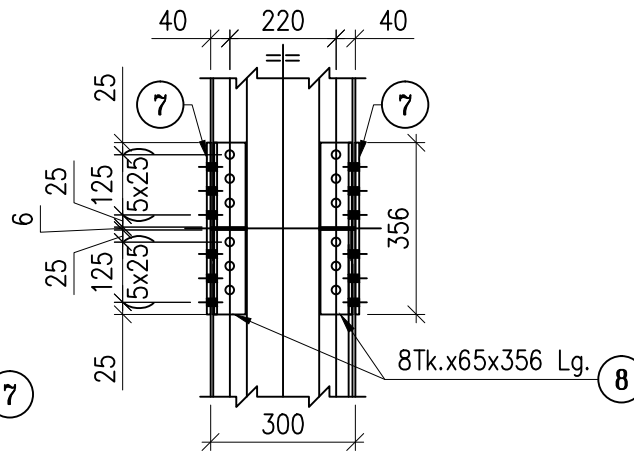
STAY CLAMP ALONG LINE

NOTES:-

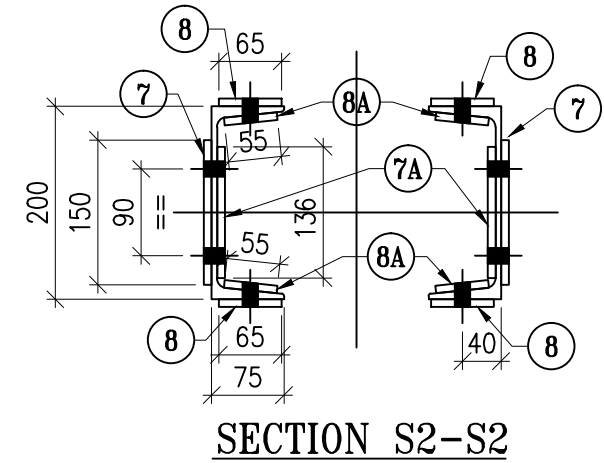
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE SPECIFIED.
2. ALL WELDS ARE 6MM FILLET CONTINUOUS WELD UNLESS OTHERWISE SPECIFIED.
4. SPRING WASHER SHALL CONFORM TO IS-3063.
5. ALL BOLTS NUTS AND LOCK NUTS SHALL CONFORM TO REQUIREMENTS OF INDIAN STANDARD SPECIFICATION IS : 1363/1367 (LATEST REVISION)
6. ALL PLAN WASHERS SHOULD CONFORM TO IS 2016.
7. ALL STRUCTURAL STEEL SHALL BE OF MILD STEEL GRADE E250A AS PER IS 2062:2006 SHALL BE USED.
8. ALL STRUCTURAL STEEL SHALL BE HOT DIP GALVANIZED WITH MIN. COATING OF 610 g/Sq.m & FOR SURFACE THAT SHALL BE EMBEDDED IN CONCRETE THE ZINC COATING SHALL BE MIN. 800 g/Sq.m AS PER TECH. SPEC., & IS:4759 & IS:2633.
9. FASTENING BOLTS & NUTS SHALL BE GALVANIZED AS PER TECHNICAL SPECIFICATION.
10. ALL SPRING WASHERS SHALL BE ELECTRO GALVANIZED AS PER TECHNICAL SPECIFICATION.
11. PLAIN WASHERS SHALL BE HOT DIP GALVANIZED AS PER TECHNICAL SPECIFICATION.
12. ALL BOLT HOLES ARE 18mm FOR M16 BOLTS UNLESS NOTED OTHERWISE.
13. 2% EXTRA NUTS & BOLTS SHALL BE PROCURED FOR ERECTION.



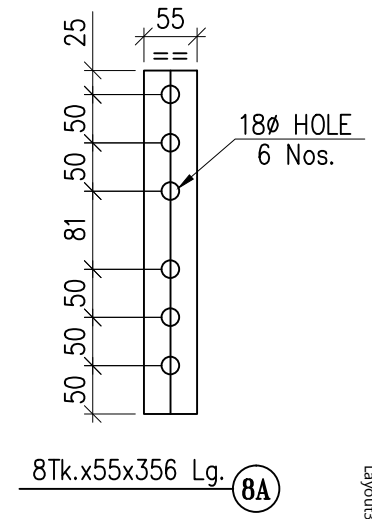
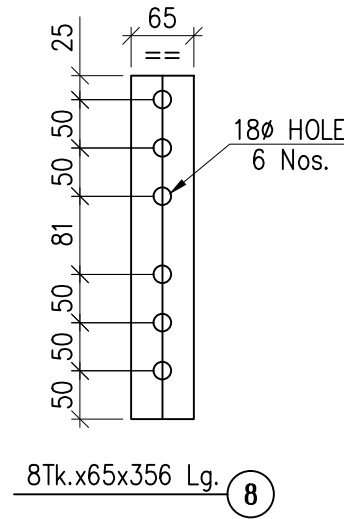
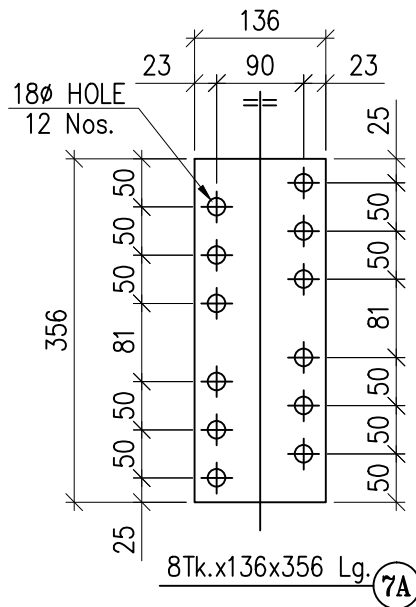
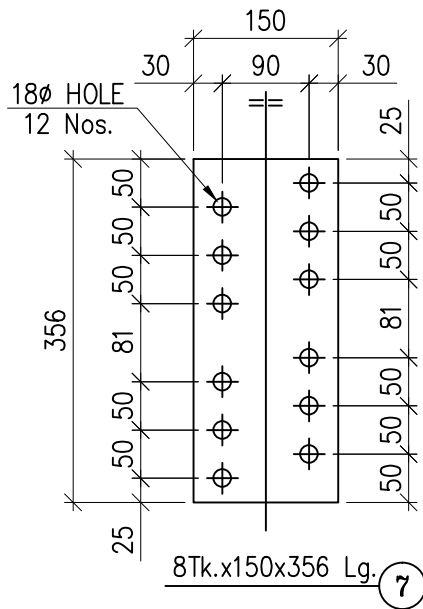
DETAIL-D1



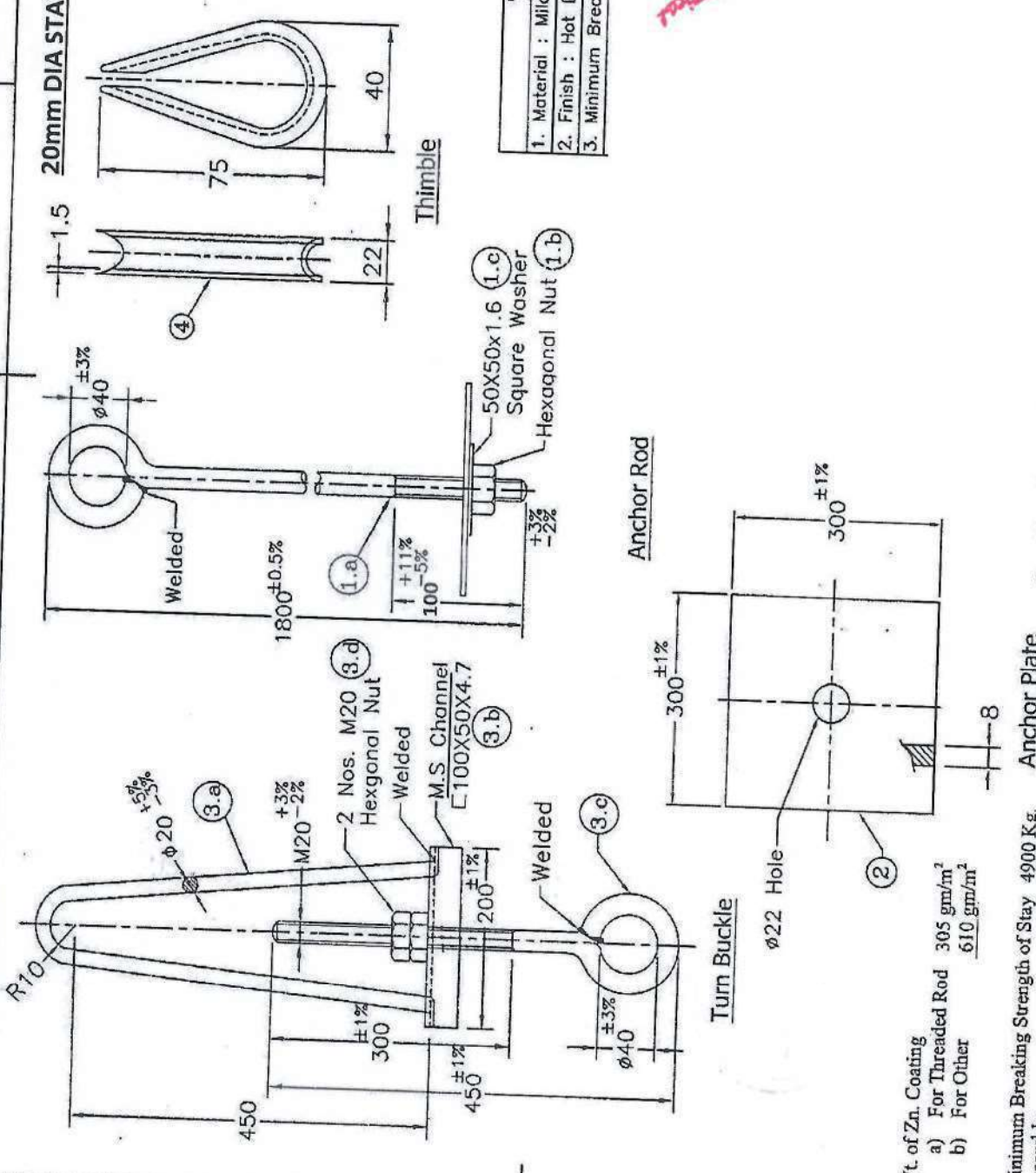
DETAIL-D2



SECTION S2-S2



20mm DIA STAY SET FOR HT LINE



SN.	Item	Material	Qty.
1.a	Anchor Rod (φ20x1800)	M.S.,HDG	1
1.b	M20 Nut	M.S.,HDG	1
1.c	50x50x1.6 mm Sq. Washer	M.S.,HDG	1
2	Anchor plate (300x300x8)	M.S.,HDG	1
3.a	Turn Buckle	M.S.,HDG	1
3.b	MS Channel (100x50x4.7x200)	M.S.,HDG	1
3.c	M20 Eye Bolt	M.S.,HDG	1
3.d	M20 Hex. Nut	M.S.,HDG	2
4	Thimble	M.S.,HDG	2

Technical Details

1. Material : Mild Steel (E250, Fe 410 WA) as per IS:2062
2. Finish : Hot Dip Galvanising conforming to IS:2633
3. Minimum Breaking Strength of Stay Assembly : 4900kg.

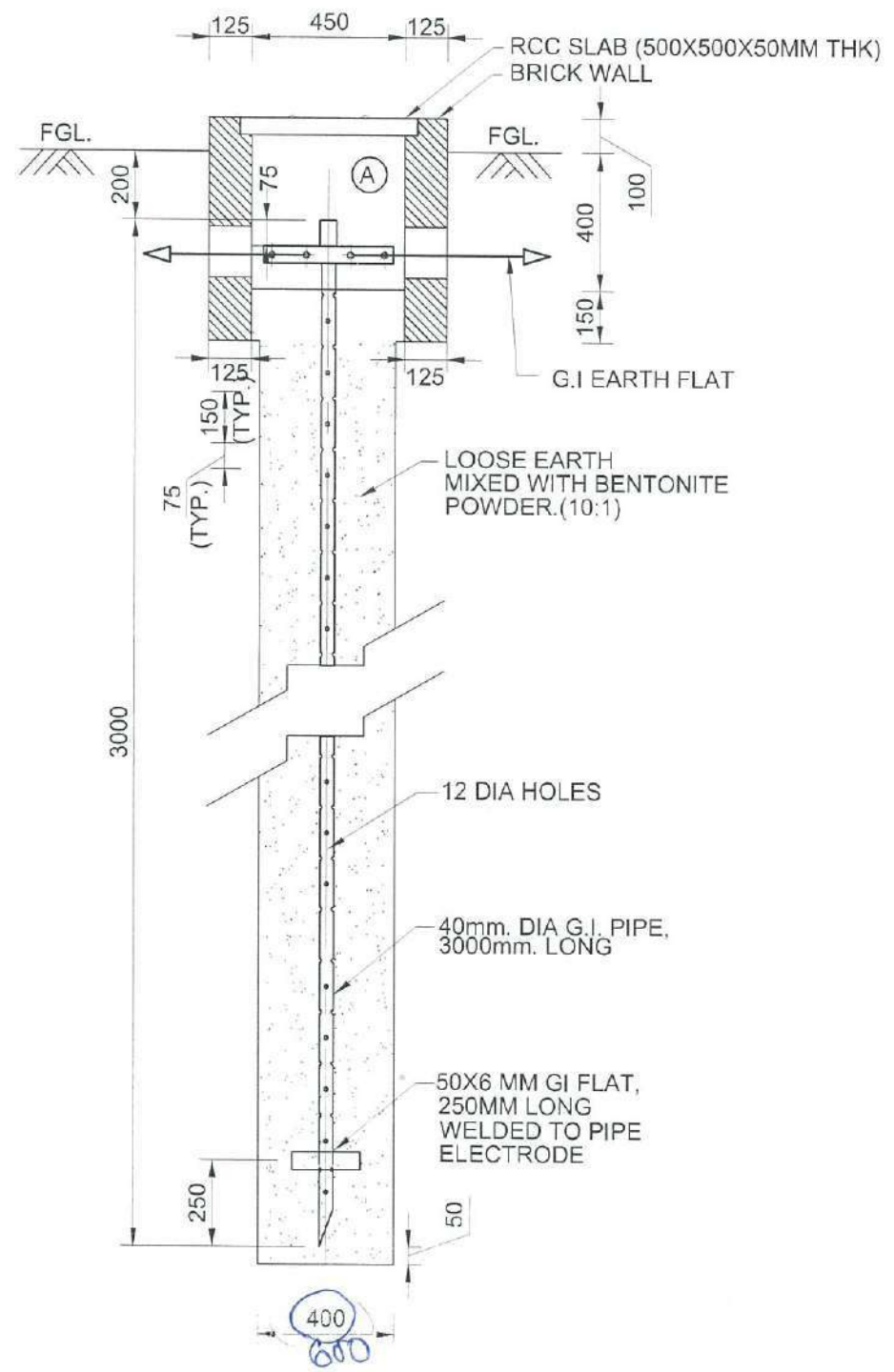
APPROVED
 For Approval & Revision Control
 Sr. General Manager (Elec.)
 Technical, CESU

Wt. of Zn. Coating
 a) For Threaded Rod 305 gm/m²
 b) For Other 610 gm/m²

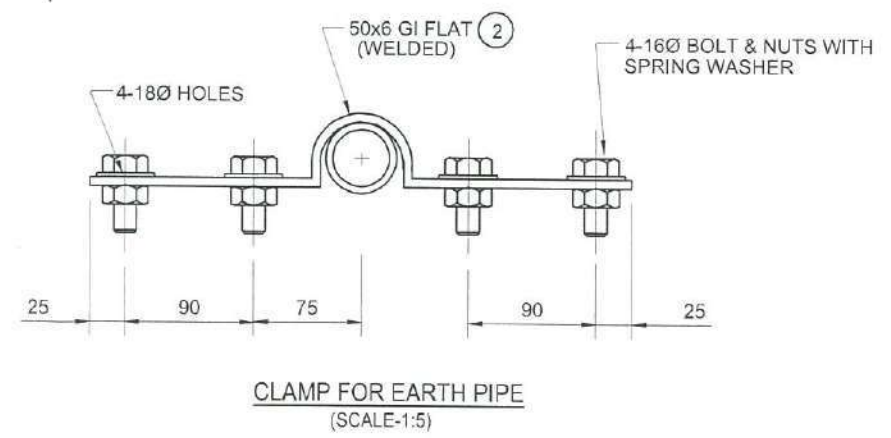
Minimum Breaking Strength of Stay Assembly 4900 Kg

Raw Material grade (Mild Steel) E250 (Gr. Fe 410 WA) of IS:2062/Equivalent

Approved as Noted



TYPICAL DETAILS OF EARTH PIT
(SCALE-1:20)



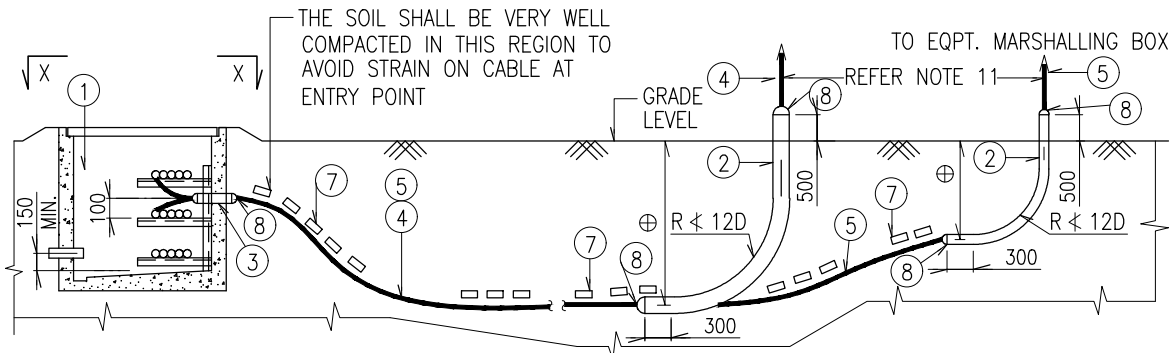
[Signature]
20.6.17
Project Consultant
Cum
Co-ordinator
Central Power Research Institute
Camp:-Bhubaneswar

NOTES:-

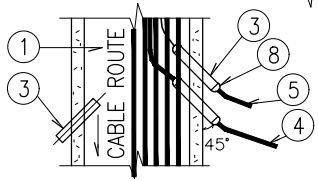
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. CLAMP FOR EARTH PIPE WILL BE WELDED TO PIPE, BEFORE GALVANIZING.
3. G.I. PIPE, CLAMP, BOLTS, NUTS & SPRING WASHERS WILL BE HOT DIP GALVANIZED AS PER I.S.-2629/1985 & 4759.
4. FOR PIPE EARTH ELECTRODE REFER DRAWING NO. IPDS/CESU/S&W/LINE/33KV/016.
5. THE EARTH PIPE PIT HAVE BEEN DESIGNED AS PER MOM DATED 29.03.17.

STATUS:
08.06.2017- REVISION 0 ISSUED FOR APPROVAL.

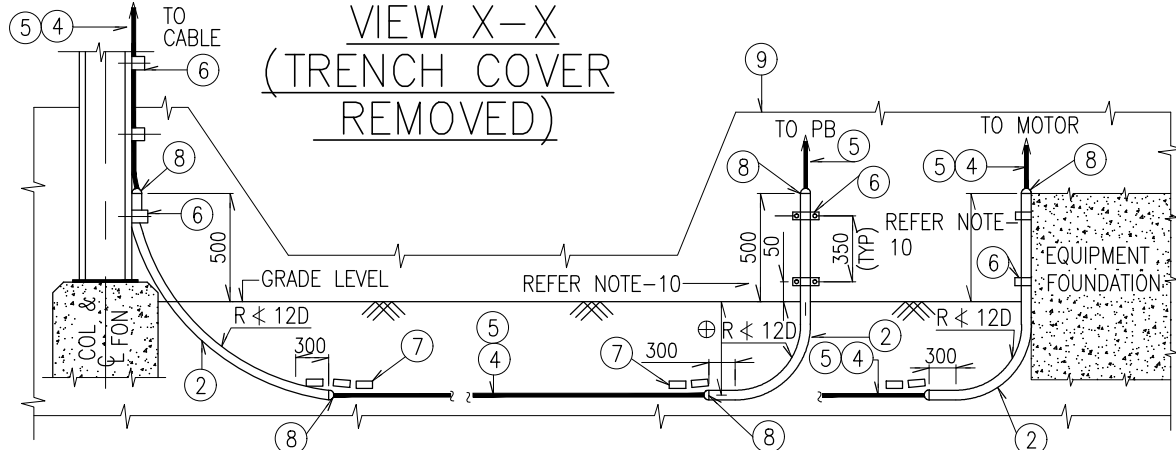
REV. NO.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED	
PROJECT		ELECTRICATION WORKS IN CESU UTILITY OF ODISHA UNDER INTEGRATED POWER DEVELOPMENT SCHEME (PKG.-01)				
LOA NO.		OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/SUPPLY- 42 DATED 25.10.2016. OPTCL/PMU/IPDS/LOA/CESU/01/102/2016/ERECTION - 43 DATED 25.10.2016.				
CLIENT		ODISHA POWER TRANSMISSION CORPORATION LIMITED				
PMA		केन्द्रीय विद्युत अनुसंधान संस्थान Central Power Research Institute				
CONTRACTOR		STERLING AND WILSON PVT. LTD., KOLKATA				
DRAWN		NAME	SIGN	DATE	GENERAL ARRANGEMENT OF GI PIPE EARTH PIT	
CHECKED		RNB		06.05.17		
APPROVED		RNB		06.05.17		
CONTRACTOR DRG. NO.:		K2016EL004A-01-DRG-008				
DRG. NO.:		IPDS/CESU/S&W/NEW-SS/008			SHEET	REV.
					01 OF 01	0
					DRG. SIZE-A3	



SECTIONAL ELEVATION
CABLE FROM TRENCH
TO EQUIPMENT



VIEW X-X
(TRENCH COVER
REMOVED)



SECTIONAL ELEVATION
CABLE FROM TRAY / RACK TO EQUIPMENT

LEGENDS

- ① - CABLE ROUTE
- ② - GI/HDPE/U-PVC PIPE
- ③ - GI/HDPE/U-PVC PIPE INSERT
- ④ - ARMoured POWER CABLE
- ⑤ - ARMoured CONTROL CABLE
- ⑥ - SADDLE & SPACER
- ⑦ - PROTECTIVE COVER
- ⑧ - WATER PROOF SEALING
- ⑨ - WALL

NOTES

1. ALL DIMENSION IN MM.
2. ALL UNUSED PIPE INSERTS/CONDUITS SHALL BE PLUGGED/SEALED.
3. CABLE SHALL BE LAID IN PIPES UNDER RCC FLOOR /PAVEMENT
4. THE DIMENSION MARKED THUS ⊕ SHALL BE DECIDED AT SITE BASED ON DEPTH OF BURIED CABLE.
5. PIPES SHALL BE LAID UP TO THE TOP OF EQUIPMENT FOUNDATION OR UP TO A HEIGHT OF 500MM FROM GRADE LEVEL WHICHEVER IS LESS.
6. THE CABLE/PIPES SHALL BE CLAMPED SUITABLY TO STEEL SUPPORTS IF THE HEIGHT OF CABLE BOX OF EQUIPMENT FROM THE GRADE LEVEL IS MORE THAN 800.
7. SPACER FOR CLAMPING THE CONDUIT SHALL BE WELDED TO THE STEEL SUPPORT AND SHALL BE FIXED TO RCC STRUCTURE WITH 6MM DIA , 35MM LONG SCREW WITH RAWL PLUG.
8. INCASE OF UNARMoured CABLES, GI/HDPE/U-PVC PIPE SHALL BE EXTENDED SUITABLY ABOVE FLOOR LEVEL TO AVOID TO DAMAGE CABLES.

ISSUE	REVISIONS	DRN	DSN	CHD	CV	EL	IC	ME	PE/PM	APPD	DATE
					CLEARED						

DO NOT SCALE

FILE NAME :

Proprietary rights of the information Contained herein belong to Tata Consulting Engineers Limited This information is intended to be used for the mentioned Purpose/project only.

In case of misuse of information and Any claim arising thereof, cost and Consequence will be on the Party misusing the information.

'P' (PRELIMINARY) ISSUES ARE NOT TO BE USED FOR CONSTRUCTION / FABRICATION BUT ARE ISSUED FOR LIMITED PURPOSE ONLY AS INDICATED IN THE SMALL BLOCK ABOVE THIS BLOCK. CONSTRUCTION / FABRICATION WORK IS PERMITTED ON 'R' (RELEASED) ISSUES ONLY.

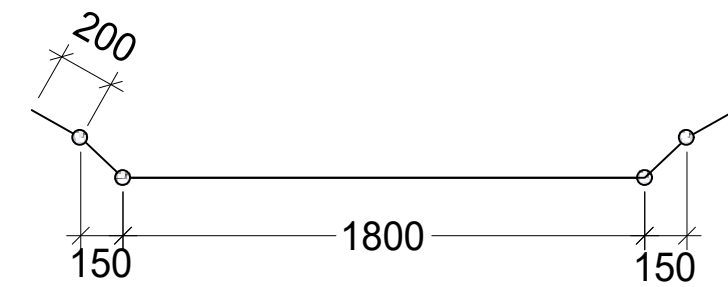
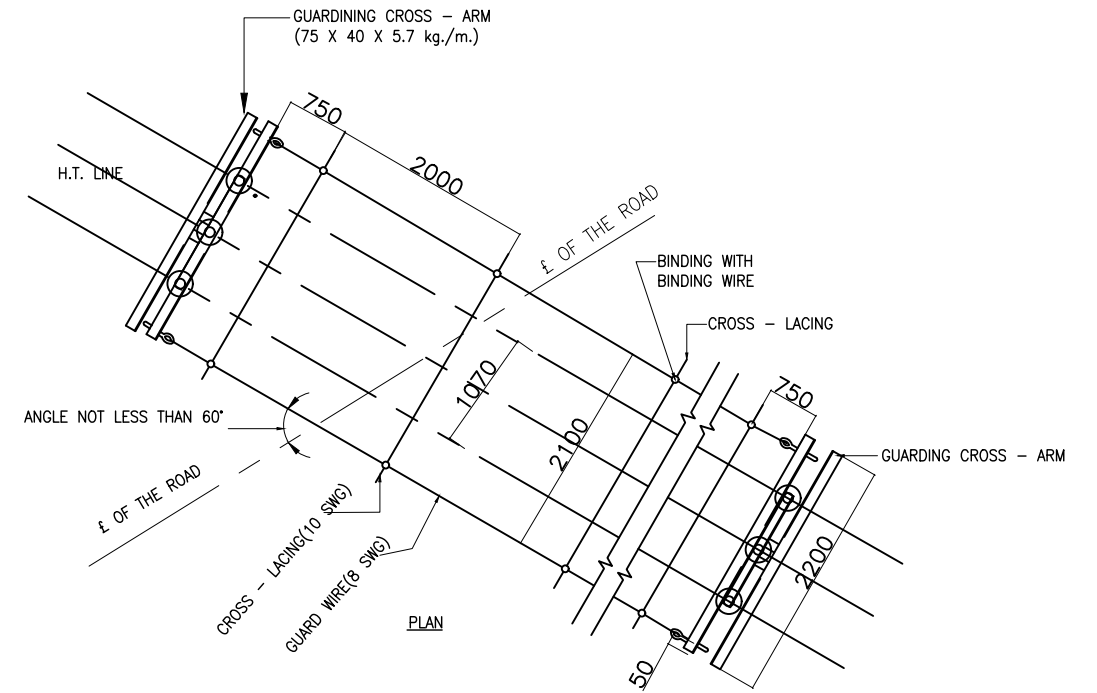
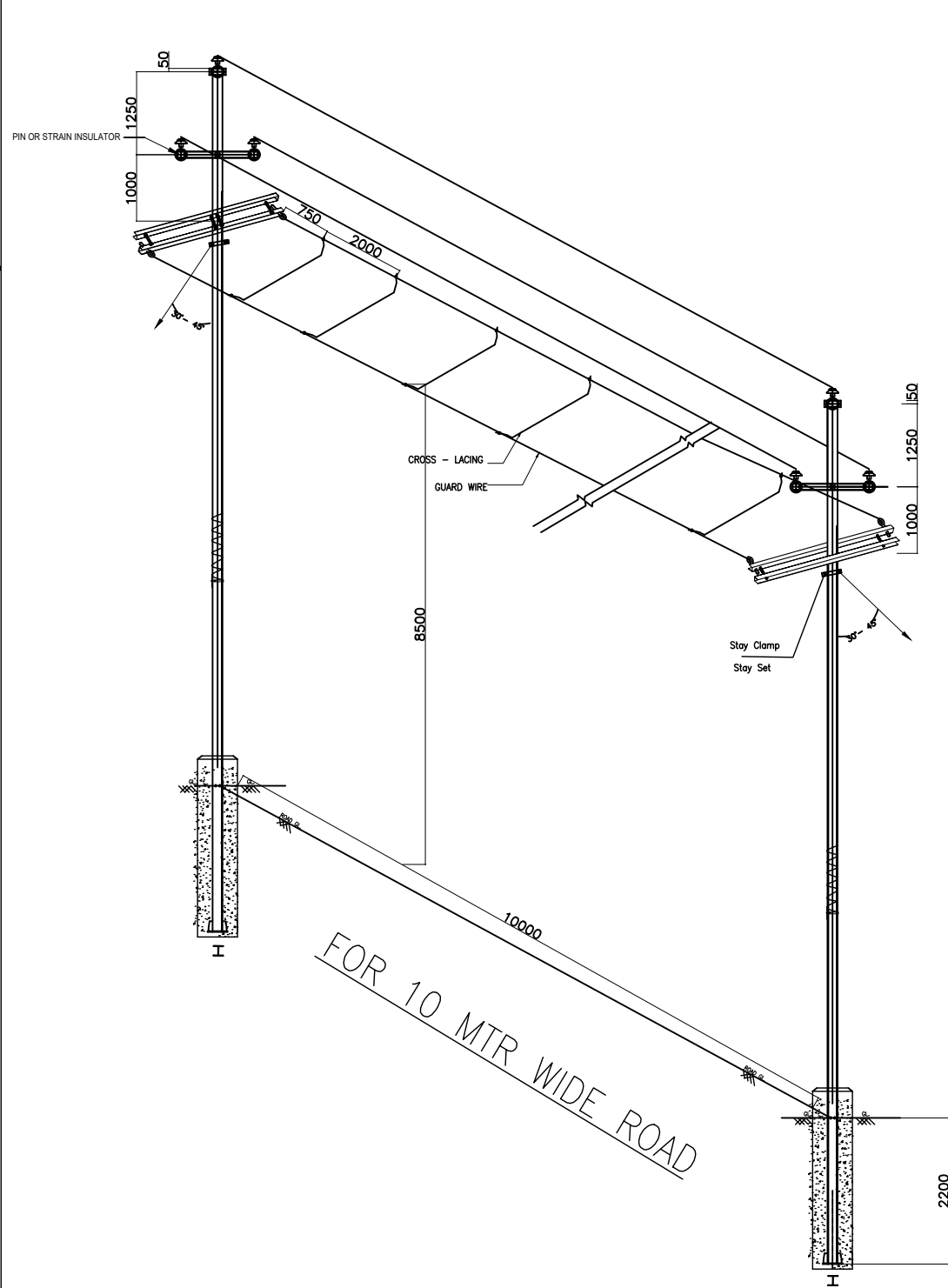
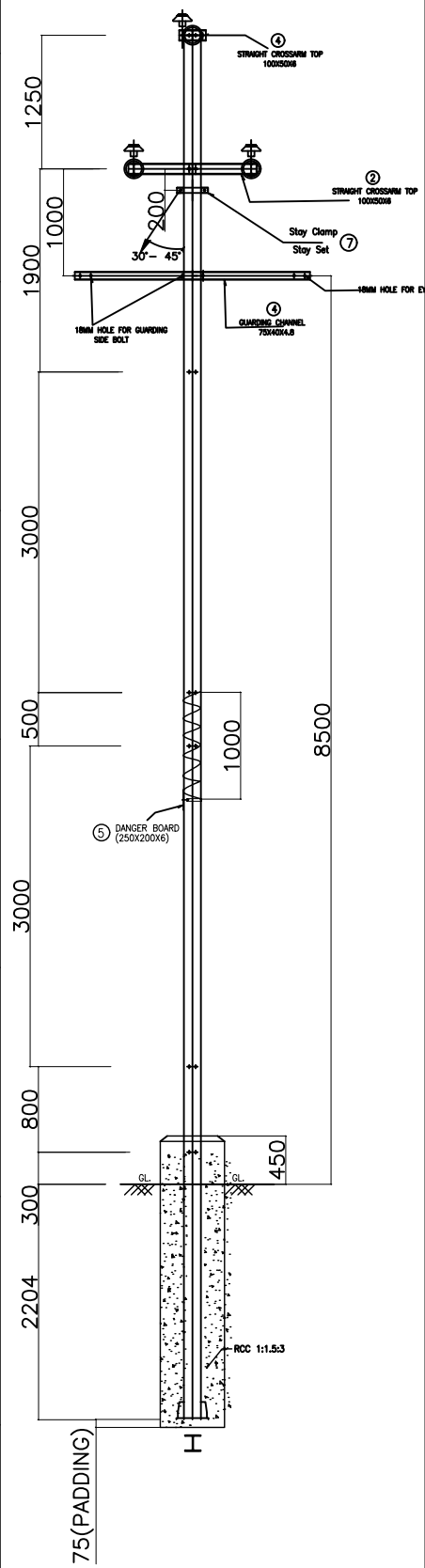
INFORMATION CONTAINED WITH 'HOLD' IS NOT RELEASED FOR CONSTRUCTION / FABRICATION. FIELD MUST GET DESIGN OFFICE TO CLEAR 'HOLDS' IN TIME BEFORE PROCEEDING WITH ANY CONSTRUCTION / FABRICATION WORK RELATED TO 'HOLDS'.

PROTECTION OF BURIED CABLES AT ENTRY/EXIT POINT TO/FROM EARTH

TATA CONSULTING ENGINEERS LIMITED
MUMBAI

SCALE NTS DWG NO ISSUE

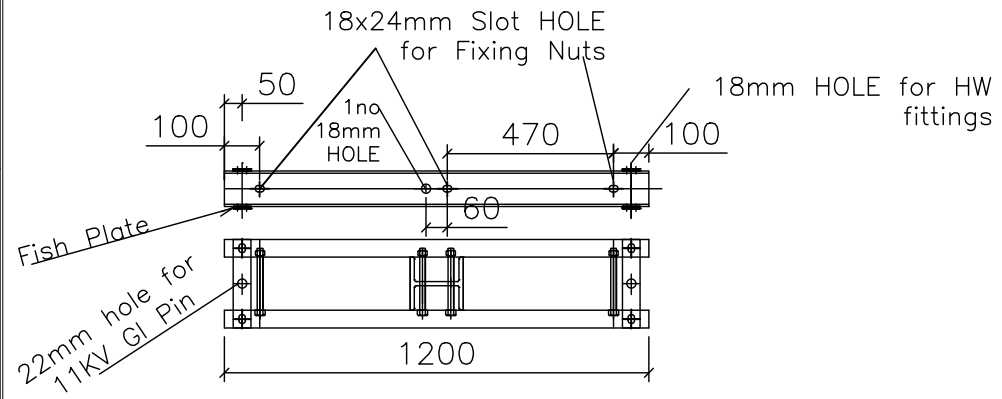
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



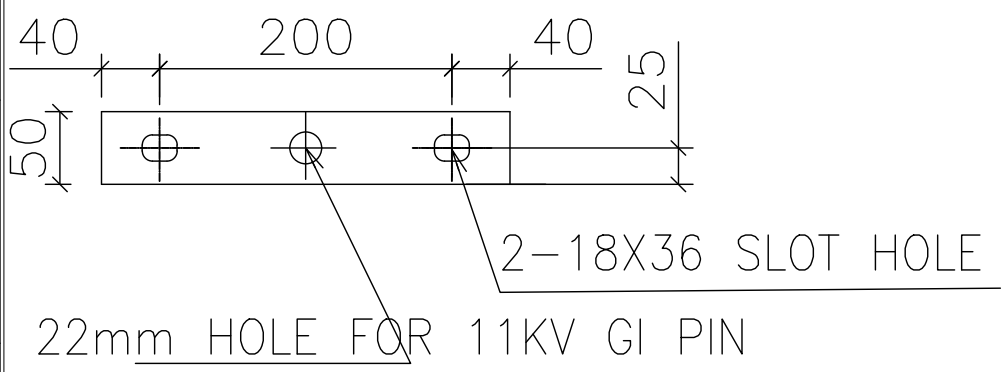
SECTION OF CROSS LACINGS

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON SINGLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME	
SCALE : NTS		DESIGN:	PHIROJ UTTARAY, E&Q
ISSUE DT: 31/05/2021		DRAWN:	J SANGRAM, E&Q
		CHECKED:	K BHARDWAJ, E&Q
		APPROVED:	P GARG, E&Q
		DRAWING NO: TPCODL-MVD-0009 REV NO: Sheet: 1 of 2	

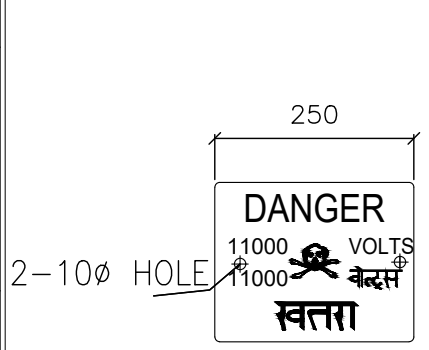
1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



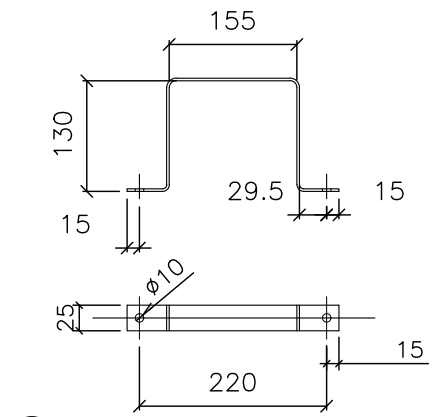
② Straight Cross Arm Bottom



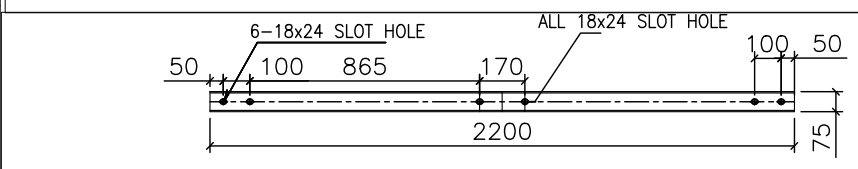
③ FISH PLATE(50x6)



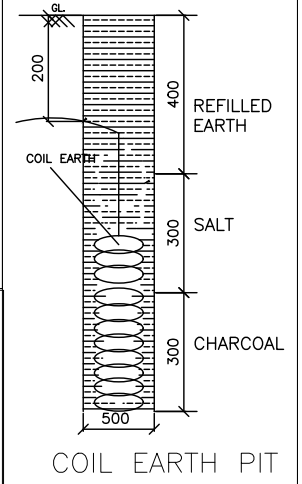
⑤ DANGER BOARD (250X220X3)X1NO.



⑥ BACK CLAMP FOR DANGER BOARD(25X3)



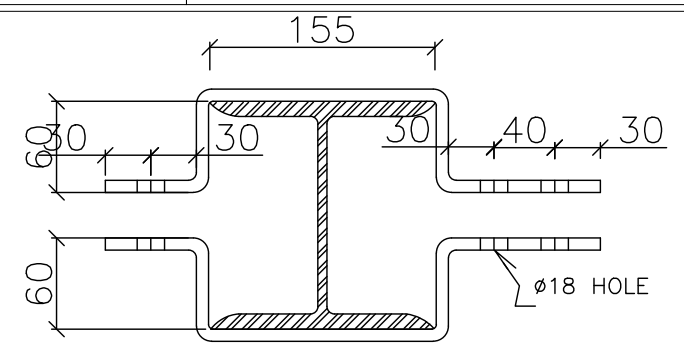
⑧ GUARDING CROSS ARM



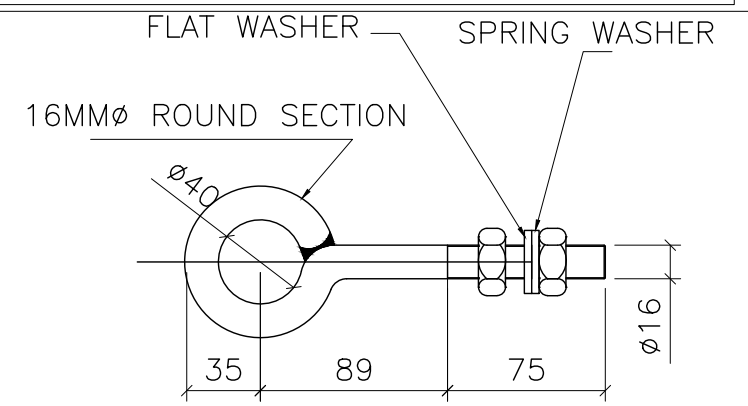
COIL EARTH PIT

BOM OF GI ITEMS OF 11KV ROAD CROSSING ON SINGLE POLE								
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	2	34.6 / 30.44	449.8 / 395.72	899.6 / 791.44
2	STRAIGHT CROSS ARM BOTTOM	100x50x6	CHANNEL	1200	4	9.5600	11.472	45.888
3	FISH PLATE	50x6	FLAT	280	16	2.3600	0.661	10.573
4	STRAIGHT CROSS ARM TOP	100x50x6	CHANNEL	306	4	9.5600	2.925	11.701
5	DANGER BOARD	200x6	FLAT	250	2	9.4200	2.355	4.710
6	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	2	0.5900	0.301	0.602
7	STAY CLAMP	50x8	FLAT	551	2	3.1400	1.730	3.460
8	CHANNEL FOR GUARDING	75x40x4.8	CHANNEL	2200	4	7.1400	15.708	62.832
9	EYE HOOK(Along with 2nuts,1 flat & spring washer each)		M16 ROD	305	4	1.5700	0.479	1.915
10	8 SWG		WIRE	42000	1	0.1310	5.502	5.502
11	10 SWG		WIRE	15000	1	0.0820	1.230	1.230
							TOTAL WT EXCEPT POLE	148.414

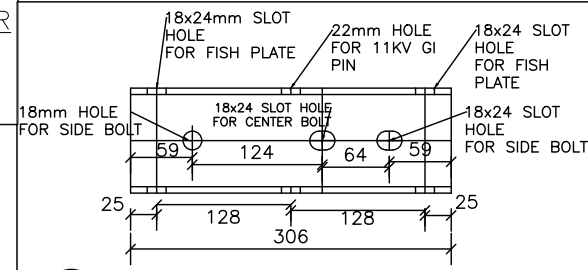
NUT & BOLTS REQUIRED											
NUT & BOLTS	LENGTH (mm)	STRAIGHT CROSS ARM BOTTOM	FISH PLATE	STRAIGHT CROSS ARM TOP	DANGER BOARD	STAY CLAMP	GUARDING CROSS ARM	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50							2	2	0.134	0.268
M16	90					6			6	0.161	0.966
M16	200	8	8	6			8		30	0.331	9.930
M8	70				4				4	0.033	0.132
M16	FLAT WASHER								76	0.014	1.064
M16	SPRING WASHER								76	0.009	0.684
M8	FLAT WASHER								8	0.005	0.040
M8	SPRING WASHER								8	0.002	0.016
									TOTAL WEIGHT		13.100



⑦ Stay Clamp(50X8)



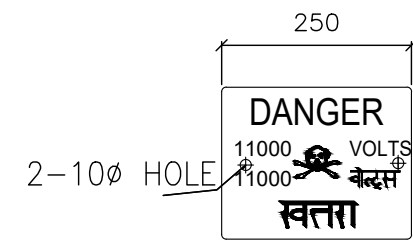
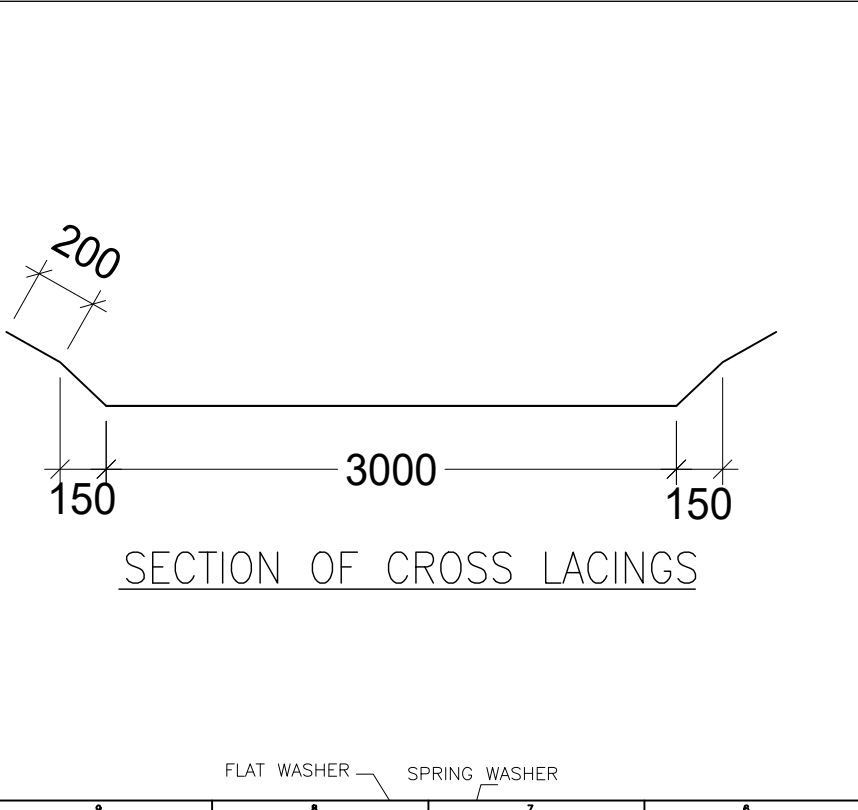
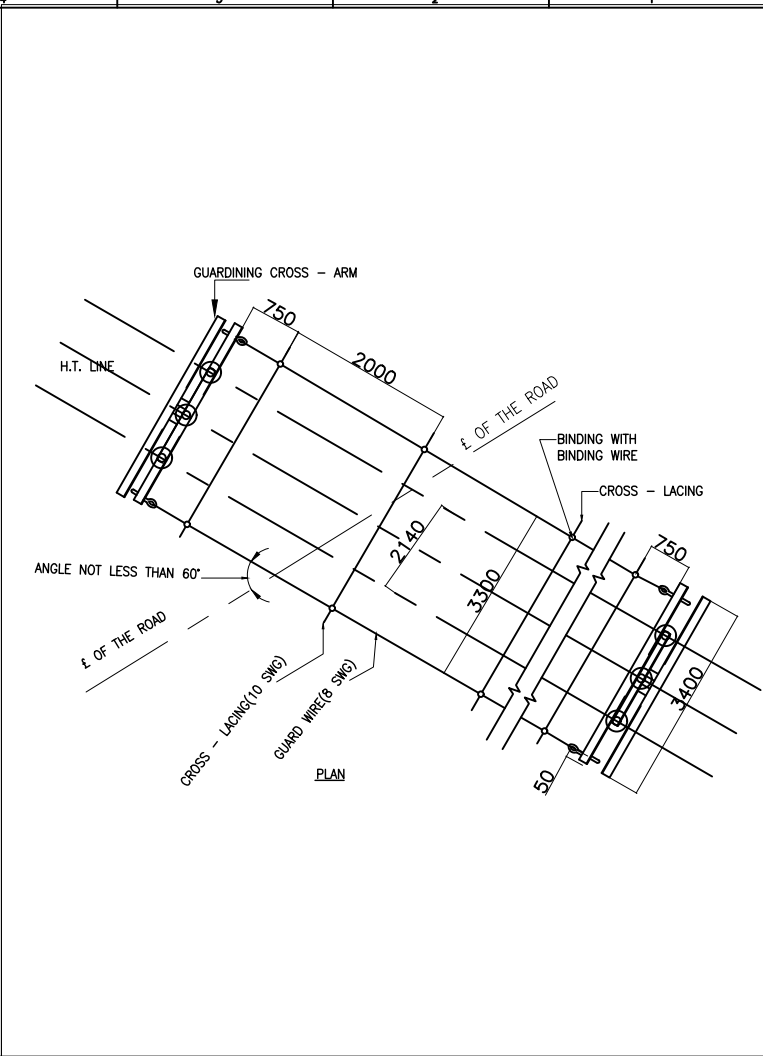
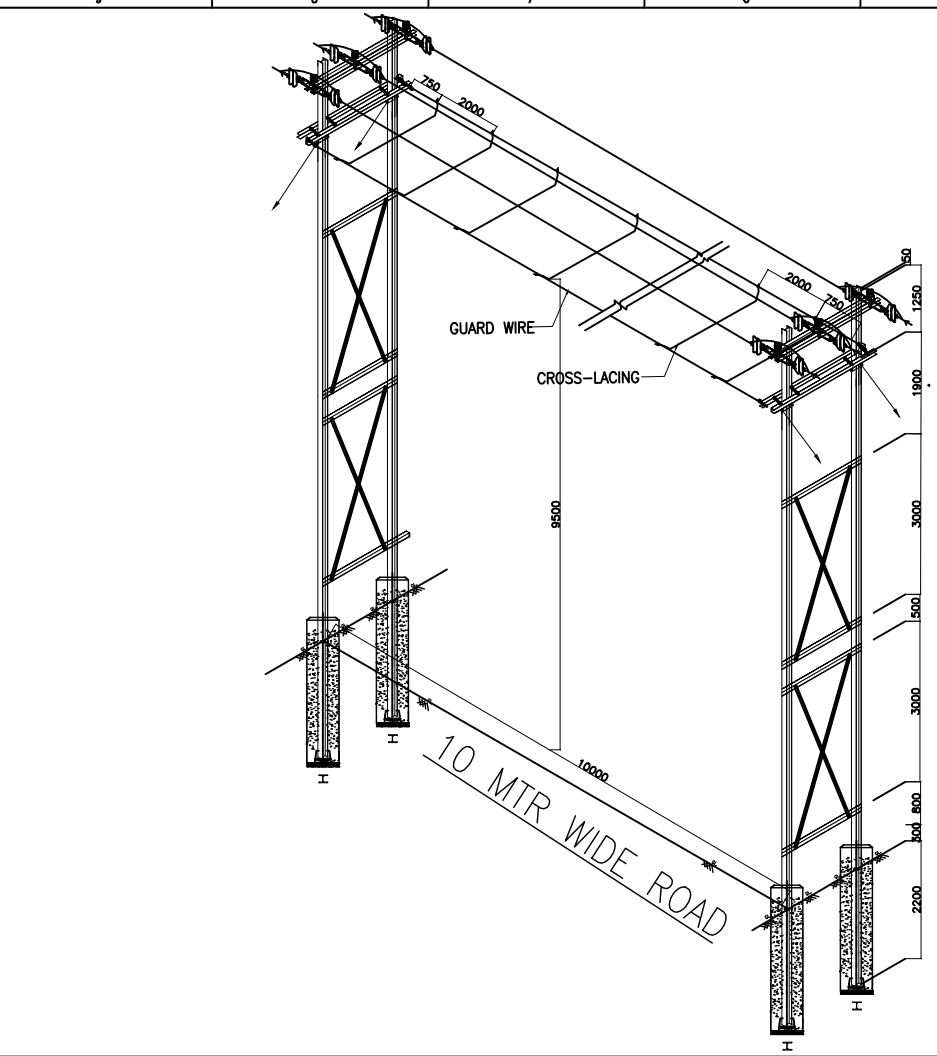
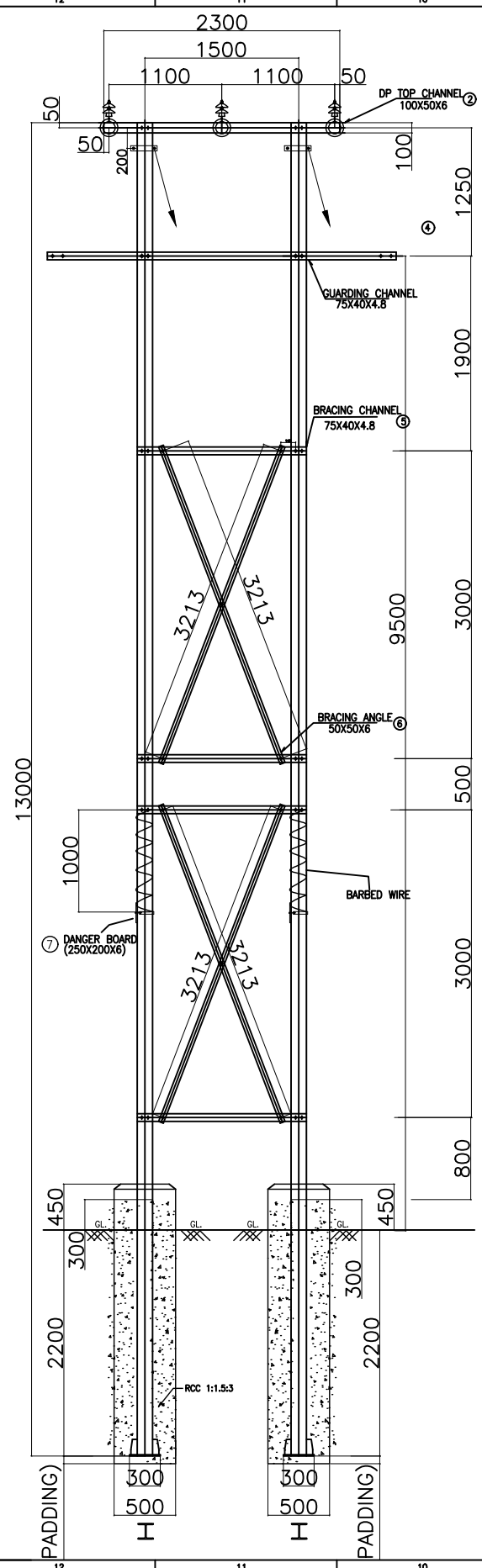
⑨ EYE HOOK



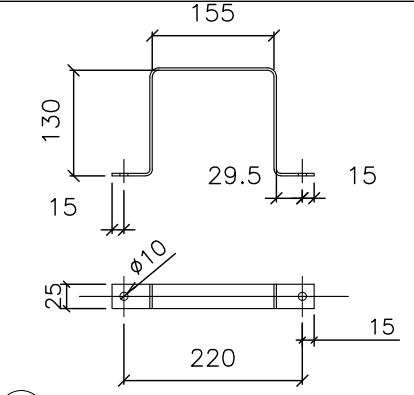
④ STRAIGHT CROSSARM TOP (100x50x6)

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON SINGLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME	
SCALE : NTS		DESIGN:	PHIROJ UTTARAY, E&Q
ISSUE DT: 31/05/2021		DRAWN:	J SANGRAM, E&Q
		CHECKED:	K BHARDWAJ, E&Q
		APPROVED:	P GARG, E&Q
		DRAWING NO: TPCODL-MVD-0009 REV NO: Sheet: 2 of 2	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



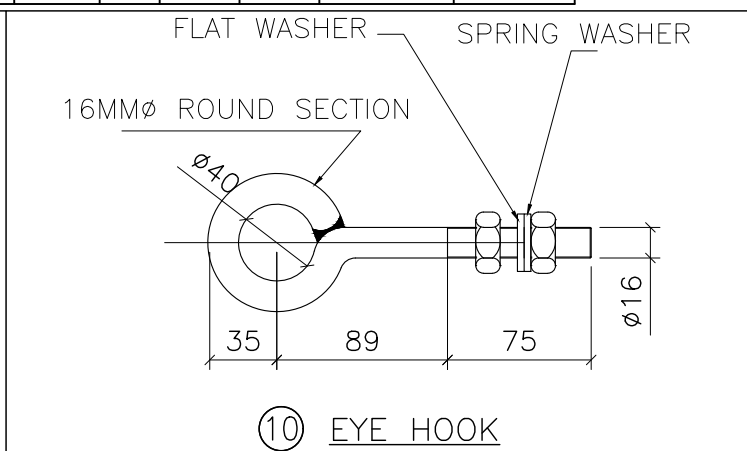
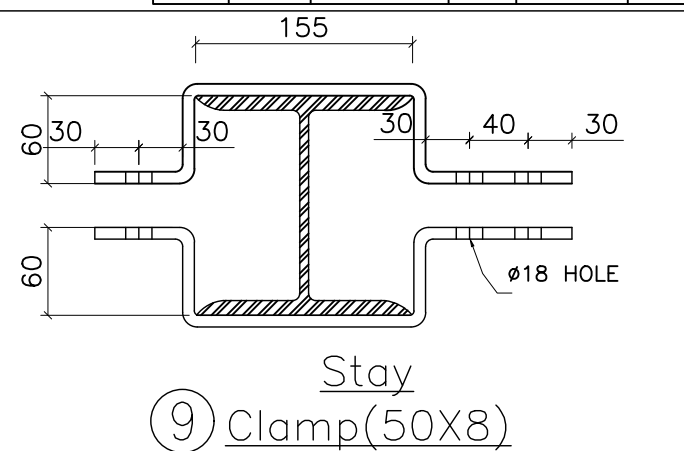
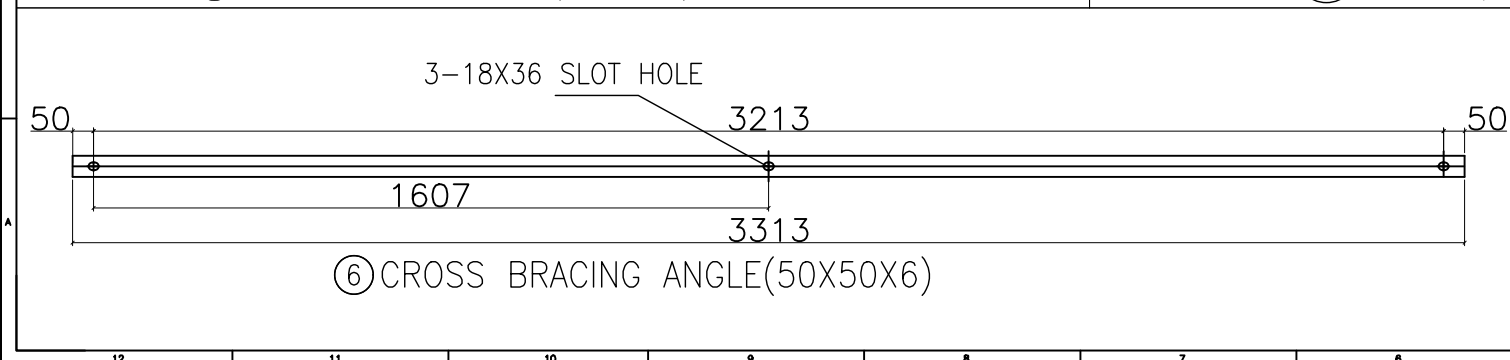
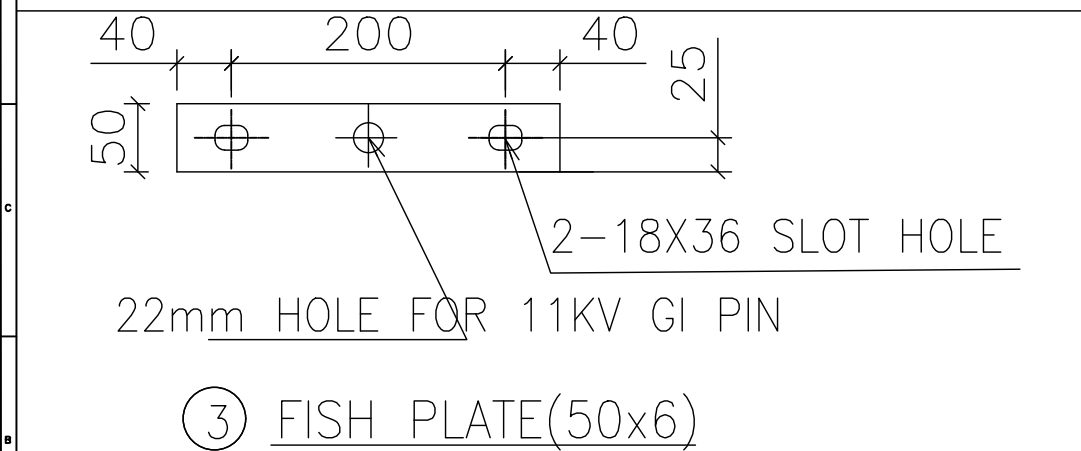
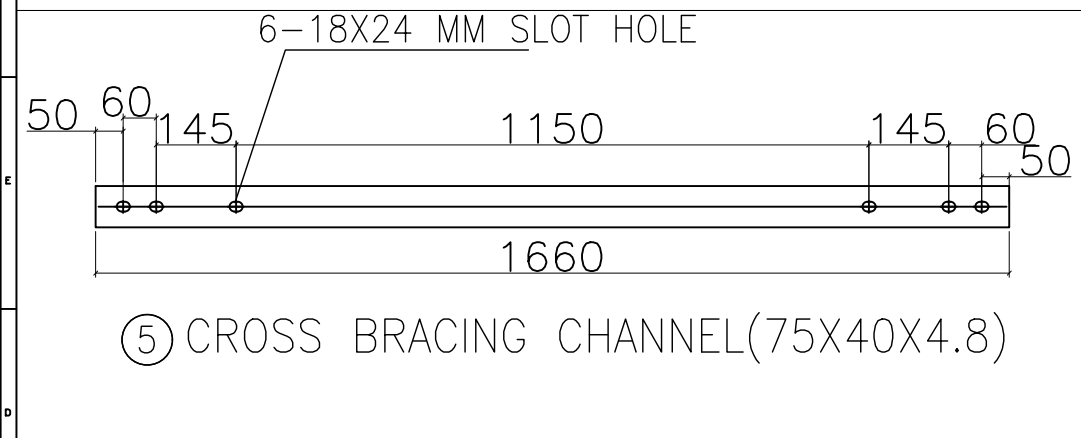
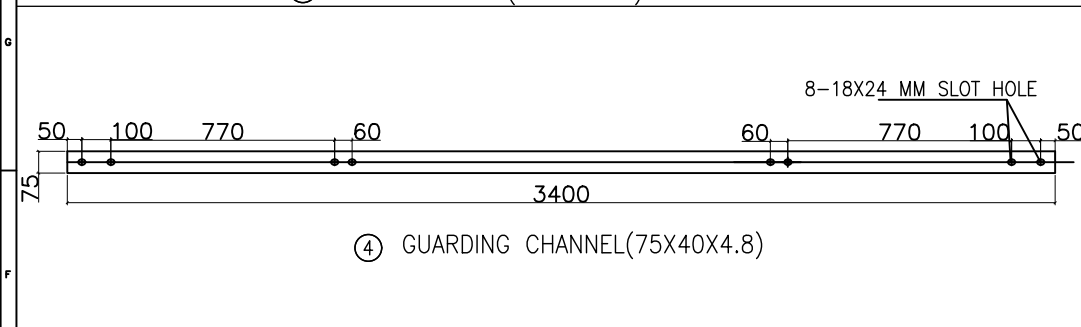
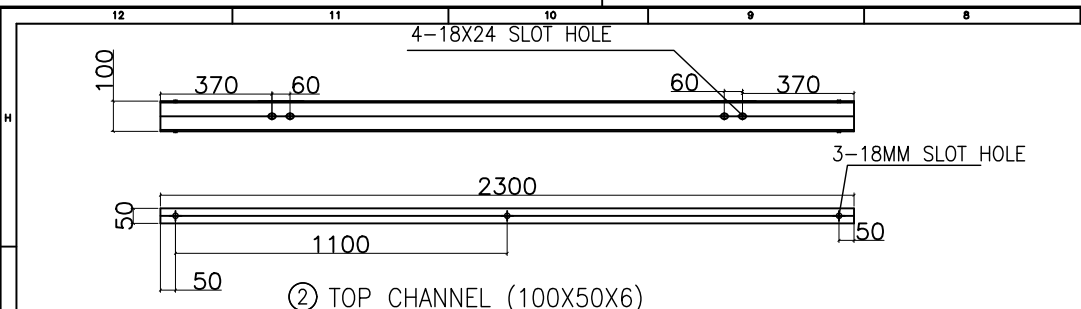
7 DANGER BOARD (250X220X3)X1N0.



8 BACK CLAMP FOR DANGER BOARD(25X3)

TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED		TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.	
TITLE:- 11KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON DOUBLE POLE(USING 13MTR 150RSJ/WPB 160)		NAME	
SCALE : NTS		DESIGN:	PHIROJ UTTARAY, E&Q
ISSUE DT: 31/05/2021		DRAWN:	J SANGRAM, E&Q
		CHECKED:	K BHARDWAJ, E&Q
		APPROVED:	P GARG, E&Q
		DRAWING NO: TPCODL-MVD-0010 REV NO: Sheet: 1 of 2	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)



BOM OF GI ITEMS OF 11KV ROAD CROSSING ON DOUBLE POLE							
ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	4	34.6 / 30.44	1799.2 / 1582.88
2	DP TOP CHANNEL	100x50x6	CHANNEL	2300	4	9.5600	21.988
3	FISH PLATE	50x6	FLAT	280	12	2.3600	0.661
4	CHANNEL FOR GUARDING	75x40x4.8	CHANNEL	3400	4	7.1400	24.276
5	CROSS BRACING	75x40x4.8	CHANNEL	1660	8	7.1400	11.852
6	CROSS BRACING	50x50x6	ANGLE	3313	8	4.5000	14.909
7	DANGER BOARD	200x6	FLAT	250	4	9.4200	2.355
8	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	4	0.5900	0.301
9	STAY CLAMP	50x8	FLAT	551	4	3.1400	1.730
10	EYE HOOK(Along with 2nuts,1 flat & spring washer each)		M16 ROD	305	4	1.5700	0.479
10	8 SWG		WIRE	42000	1	0.1310	5.502
11	10 SWG		WIRE	22200	1	0.0820	1.820
12	PIPE EARTHING		PIPE	3000	4	0.0000	0.000
TOTAL WT EXCEPT POLE							433.855

NUT & BOLTS REQUIRED												
NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	GUARDING CROSS ARM	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				20				4	24	0.134	3.216
M16	90						12			12	0.161	1.932
M16	200	8		32				8		48	0.331	15.888
M8	70				0	8				8	0.033	0.264
M16	FLAT WASHER									168	0.014	2.352
M16	SPRING WASHER									168	0.009	1.512
M8	FLAT WASHER									16	0.005	0.080
M8	SPRING WASHER									16	0.002	0.032
TOTAL WEIGHT												25.276

TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

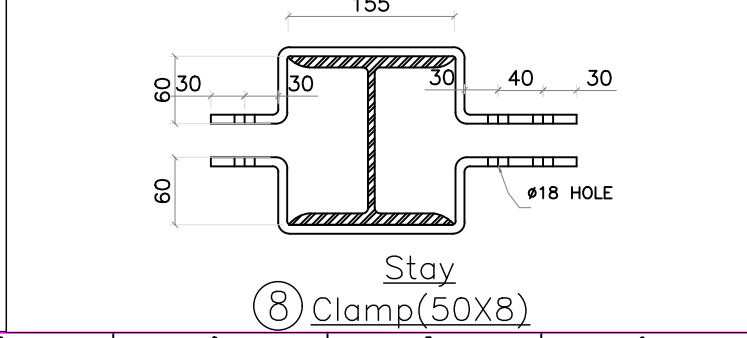
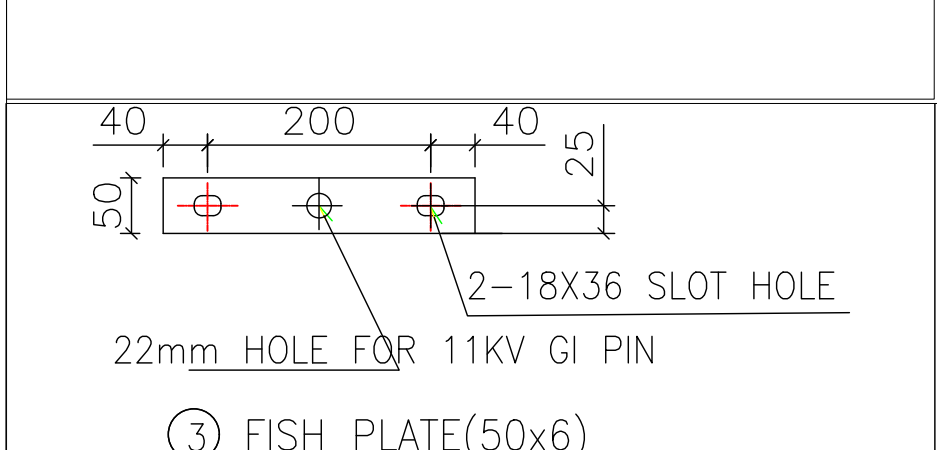
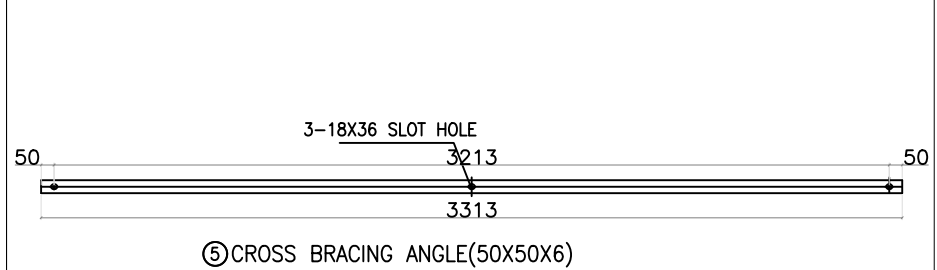
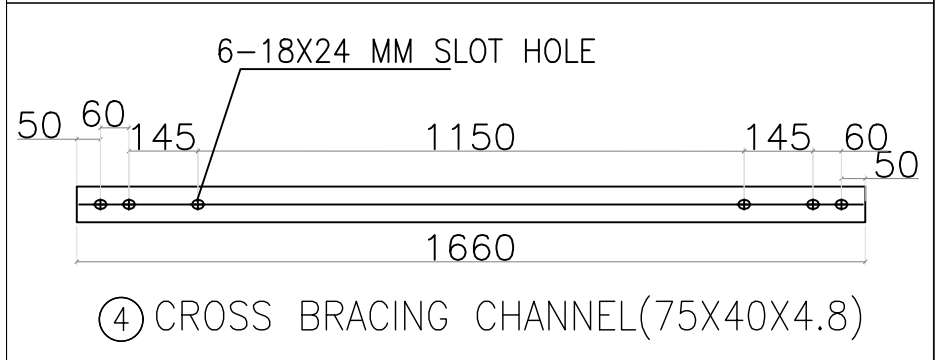
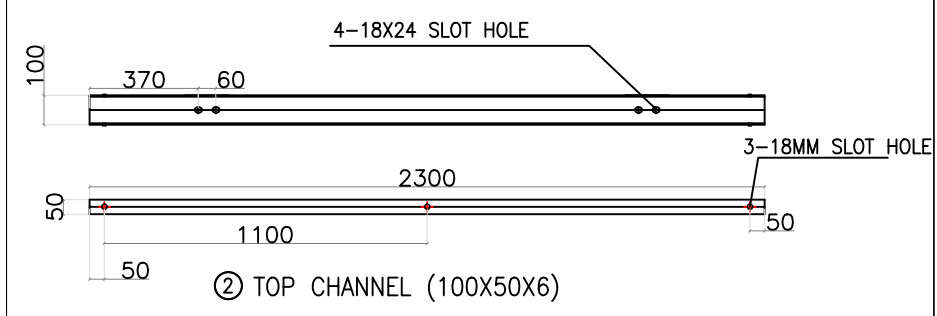
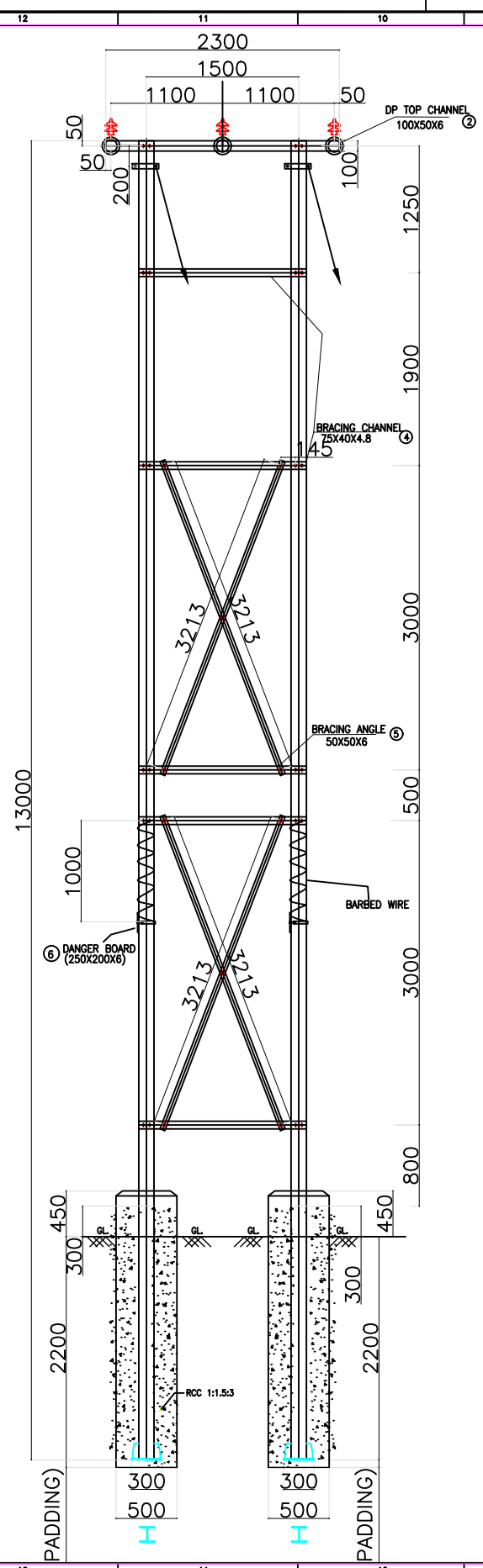
TATA POWER
CENTRAL ODISHA DISTRIBUTION LTD.

TITLE:-
11KV LINE PROTECTIVE GUARDING ACROSS MAJOR ROAD CROSSINGS ON DOUBLE POLE(USING 13MTR 150RSJ/WPB 160)

NAME	
DESIGN:	PHIROJ UTTARAY, E&Q
DRAWN:	J SANGRAM, E&Q
CHECKED:	K BHARDWAJ, E&Q
APPROVED:	P GARG, E&Q
DRAWING NO: TPCODL-MVD-0010 REV NO: Sheet: 2 of 2	

SCALE : NTS ISSUE DT: 31/05/2021

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)

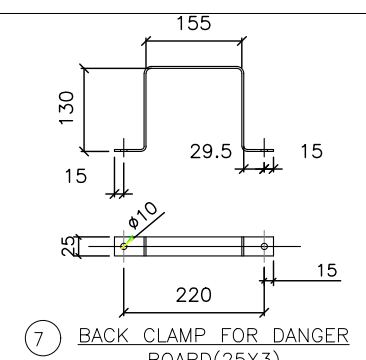
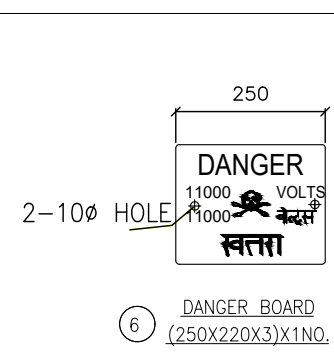


BOM OF GI ITEMS OF 11KV 13MTR INLINE DOUBLE POLE(FOR SPACE CONSTRAINT)

ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	2	34.6 / 30.44	449.8 / 395.72	899.6 / 791.44
2	DP TOP CHANNEL	100x50x6	CHANNEL	2300	2	9.5600	21.988	43.976
3	FISH PLATE	50x6	FLAT	280	6	2.3600	0.661	3.965
4	CROSS BRACING	75x40x4.8	CHANNEL	1660	5	7.1400	11.852	59.262
5	CROSS BRACING	50x50x6	ANGLE	3313	4	4.5000	14.909	59.634
6	DANGER BOARD	250x200x6	FLAT	250	2	9.4200	2.355	4.710
7	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	2	0.5900	0.301	0.602
8	STAY CLAMP	50x8	FLAT	551	2	3.1400	1.730	3.460
9	PIPE EARTHING		PIPE	3000	2	0.0000	0.000	0.000
							TOTAL WT EXCEPT POLE	175.609

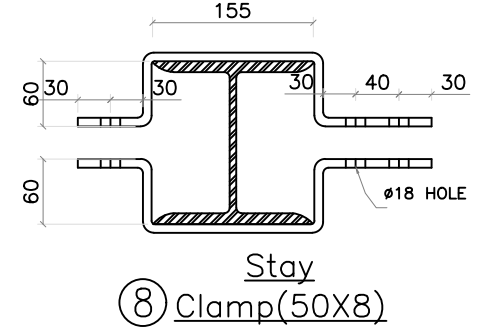
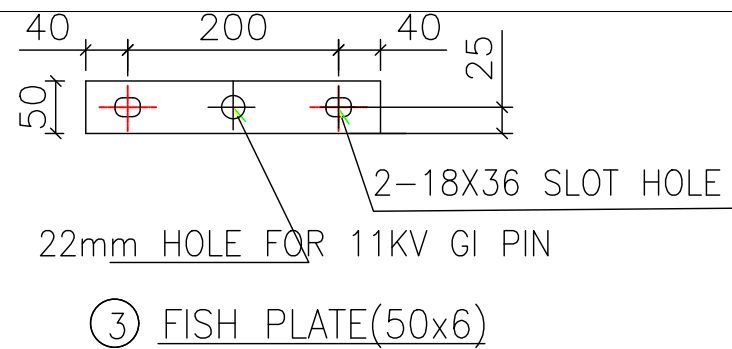
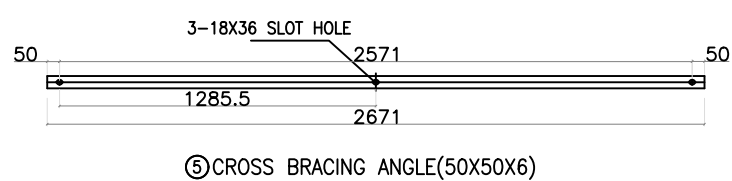
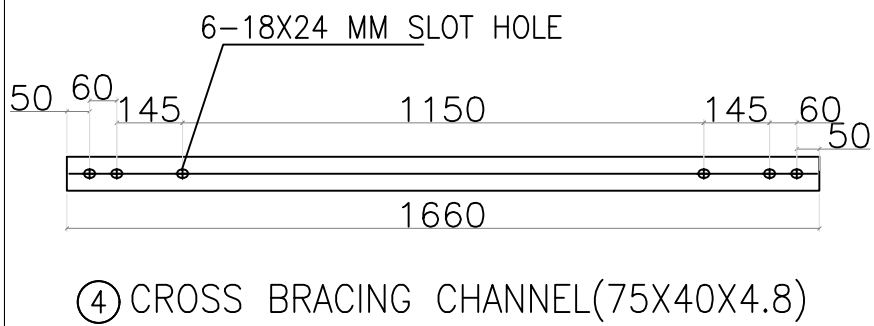
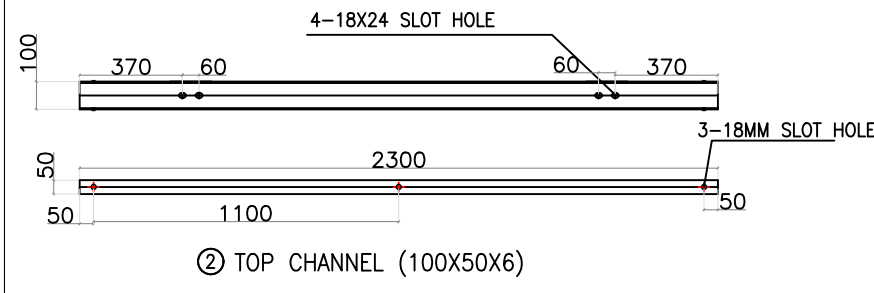
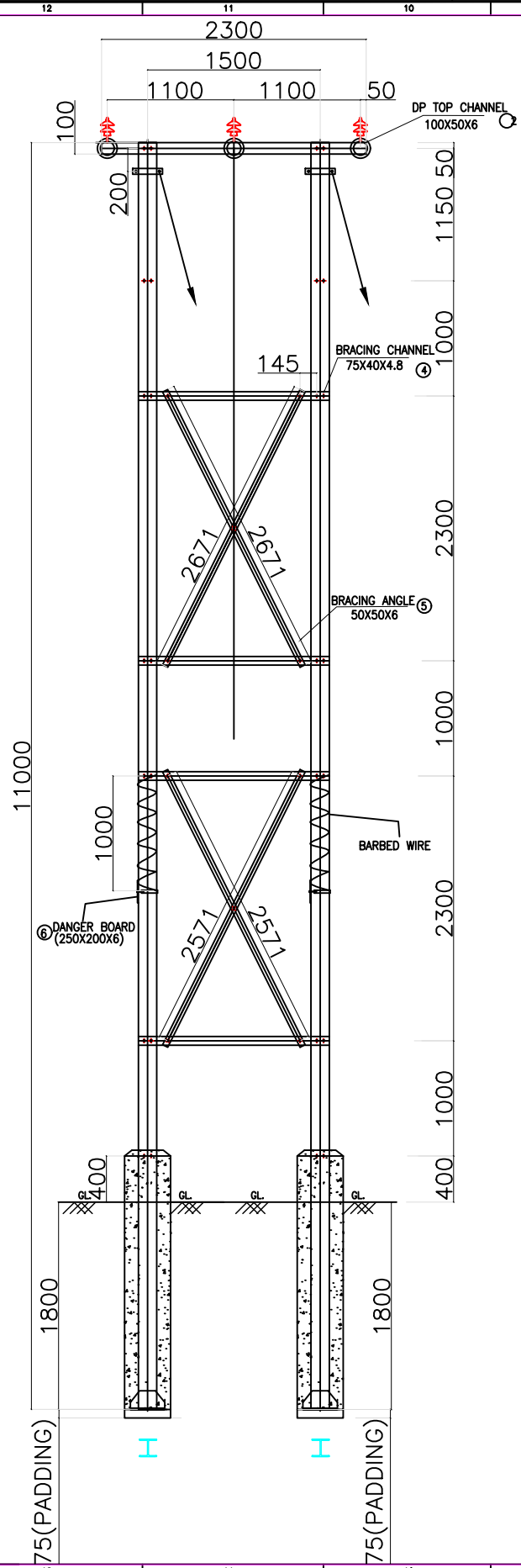
NUT & BOLTS REQUIRED

NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				10		2		12	0.134	1.608
M16	90						6		6	0.161	0.966
M16	200	4	3	16					23	0.331	7.613
M8	70				0	4			4	0.033	0.132
M16	FLAT WASHER								82	0.014	1.148
M16	SPRING WASHER								82	0.009	0.738
M8	FLAT WASHER								8	0.005	0.040
M8	SPRING WASHER								8	0.002	0.016
									TOTAL WEIGHT		12.261



<p>TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED</p>		<p>TATA POWER CENTRAL ODISHA DISTRIBUTION LTD.</p>	
<p>TITLE:- 11KV LINE DP USING 13 MTR 150X150 RSJ/WPB 160(FOR SPECIAL CASE OF HEIGHT REQUIREMENT AND SPACE CONSTRAINT)</p>		<p>NAME</p>	
<p>SCALE : NTS</p>		<p>DESIGN:</p>	<p>PHIROJ UTTARAY, E&Q</p>
<p>ISSUE DT: 31/05/2021</p>		<p>DRAWN:</p>	<p>J SANGRAM, E&Q</p>
		<p>CHECKED:</p>	<p>K BHARDWAJ, E&Q</p>
		<p>APPROVED:</p>	<p>P GARG, E&Q</p>
		<p>DRAWING NO: TPCODL-MVD-0011 REV NO:</p>	

1. All Dimensions are in MM & Weights in KG unless Specified 2. All items are GI (as per TS)

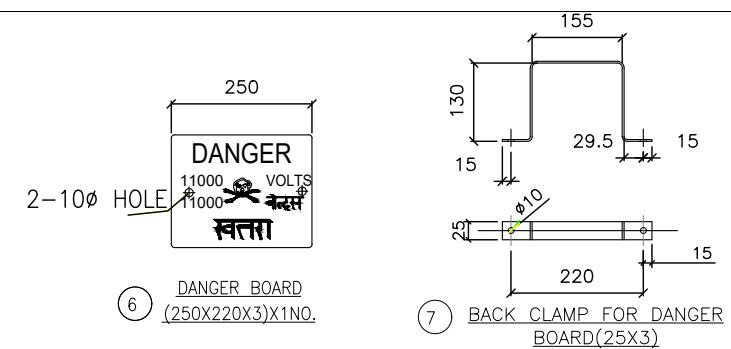


BOM OF GI ITEMS OF 11KV 11MTR INLINE DOUBLE POLE(FOR SPACE CONSTRAINT)

ITEM NO	DESCRIPTION (mm)	SECTION	MATERIALS	LENGTH (mm)	QTY (Nos)	WT (KG/MTR)	WT/ ITEM (KG)	TOTAL WT. (KG)
1	RSJ POLE/ WPB 160	150x150/160x152	JOIST	13000	2	34.6 / 30.44	449.8/ 395.72	899.6/ 791.44
2	DP TOP CHANNEL	100x50x6	CHANNEL	2300	2	9.5600	21.988	43.976
3	FISH PLATE	50x6	FLAT	280	6	2.3600	0.661	3.965
4	CROSS BRACING	75x40x4.8	CHANNEL	1660	4	7.1400	11.852	47.410
5	CROSS BRACING	50x50x6	ANGLE	2671	4	4.5000	12.020	48.078
6	DANGER BOARD	200x6	FLAT	250	2	9.4200	2.355	4.710
7	BACK CLAMP FOR DANGER BOARD	25x3	FLAT	510	2	0.5900	0.301	0.602
8	STAY CLAMP	50x8	FLAT	551	2	3.1400	1.730	3.460
9	PIPE EARTHING		PIPE	3000	2	0.0000	0.000	0.000
							TOTAL WT EXCEPT POLE	152.200

NUT & BOLTS REQUIRED

NUT & BOLTS	LENGTH (mm)	DP TOP CHANNEL	FISH PLATE	CROSS BRACING CHANNEL	CROSS BRACING ANGLE	DANGER BOARD	STAY CLAMP	EARTHING	TOTAL (No)	UNIT WT (Kg)	TOTAL WT. (Kg)
M16	50				10				12	0.134	1.608
M16	90						6		6	0.161	0.966
M16	200	4	3	16					23	0.331	7.613
M8	70				0	4			4	0.033	0.132
M16	FLAT WASHER								82	0.014	1.148
M16	SPRING WASHER								82	0.009	0.738
M8	FLAT WASHER								8	0.005	0.040
M8	SPRING WASHER								8	0.002	0.016
									TOTAL WEIGHT		12.261

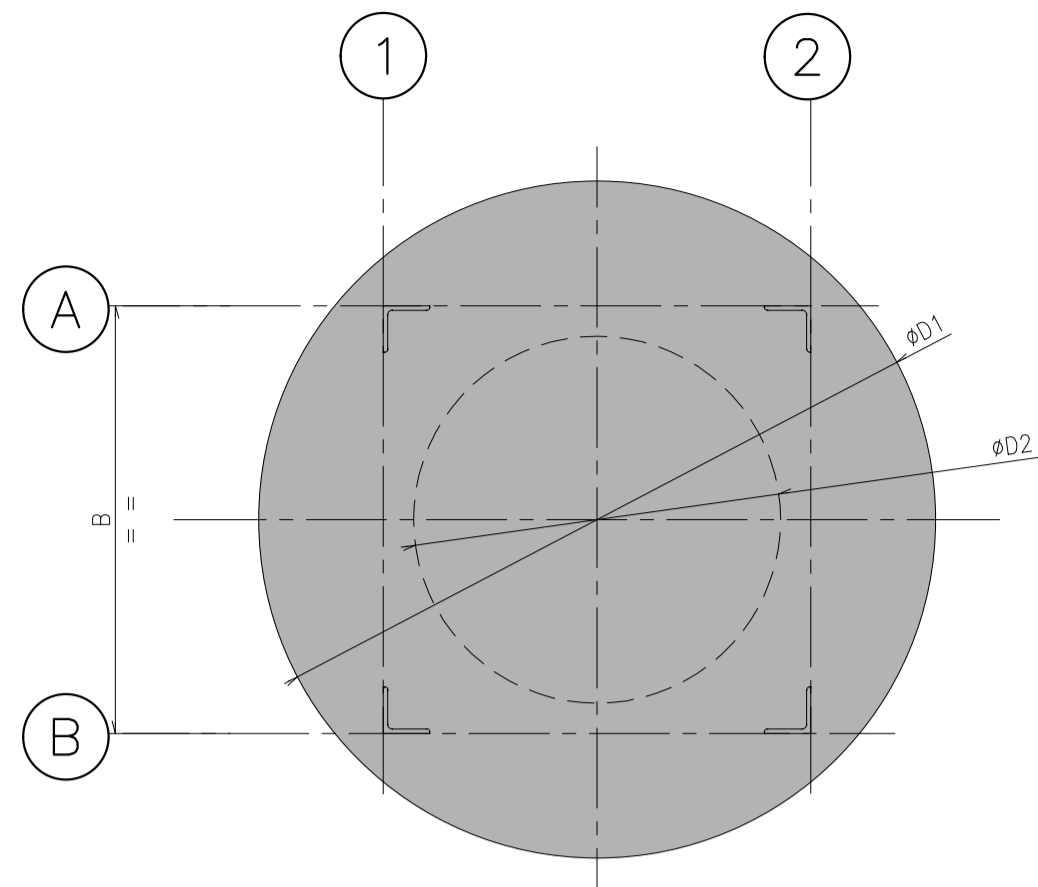


TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

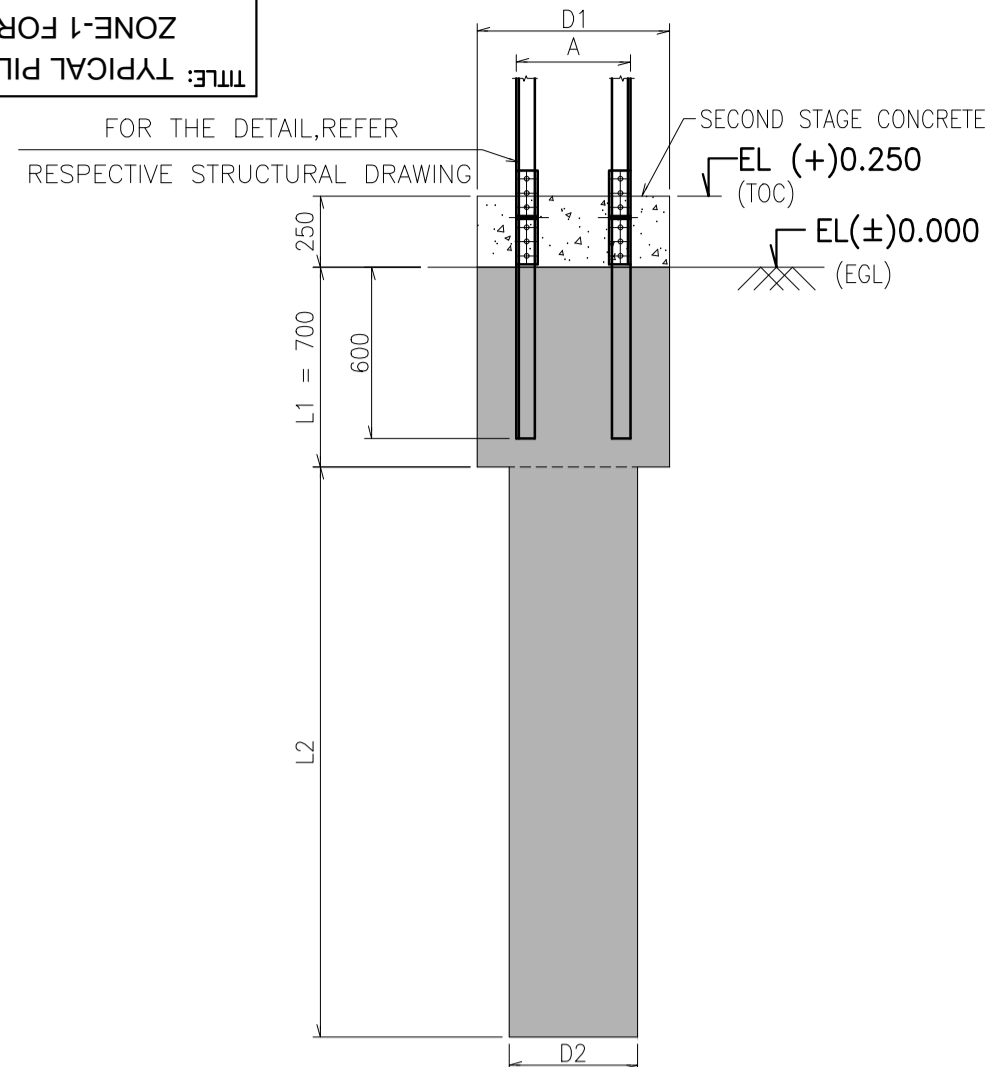
TATA POWER
CENTRAL ODISHA DISTRIBUTION LTD.

TITLE:- 11KV LINE DP USING 11 MTR 150X150 RSJ/WPB 160(FOR SPACE CONSTRAINT CASES)	NAME
DESIGN:-	PHIROJ UTTARAY, E&Q
DRAWN:-	J SANGRAM, E&Q
CHECKED:-	K BHARDWAJ, E&Q
APPROVED:-	P GARG, E&Q
SCALE : NTS	DRAWING NO: TPCODL-MVD-0012 REV NO:
ISSUE DT: 31/05/2021	

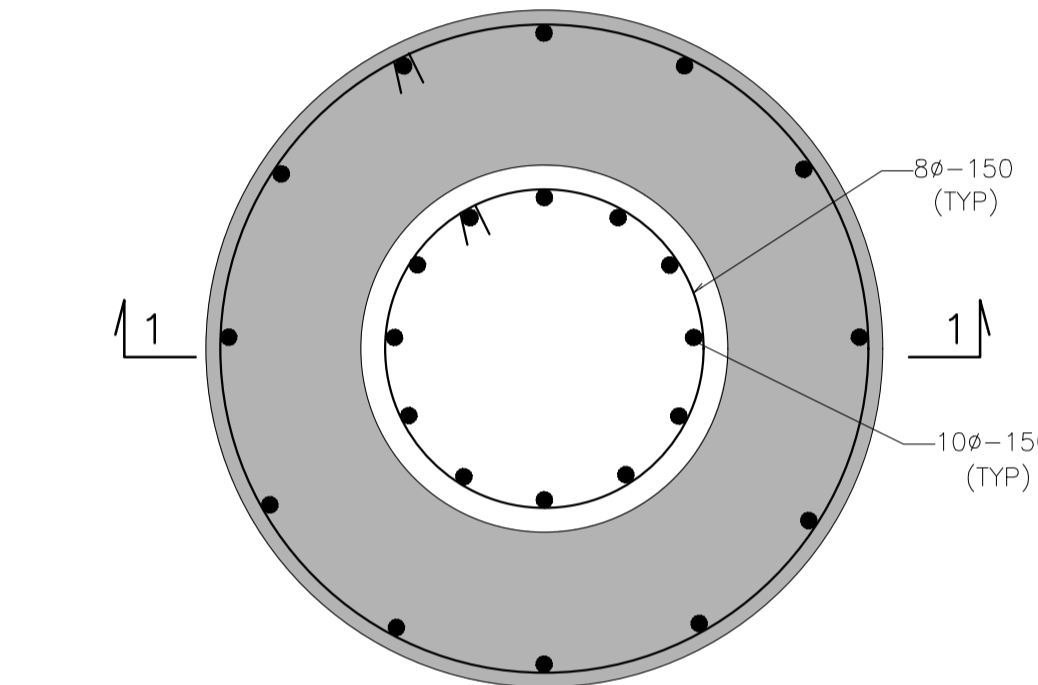
TITLE: TYPICAL PILE DETAIL FOR FOUR POLE STRUCTURE OF ZONE-1 FOR SINGLE & DOUBLE CIRCUIT OHL NETWORK
 DWG NO TCE.12137B - CV-3000-DWG-30002



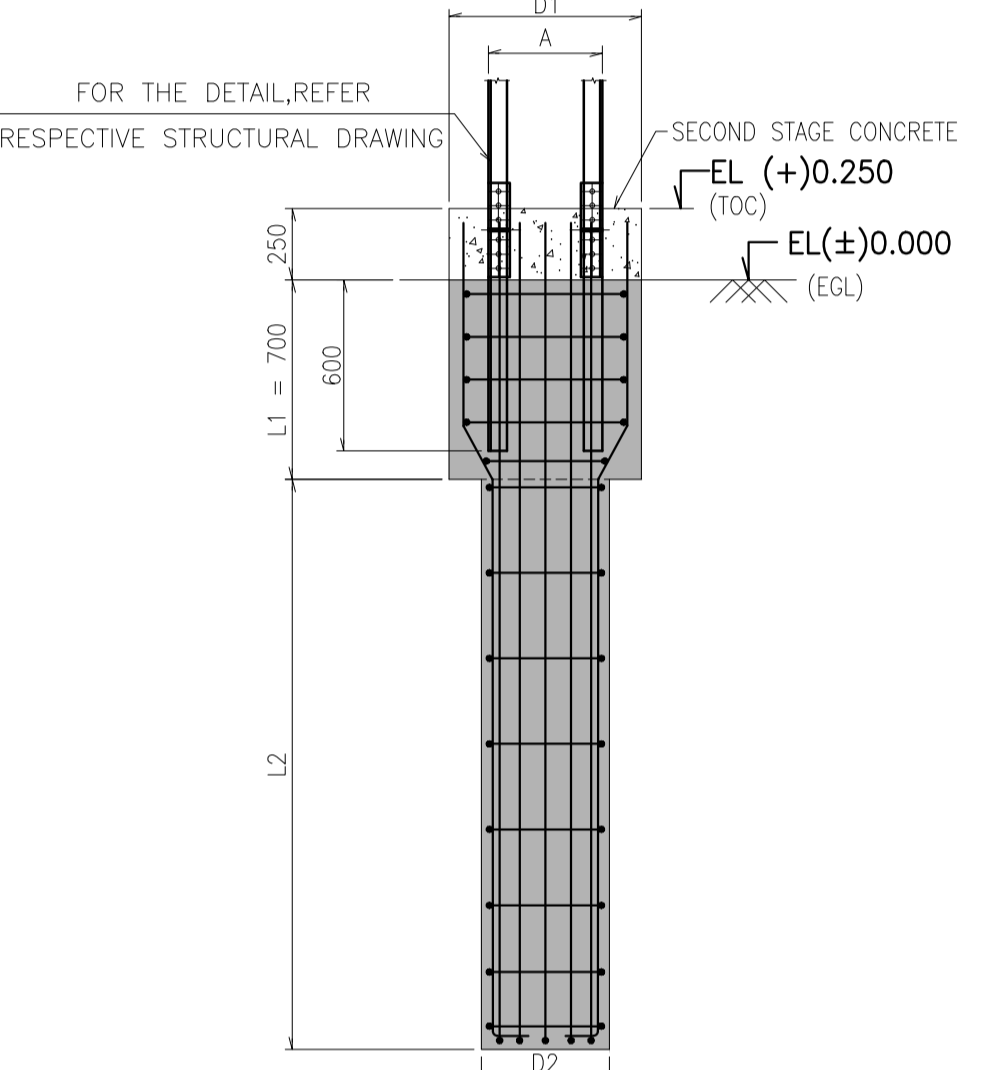
TYPICAL PLAN OF PILE (SCALE 1:10)



TYPICAL SECTION OF PILE (SCALE 1:25)



TYPICAL REINFORCEMENT DETAIL OF PILE (SCALE 1:10)



SECTION 1-1 (SCALE 1:25)

PILE DETAILS FOR ZONE-1											
Type of pole	SC/DC	Voltage	Conductor size (sq. mm.)	Angle of deviation	BASE WIDTH		PILE DIAMETER				
					A mm	B mm	Diameter (D ₁) mm	Diameter (D ₂) mm	Type of soil	Length of pile (L ₁) mm	Length of pile below ground (L ₂) mm
Angle	SC	33kv	232	2-15	450	450	750	450	Loose sand	700	2800
					450	450	750	450	Medium sand	700	2800
					450	450	750	450	Dense sand	700	2700
			15-30	450	450	750	450	Loose sand	700	2800	
				450	450	750	450	Medium sand	700	2700	
				450	450	750	450	Dense sand	700	2600	
		30-60	450	450	750	450	Loose sand	700	2800		
			450	450	750	450	Medium sand	700	2700		
			450	450	750	450	Dense sand	700	2600		
		148	2-15	450	450	750	450	Loose sand	700	2900	
				450	450	750	450	Medium sand	700	2800	
				450	450	750	450	Dense sand	700	2700	
	15-30		450	450	750	450	Loose sand	700	2800		
			450	450	750	450	Medium sand	700	2700		
			450	450	750	450	Dense sand	700	2600		
	30-60	450	450	750	450	Loose sand	700	2600			
		450	450	750	450	Medium sand	700	2500			
		450	450	750	450	Dense sand	700	2400			
	11kv	100	2-15	400	400	675	450	Loose sand	700	2400	
				400	400	675	450	Medium sand	700	2300	
				400	400	675	450	Dense sand	700	2200	
			15-30	400	400	675	450	Loose sand	700	2100	
				400	400	675	450	Medium sand	700	2000	
				400	400	675	450	Dense sand	700	1900	
30-60		400	400	675	450	Loose sand	700	2100			
		400	400	675	450	Medium sand	700	2000			
		400	400	675	450	Dense sand	700	1900			
80		2-15	400	400	675	450	Loose sand	700	2200		
			400	400	675	450	Medium sand	700	2100		
			400	400	675	450	Dense sand	700	2000		
	15-30	400	400	675	450	Loose sand	700	2100			
		400	400	675	450	Medium sand	700	2000			
		400	400	675	450	Dense sand	700	1900			
30-60	400	400	675	450	Loose sand	700	2000				
	400	400	675	450	Medium sand	700	1900				
	400	400	675	450	Dense sand	700	1800				
33kv	232	2-15	600	600	950	450	Loose sand	700	3500		
			600	600	950	450	Medium sand	700	3400		
			600	600	950	450	Dense sand	700	3300		
		15-30	600	600	950	450	Loose sand	700	3200		
			600	600	950	450	Medium sand	700	3100		
			600	600	950	450	Dense sand	700	3000		
	30-60	600	600	950	450	Loose sand	700	3700			
		600	600	950	450	Medium sand	700	3600			
		600	600	950	450	Dense sand	700	3500			
	148	2-15	600	600	950	450	Loose sand	700	4000		
			600	600	950	450	Medium sand	700	3900		
			600	600	950	450	Dense sand	700	3800		
15-30		600	600	950	450	Loose sand	700	3200			
		600	600	950	450	Medium sand	700	3100			
		600	600	950	450	Dense sand	700	3000			
30-60	600	600	950	450	Loose sand	700	3700				
	600	600	950	450	Medium sand	700	3600				
	600	600	950	450	Dense sand	700	3500				
DC	33kv	2-15	450	450	750	450	Loose sand	700	3500		
			450	450	750	450	Medium sand	700	3400		
			450	450	750	450	Dense sand	700	3300		
		15-30	450	450	750	450	Loose sand	700	3200		
			450	450	750	450	Medium sand	700	3100		
			450	450	750	450	Dense sand	700	3000		
	30-60	450	450	750	450	Loose sand	700	3700			
		450	450	750	450	Medium sand	700	3600			
		450	450	750	450	Dense sand	700	3500			
	11kv	80	2-15	450	450	750	450	Loose sand	700	3500	
				450	450	750	450	Medium sand	700	3400	
				450	450	750	450	Dense sand	700	3300	
15-30		450	450	750	450	Loose sand	700	2800			
		450	450	750	450	Medium sand	700	2700			
		450	450	750	450	Dense sand	700	2600			
30-60	450	450	750	450	Loose sand	700	2800				
	450	450	750	450	Medium sand	700	2700				
	450	450	750	450	Dense sand	700	2600				

LEGENDS
 SC- SINGLE CIRCUIT
 DC- DOUBLE CIRCUIT
 TOC- TOP OF CONCRETE
 EGL- EXISTING GROUND LEVEL

NOTES
 1. ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS UNLESS NOTED.
 2. EL (±)0.000M LEVEL CORRESPONDS TO EGL (EXISTING GROUND LEVEL).
 3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL STRUCTURAL DRAWINGS.
 4. PILES SHALL BE BORED CAST IN SITU CONCRETE PILES.
 5. GRADE OF CONCRETE SHALL BE M20 & GRADE OF STEEL SHALL BE 415 MPA.
 6. CLEAR COVER TO LINKS SHALL BE 40MM.

PILE DETAILS FOR ZONE-1											
Type of pole	SC/DC	Voltage	Conductor size (sq. mm.)	Angle of deviation	BASE WIDTH		PILE DIAMETER				
					A mm	B mm	Diameter (D ₁) mm	Diameter (D ₂) mm	Type of soil	Length of pile (L ₁) mm	Length of pile below ground (L ₂) mm
Suspension	SC	33kv	232	0-2	400	400	675	450	Loose sand	700	2300
					400	400	675	450	Medium sand	700	2200
					400	400	675	450	Dense sand	700	2100
			15-30	400	400	675	450	Loose sand	700	2100	
				400	400	675	450	Medium sand	700	2000	
				400	400	675	450	Dense sand	700	1900	
		30-60	400	400	675	450	Loose sand	700	2000		
			400	400	675	450	Medium sand	700	2100		
			400	400	675	450	Dense sand	700	1900		
		11kv	80	0-2	400	400	675	450	Loose sand	700	2000
					400	400	675	450	Medium sand	700	1800
					400	400	675	450	Dense sand	700	1700
	55		0-2	400	400	675	450	Loose sand	700	1800	
				400	400	675	450	Medium sand	700	1700	
				400	400	675	450	Dense sand	700	1600	
	DC	33kv	232	0-2	450	450	750	450	Loose sand	700	2700
					450	450	750	450	Medium sand	700	2600
					450	450	750	450	Dense sand	700	2500
			148	450	450	750	450	Loose sand	700	2700	
				450	450	750	450	Medium sand	700	2600	
				450	450	750	450	Dense sand	700	2500	
		11kv	100	0-2	450	450	750	450	Loose sand	700	2400
					450	450	750	450	Medium sand	700	2300
					450	450	750	450	Dense sand	700	2200
80			0-2	450	450	750	450	Loose sand	700	2300	
				450	450	750	450	Medium sand	700	2200	
				450	450	750	450	Dense sand	700	2100	
55	0-2	450	450	750	450	Loose sand	700	2200			
		450	450	750	450	Medium sand	700	2100			
		450	450	750	450	Dense sand	700	2000			

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 TP CENTRAL ODISHA DISTRIBUTION LIMITED

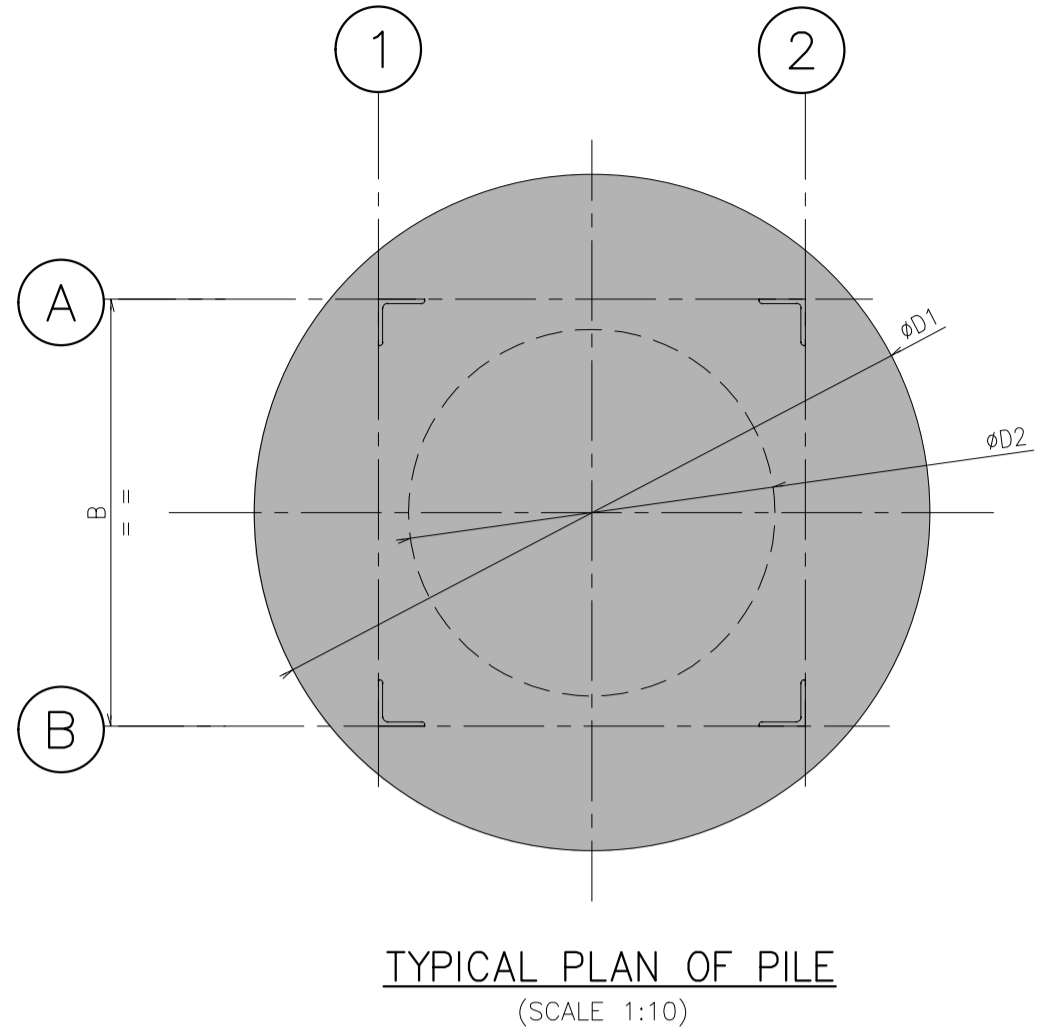
TYPICAL PILE DETAIL FOR FOUR POLE STRUCTURE OF ZONE-1 FOR SINGLE & DOUBLE CIRCUIT OHL NETWORK

TATA CONSULTING ENGINEERS LIMITED MUMBAI

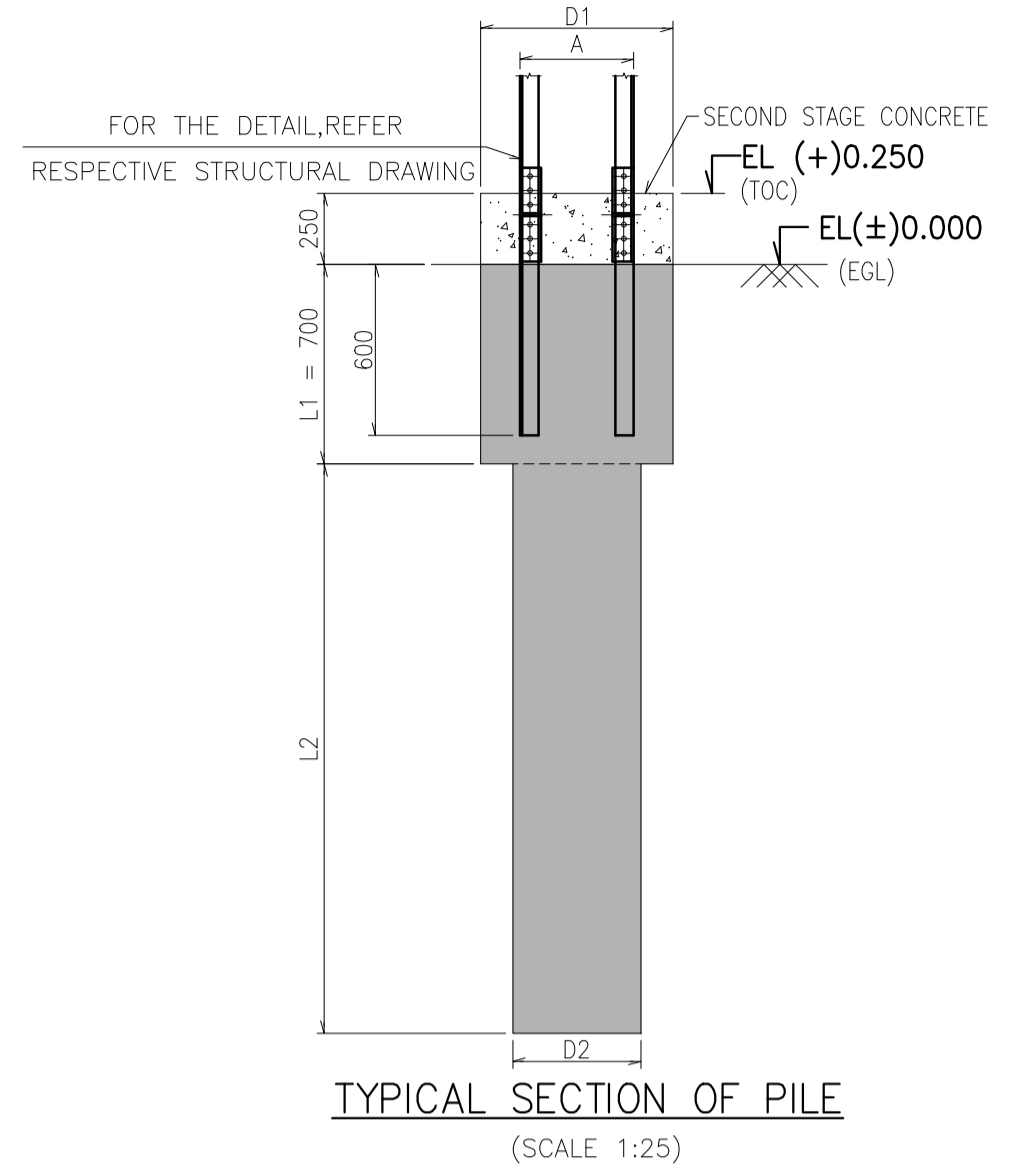
FOR RO ISSUE ONLY			ISSUE	REVISIONS				DRN	CLEARED				DRN	REVISIONS				DRN	CLEARED						
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 SCALE: AS SHOWN APPROVED DATE (PO ISSUE) 14/04/2022
 DELCENTRE-DISC:CV DATE (CURRENT ISSUE) 24/09/2022
 DRN: RF SP PKR PROJECTION
 CHD: RK DWG NO TCE.12137B - CV-3000-DWG-30002 ISSUE P1

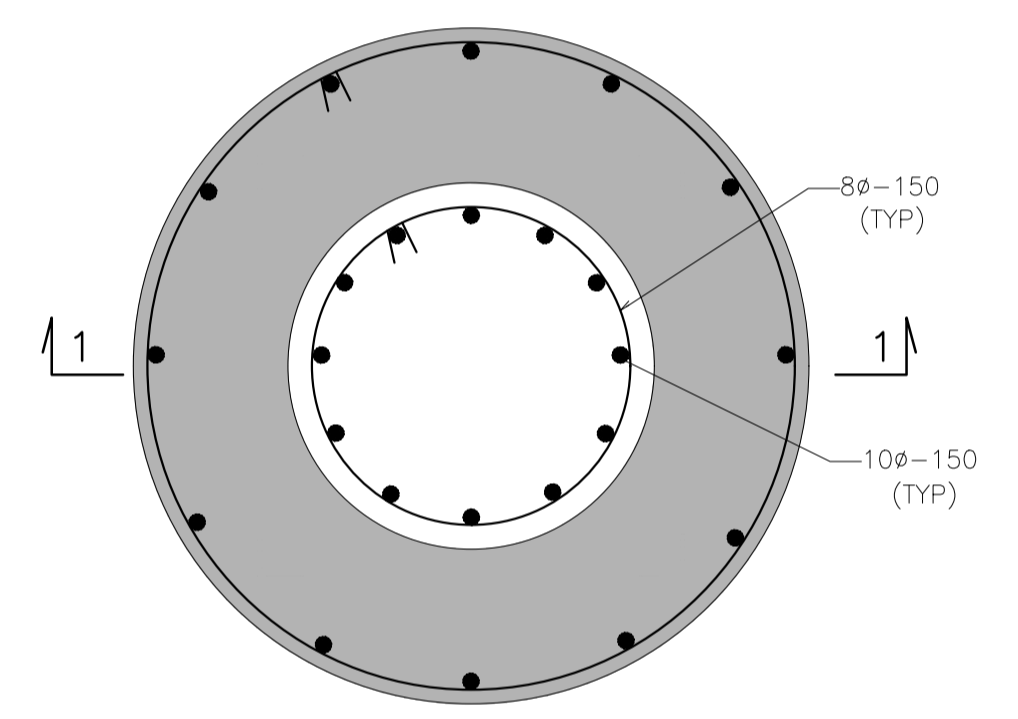
TPCL: TYPICAL PILE DETAIL FOR FOUR POLE STRUCTURE OF ZONE-2 FOR SINGLE & DOUBLE CIRCUIT OHL NETWORK
DWS NO



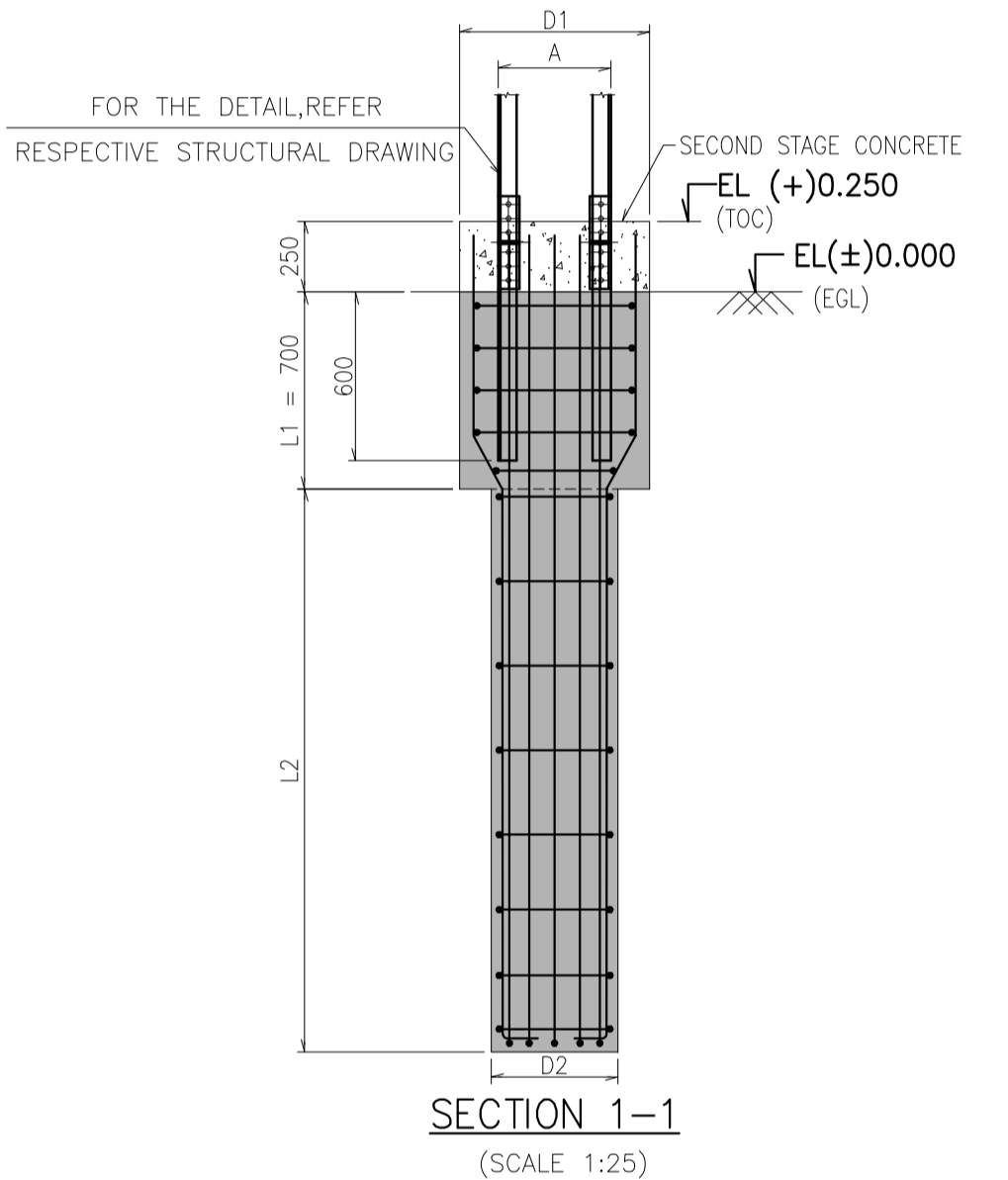
TYPICAL PLAN OF PILE (SCALE 1:10)



TYPICAL SECTION OF PILE (SCALE 1:25)



TYPICAL REINFORCEMENT DETAIL OF PILE (SCALE 1:10)



SECTION 1-1 (SCALE 1:25)

PILE DETAILS FOR ZONE-2											
Type of pole	SC/DC	Voltage	Conductor size (sq. mm)	Angle of deviation	BASE WIDTH		PILE DIAMETER				
					A mm	B mm	Diameter (D ₁) mm	Diameter (D ₂) mm	Type of soil	Length of pile (L1) mm	Length of pile below ground (L2) mm
Suspension	SC	33kv	232	0.2	400	400	675	450	Loose sand	700	1500
					400	400	675	450	Medium sand	700	1400
					400	400	675	450	Dense sand	700	1300
			148	0.2	400	400	675	450	Loose sand	700	1500
					400	400	675	450	Medium sand	700	1400
					400	400	675	450	Dense sand	700	1300
		11kv	100	0.2	400	400	675	450	Loose sand	700	1800
					400	400	675	450	Medium sand	700	1700
					400	400	675	450	Dense sand	700	1600
			80	0.2	400	400	675	450	Loose sand	700	1800
					400	400	675	450	Medium sand	700	1700
					400	400	675	450	Dense sand	700	1600
	55	0.2	400	400	675	450	Loose sand	700	1900		
			400	400	675	450	Medium sand	700	1800		
			400	400	675	450	Dense sand	700	1700		
		33kv	232	0.2	450	450	750	450	Loose sand	700	2300
					450	450	750	450	Medium sand	700	2200
					450	450	750	450	Dense sand	700	2100
	148		0.2	450	450	750	450	Loose sand	700	2000	
				450	450	750	450	Medium sand	700	2000	
				450	450	750	450	Dense sand	700	2000	
	11kv	100	0.2	450	450	750	450	Loose sand	700	1900	
				450	450	750	450	Medium sand	700	1800	
				450	450	750	450	Dense sand	700	1700	
80		0.2	450	450	750	450	Loose sand	700	1800		
			450	450	750	450	Medium sand	700	1700		
			450	450	750	450	Dense sand	700	1600		
55	0.2	450	450	750	450	Loose sand	700	1900			
		450	450	750	450	Medium sand	700	1800			
		450	450	750	450	Dense sand	700	1700			

PILE DETAILS FOR ZONE-2											
Type of pole	SC/DC	Voltage	Conductor size (sq. mm)	Angle of deviation	BASE WIDTH		PILE DIAMETER				
					A mm	B mm	Diameter (D ₁) mm	Diameter (D ₂) mm	Type of soil	Length of pile (L1) mm	Length of pile below ground (L2) mm
Angle	SC	33kv	232	2-15	400	400	675	450	Loose sand	700	1900
					400	400	675	450	Medium sand	700	1800
					400	400	675	450	Dense sand	700	1700
			15-30	0.2	400	400	675	450	Loose sand	700	1800
					400	400	675	450	Medium sand	700	1600
					400	400	675	450	Dense sand	700	1500
		148	30-60	0.2	400	400	675	450	Loose sand	700	2200
					400	400	675	450	Medium sand	700	2100
					400	400	675	450	Dense sand	700	2000
			2-15	0.2	400	400	675	450	Loose sand	700	2400
					400	400	675	450	Medium sand	700	2300
					400	400	675	450	Dense sand	700	2200
	100	15-30	0.2	400	400	675	450	Loose sand	700	2100	
				400	400	675	450	Medium sand	700	2000	
				400	400	675	450	Dense sand	700	1900	
		2-15	0.2	400	400	675	450	Loose sand	700	2000	
				400	400	675	450	Medium sand	700	1900	
				400	400	675	450	Dense sand	700	1800	
	33kv	11kv	80	2-15	400	400	675	450	Loose sand	700	1900
					400	400	675	450	Medium sand	700	1800
					400	400	675	450	Dense sand	700	1700
			15-30	0.2	400	400	675	450	Loose sand	700	1500
					400	400	675	450	Medium sand	700	1400
					400	400	675	450	Dense sand	700	1300
30-60		0.2	400	400	675	450	Loose sand	700	1800		
			400	400	675	450	Medium sand	700	1700		
			400	400	675	450	Dense sand	700	1600		
232		2-15	0.2	500	500	825	450	Loose sand	700	3700	
				500	500	825	450	Medium sand	700	3600	
				500	500	825	450	Dense sand	700	3500	
	15-30	0.2	500	500	825	450	Loose sand	700	3400		
			500	500	825	450	Medium sand	700	3300		
			500	500	825	450	Dense sand	700	3200		
148	30-60	0.2	500	500	825	450	Loose sand	700	3100		
			500	500	825	450	Medium sand	700	3000		
			500	500	825	450	Dense sand	700	3000		
	2-15	0.2	500	500	825	450	Loose sand	700	3800		
			500	500	825	450	Medium sand	700	3700		
			500	500	825	450	Dense sand	700	3600		
DC	33kv	100	2-15	450	450	750	450	Loose sand	700	2900	
				450	450	750	450	Medium sand	700	2800	
				450	450	750	450	Dense sand	700	2700	
		15-30	0.2	450	450	750	450	Loose sand	700	2800	
				450	450	750	450	Medium sand	700	2700	
				450	450	750	450	Dense sand	700	2600	
	11kv	80	2-15	450	450	750	450	Loose sand	700	2700	
				450	450	750	450	Medium sand	700	2600	
				450	450	750	450	Dense sand	700	2500	
		15-30	0.2	450	450	750	450	Loose sand	700	2300	
				450	450	750	450	Medium sand	700	2200	
				450	450	750	450	Dense sand	700	2100	
55	30-60	0.2	450	450	750	450	Loose sand	700	2000		
			450	450	750	450	Medium sand	700	2000		
			450	450	750	450	Dense sand	700	2000		
	2-15	0.2	450	450	750	450	Loose sand	700	2700		
			450	450	750	450	Medium sand	700	2600		
			450	450	750	450	Dense sand	700	2500		

LEGENDS
 SC- SINGLE CIRCUIT
 DC- DOUBLE CIRCUIT
 TOC- TOP OF CONCRETE
 EGL- EXISTING GROUND LEVEL

NOTES
 1. ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS UNLESS NOTED.
 2. EL (±)0.000 LEVEL CORRESPONDS TO EGL (EXISTING GROUND LEVEL).
 3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL STRUCTURAL DRAWINGS.
 4. PILES SHALL BE BORED CAST IN SITU CONCRETE PILES.
 5. GRADE OF CONCRETE SHALL BE M15 & GRADE OF STEEL SHALL BE 415 MPA.
 6. CLEAR COVER TO LINKS SHALL BE 40MM.

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 TP CENTRAL ODISHA DISTRIBUTION LIMITED
TP CENTRAL ODISHA DISTRIBUTION LIMITED

TYPICAL PILE DETAIL FOR FOUR POLE STRUCTURE OF ZONE-2 FOR SINGLE & DOUBLE CIRCUIT OHL NETWORK


TATA CONSULTING ENGINEERS LIMITED
 MUMBAI

SCALE: AS SHOWN
 APPROVED
 DATE (PO ISSUE) 14/04/2022
 DATE (CURRENT ISSUE) 24/09/2022
 DRN: RF
 SP
 PKR
 PROJECTION
 CHD: RK
 DWS NO TCE.12137B - CV -3000-DWG-30007
 ISSUE P1

FOR RO ISSUE ONLY			ISSUE	REVISIONS	DRN	CLEARED				APPD	DATE	ISSUE	REVISIONS	DRN	CLEARED				APPD	DATE		
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SIZE-A4

 TP CENTRAL ODISHA DISTRIBUTION LIMITED	TP CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR		
	TECHNICAL SPECIFICATION		
Doc. Title	Speciation for LT LTDB 25 KVA, 63 KVA and 100 KVA SMC Enclosure		
Doc. No	ENG-ELC-051	Date: 22.08.2022	
Rev. No	00	Page 1 of 23	
Prepared by: Swarup Nayak	Reviewed By: Srastanth Mohanty	Approved By: Khajan C. Bhardwaj	Issued By: Pourush Garg

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2. APPLICABLE STANDARDS
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7. TESTS
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12. PACKING
13. TENDER SAMPLE
14. QUALITY CONTROL
15. MINIMUM TESTING FACILITIES
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17. SPARES, ACCESSORIES AND TOOLS
18. DRAWINGS AND DOCUMENTS
19. GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE OF DEVIATIONS
21. SAMPLE DRAWINGS

Initiator		HOG (Engineering)	
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 TP CENTRAL ODISHA DISTRIBUTION LIMITED	TP CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR		
	TECHNICAL SPECIFICATION		
Doc. Title	Speciation for LT LTDB 25 KVA, 63 KVA and 100 KVA SMC Enclosure		
Doc. No	ENG-ELC-051	Date: 22.08.2022	
Rev. No	00	Page 2 of 23	
Prepared by: Swarup Nayak	Reviewed By: Srastanth Mohanty	Approved By: Khajan C. Bhardwaj	Issued By: Pourush Garg

1. SCOPE

This Specification covers the design, manufacture, testing at works and supply of L.T Distribution Boxes made out of SMC (S3 grade) conforming IS : 13410-1992 for controlling the L.T. feeders from the L.T. side of Distribution for Feeders upto 100KVA. The system shall be A.C. 3 phase, 4 wires, 433 V, 50 HZ with effectively grounded neutral.

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 confirm to the regulations of the local authorities.


S.NO	Indian Standard	Title
1	IS 5039	Specification for distribution pillars below 1000V AC
2	IS :13947/1993 (Part 3)	Specification for Isolator (Switch Disconnecter)
3	IS: 13947/1993 (Part2) (amended upto date)	Specification for L.T. MCCBs.
4	IS: 8623/1993 (amended upto date)	Specification for enclosure Box & for degree of protection provided by enclosures of electrical equipments.
5	IS: 4237/1982 IS: 8623/1993 (amended upto date)	Specification for general requirement of L.T. switchgears.
6	IS 13703/1993 (Part I & II amended upto date)	Specification for HRC Fuse Base and HRC Fuse Link.
7	IS: 13410: 1992	Specification for Sheet Moulding compound (SMC) Enclosure
8	IS: 13411: 1992	Specification for Glass Reinforced Polyester Dough Moulding Compounds.
9	IS 2705	Current Transformer

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

- | | |
|------------------------------------|------------|
| a) Max. Ambient Temperature | : 50 deg.C |
| b) Max. Daily average ambient temp | : 40 deg.C |
| c) Min Ambient Temp | : 0 deg.C |
| d) Maximum Humidity | : 90% |
| e) Minimum Humidity | : 10% |
| f) Average Annual Rainfall | : 1458 mm |

The atmosphere across coastal divisions of TPCODL is very Saline, laden with salt, acid and dust suspended during dry months and subjected to fog in cold months. The area is Cyclone prone with wind speed upto 300KM.

Initiator		HOG (Engineering)	
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 TP CENTRAL ODISHA DISTRIBUTION LIMITED	TP CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR TECHNICAL SPECIFICATION		
	Doc. Title Speciation for LT LTDB 25 KVA, 63 KVA and 100 KVA SMC Enclosure		
Doc. No	ENG-ELC-051	Date: 22.08.2022	
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Prepared by: Swarup Nayak	Reviewed By: Srastanth Mohanty	Approved By: Khajan C. Bhardwaj	Issued By: Pourush Garg

4. GENERAL TECHNICAL REQUIREMENTS

Standard General Arrangement MCCB In the incoming & HRC fuse base with HRC fuse links in the Outgoing Circuit. Provision space for fixing 3 Phase energy meter.

5. GENERAL CONSTRUCTIONS

Distribution Boxes shall have triple-pole MCCB on incoming circuit and HRC fuse base with HRC fuse links on outgoing circuits with necessary interconnecting Bus Bars/Links. The distribution box shall have provision for installation of 3 Phase energy meter.

LTDB for 25KVA, 63KVA, 100KVA will be pole mounted .Suitable arrangements in Scope of Bidder.

All Control Wirings, PT Wiring, Indication wiring shall be through suitable MCB/Fuse.

5.1 INCOMING CIRCUIT

Each distribution box shall have 1 nos. of triple-pole MCCB rating suitable for 25KVA/63 KVA /100 KVA KVA Box to protect out going circuits. MCCB shall be conforming as mentioned below table. The bidder shall indicate the makes and types of MCCBs offered in GTP. The Bidder shall furnish detailed type test reports before or on due date & time of submission of tender. Opening & Closing of MCCB shall only be manual .MCCB should electrically open during fault. The MCCB should be front operated triple pole type.

5.2 OUT GOING CIRCUIT

1. HRC FUZE :

HRC Fuse of suitable capacity shall be provided on outgoing terminal of MCCB to facilitate electrical breaking of the circuit. Each Distribution Box shall have HRC Fuse Base with HRC Fuse (Blade type Contacts) on Outgoing Circuit. The bidder shall indicate in GTP, the make, type, Fault Rating and capacity of HRC Fuse Base and Fuse offered.

2. HRC FUZE BASE

The base of the HRC Fuse shall be of non-tracking, heat resistant insulating material of Dough Moulding Compound (DMC) of D3Grade as per IS: 13411/1992. The Fuse Base shall be sturdy in construction. The extension terminal connector strips of the Fuse Base shall be projecting out on both sides, made with two pieces (half portion of the terminal contact and extension strip should be continuous in one piece).

DT RATING	LTDB Incoming MCCB-3P	O/G-I HRC Fuse Rating	O/G-II HRC Fuse Rating	O/G-III HRC Fuse Rating	O/G-IV HRC Fuse Rating
25KVA	40A	6No's x 25A HRC fuse			
63KVA	100A	3 Nos x 63A	3 Nos x 25A		
100KVA	160A	3 Nos x 100A	3 Nos x 63A		


The Bidder shall furnish detailed type test reports before or on due date & time of submission of tender. The HRC fuse base with HRC fuse to be provided in the Distribution Box. Each Distribution box shall have provision for fixing of three phase tri-vector energy meter & suitable rating CTs for DT metering. CT arrangement will be the incoming side of MCCB.

3. Meter size 400mm x 400mm x 150mm.

Metering Terminal Block shall be provided by bidder.

Suitable arrangements to be given to physically isolate the meter from Busbar area for safety purpose.

Initiator		HOG (Engineering)	
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 TP CODL TP CENTRAL ODISHA DISTRIBUTION LIMITED	TP CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR TECHNICAL SPECIFICATION		
	Doc. Title Speciation for LT LTDB 25 KVA, 63 KVA and 100 KVA SMC Enclosure		
Doc. No ENG-ELC-051			Date: 22.08.2022
Rev. No 00			Page 4 of 23
Prepared by: Swarup Nayak	Reviewed By: Srastanth Mohanty	Approved By: Khajan C. Bhardwaj	Issued By: Pourush Garg

4. Current Transformers :The Bidder has to supply Base Mounted Current Transformers for 3 Phases and Neutral.

CT Specification as per Annexure-2.

Suitable CT Ratios to be selected by Bidder.

5.3 BUSBARS AND CONNECTIONS:

The Incomer feeder should be on Left side of the distribution box and all outgoing feeders will be on Right side of the distribution box, with phase sequence RYB to be maintained. The phase bus bars and feeder droppers from bus bars shall be of electrolytic grade Aluminium with purity 99.5%.


- 1) **The Incomer Feeder dropper & Bus Bar for 25KVA LTDB will be 25 X 3 mm Cross Section**
- 2) **The Incomer Feeder dropper & Bus Bar for 63KVA LTDB will be 25 x 6 mm cross section.**
- 3) **The Incomer Feeder dropper & Bus Bar for 100KVA LTDB will be 25 x 8 mm cross section.**

All bus bars and droppers shall be properly drilled and deburred. Each bus bars shall be of one single strip without any joint. At the joint with copper part the aluminium end piece shall be bimetallic with sufficient thickness. Bus bars shall be provided with durable PVC insulating sleeves of standard colour code for different phases. Corrugated/Spring & Plain washers shall be used for Nut-Bolt connections. Bus bars shall be mounted on suitable size support insulators which should be tightened from inside. i.e. once fitted, should not be able to removed. Minimum clearances, wherever shown, shall be as per General

Arrangement shall be as per requirement of IS: 4237/1982 amended up to date.

- 1) Minimum Clearance between **Phase to Earth** to be maintained : **40mm**
- 2) Minimum Clearance between **Phase to Phase** to be maintained : **40mm**

Initiator		HOG (Engineering)	
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 TP CODL TP CENTRAL ODISHA DISTRIBUTION LIMITED	TP CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR TECHNICAL SPECIFICATION		
	Doc. Title Speciation for LT LTDB 25 KVA, 63 KVA and 100 KVA SMC Enclosure		
Doc. No ENG-ELC-051			Date: 22.08.2022
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Prepared by: Swarup Nayak	Reviewed By: Srastanth Mohanty	Approved By: Khajan C. Bhardwaj	Issued By: Pourush Garg

5.4 ENCLOSURE:

The enclosure shall be made up of Thermosetting Plastic, Sheet Moulding Compound (SMC) As per confirming IS 13410 of 3 mm thickness . The manufacturing process of Box shall be moulding type. SMC distribution boxes, the rounding of corners and slope on Top shall be as shown in the drawing. No joints in the body of the Box are permitted. The enclosure shall be dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant property.

SMC SHEET PROPERTIES (APPLICABLE FOR PANEL UPTO 100KVA)

Sr. no	Test Details	Requirement for S3 electrical Grade	Type of test	Reference standard
1.	Glass Content , % by mass , minimum	20	type	Annexure –A of IS : 13411: 1992
2.	Flow, mm, Min	170	Acceptance	Annexure – C of IS : 13411: 1992
3.	Mould shrinkage , linear percent, Max	0.25	Acceptance	Annexure – B of IS : 13411: 1992
4.	Density of Moulding , g/ml	1.8 to 2.1	Routine	IS:8543 (part 1/Sec2:1970)
5.	Water Absorption, % Max.	0.01	Acceptance	Annex. D of ofIS : 13411: 1992
6.	Izod Impact Strength (Notched), KJ/m ² , Min	55	Type, Acceptance for S2	Annex.E IS : 13411: 1992
7.	Tensile Strength ,MPa, Min	70	Type, Acceptance for S2	IS:8543 Part 4/1984)
8.	Flexural Strength, Mpa	170	Type	Annex. F of IS13411:1992.
9	Modulus of Elasticity,103 MPa	12 to 15	Type	IS 8543 (Part 4/Sec1) : 1984
10	Surface Resistivity (24H in Water), Ohm, Min	1x10 ¹³	Routine	IS3396:1979
11	Volume Resistivity , Ohm-cm,Min	1x10 ¹⁴	Routine	IS3396:1979
12	Tracking Resistance CTI, Min	1000	Type	IS2824:1975
13	Power Arc Resistance, sec, Min	180	Type(Acceptance for S2)	Annex. G of IS13411:1992

Initiator		HOG (Engineering)	
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TPCODL <small>TP CENTRAL ODISHA DISTRIBUTION LIMITED</small>	TP CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR		
	TECHNICAL SPECIFICATION		
Doc. Title	Speciation for LT LTDB 25 KVA, 63 KVA and 100 KVA SMC Enclosure		
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14	Dielectric Strength at 90°C In Oil KV/Min	11	Type	IS 6262:1971
15	Dissipation factor (4 days at 80% RH & 1 KHz)	0.01	Type	IS4486:1967
16	Heat Distortion Temperature, C, Min	150	Type	Annex. H of 13411:1992
17	Oxygen Index, % Min		24	Type (Part6/Sec6):1992
18	Flammability (Vo)	-	Type	UL 94 or IS : 11731(Pt.II)
19	Glow wire test	-	Type	IEC – 695 –2-1 or IS :11000(Pt 2/sec.1)
20	Ball pressure test	-	Type	IEC : 335
21	Mechanical Strength	-	Type	IS : 14772
22	Marking, Dimensions and construction	-	Routine	IS : 14772
23	Spirit burner test (Self Extinguishing)	-	Type	IS : 4249
24	Melting point (to test up to 400°C) should not melt		Type	IS :13360

The general clear dimensions of Distribution boxes without considering colour of box.

Dimensions in mm (Height X Width X Depth) :

For 25KVA Distribution box :800X1000X300

For 63KVA Distribution box :1050x1305x325

For 100KVA Distribution box :1050x1305x325


The above dimension are indicative, the box should able to accommodate all equipments with sufficient rating & required clearances . The design should also be maintenance friendly so that the replacement of any equipment can be done without any difficulty.

The Base and doors of SMC enclosure shall be individually in one piece, except for fixing of the accessories like hinges, clamps, mounting clamps, bolts etc.

Boxes shall have centre opening swing double door type with four hinges as shown in drawing. On closing of doors, right door shall rest on the left door. Base and doors shall have flange / collars. Collar of Base and doors shall overlap by 10mm. Rubber gasket of suitable size shall be provided in between base and doors, such that it provides proper sealing between the door and base of box to avoid penetration of dust & ingress of water. Degree of protection shall be IP-55 . Rubber Gasket shall be fixed with suitable adhesive. Hinges shall be stainless type ,minimum 50 mm in length & made from 2mm thickness. The hinges shall not be visible from outside.Padlocking arrangement should be provided outside the Door.

The MCCBs, HRC Fuse, Meter, CT and HRC fuse base shall be housed inside the enclosure.

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Four set of Louvers (two sets on each side) of suitable size shall be provided as shown in drawing. The louvers shall be provided such that heat dissipation is proper. The perforated sheet of 20 SWG with 2.5 mm holes shall be welded from inside of the louvers.

Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per drawings

5.5 LOCKING ARRANGEMENT TO THE BOX


- A. The door should be front operated with a common handle provided outside the door. In addition to this, Pad lock to be provided in Centre & C&R panel door locks shall be provided to the door at top & bottom. Key way shall be provided on the door for operating the lock from outside. Key way shall be provided with cover. A nylon washer shall be provided between the handle and door to avoid penetration of water.
- B. Electrolytic grade aluminium neutral busbar will be same rating as phase bus bar with current density 1 Amp/sqmm.
- C. Neutral Busbar shall be isolated with respect to body. The bimetallic lugs of adequate size, as per enclosed specification & drawing, shall be provided. Neutral Busbar shall be as shown in the drawing attached with the specifications.
- D. Two galvanized earthing Bolts of suitable size shall be fixed from inside and projecting outside of the box. There should be no powder coating on the earthing bolts. Two Nuts with washers shall be provided on each bolt.
- E. Necessary fixing arrangement shall be provided at the back of the enclosure to ensure proper fixing on double pole structure by means of suitable clamps at 4 places.
- F. Danger Board drawing attached with specifications shall be riveted on the box as per IS: 2551. Danger board marking by painting shall not be accepted.
- G. All the components inside the Box shall be mounted on SMC BOX. The mounting strips shall be provided with required bends or ribs to give the extra strength and shall be powder coated or zinc plated.
- H. All joints of current carrying parts shall be bolted with 8.8 grade High Tensile SS Nuts & Bolts, Corrugated/spring & Plain Washers. The nuts & bolts should be of hexagonal type. All the nuts, bolts & washers should be properly zinc plated.
- I. Each distribution box shall be supplied with proper packing in five ply - corrugated box.
- J. Name plate having details such as Month & year of manufacturing, Name of manufacturer/Trade mark, Sr.No, and rating of Distribution box, shall be riveted on the Distribution box door. The name plate should be of stainless steel of thickness 1 mm. TPCODL logo shall be embossed on the door of the distribution box.
- K. Incoming and outgoing circuit should be duly highlighted with paint by stencil printing.
- L. Adequate slope on the top of box shall be provided to drain out rainwater from the top. Good-quality plastic sticker leaflet should be pasted inside of distribution box door. The matter of instruction leaflet is given along with this specification. All the instructions in leaflet should be in Odia/Hindi/English language.

6. MARKING

The LTDB box shall carry the following information contained in a label attached to it :

- a) Reference to the Standards.
- b) Manufacturer's name
- c) Year of manufacture.
- d) The following shall be embossed on the LTDB," PROPERTY OF TPCODL."

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- e) Danger Name plates, Supply voltage-440v
- f) Purchase Order number
- g) Warranty has to be marked on the nameplate of the enclosure with another warranty sticker (Metal Riveted) to be placed inside the enclosure with date and other details related to warranty.

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 shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the LTDB components in additions to others specified in the IS/IEC Standards. All these Type Test should be conducted at CPRI/ERDA. Type Test report validity should not exceeded more than 5 Years from the date of testing.

TYPE TESTS

i. **ON COMPLETE BOX:**

- Temperature rise test:-The temperature rise test should be carried out as per IS: 8623 -1993 .
- High voltage test shall be carried out as per IS:8623/ 1993 amended upto date.
- Short Time Withstand Current Test on Distribution Box shall be carried out as per IS 8623 or latest version.
- Degree of protection for IP- 55 on complete box shall be carried out as per IS: 13947/1993 or the latest version thereof.
- Time /current characteristic test on MCCBs shall be carried out as per clause 7.2 of this specification as stated above.
- For Panels of SMC material, Tests in line with Cl. 11.1 and IS: 13410-1992 for Sheet Moulding Compound (SMC) Enclosure for conformance to the values specified therein

ii. **ON HRC fuses base and HRC fuse :**

Type tests on HRC fuses and HRC fuse links IS 13703/1993 (Part I & II date) for HRC Fuse Base and HRC fuse link shall be carried out.

ii. **ON MCCB:**

Type tests on MCCB as per IS-13947 amended upto date shall be carried out.

ACCEPTANCE TESTS


Following tests shall be carried out as per acceptance tests in addition to routine tests on one random sample of each rating out of the lot offered for inspection:

1. Temperature rise test on one sample of each rating. Temperature rise test will be carried out as per the procedure given below: For temperature rise test, a distribution box with all assembly of MCCBs / HRC fuse base with HRC fuse link shall be kept in an enclosure such that the temperature outside the box shall be maintained at 50 ° C.
20% more current than transformer secondary capacity i.e. for 63 KVA Distribution Transformers full load current 84A, 20 % more is 100 A shall be kept in incoming circuit keeping outgoing circuits short, till the temperature stabilizes and maximum temperature rise should be recorded.
2. Time-Current Characteristics The MCCB should be tested for time current characteristics at 1.05 & 1.2 times of overload release setting current and should pass the requirement given in clause- 7.2.

ROUTINE TESTS

1. Overall Dimensions Checking.
2. Insulation Resistance Tests.
3. High Voltage Test at 2500 V, 50 Hz AC for one minute.

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4. Operation Test on MCCB/Link Disconnecter / HRC fuse base and HRC fuse links.
5. Thermal overloading Test for MCCB
6. Contact Resistance Test

For MCCB and Fuse OEM Routine Certificate is accepted.

8. TYPE TEST CERTIFICATES

The Bidder shall furnish the type test certificates of the LTDB for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI 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 TPCODL

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'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 TPDDL
- 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 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 Purchaser 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 later. 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 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. In case of any issue in LTDB and its components within the guarantee period the purchaser will immediately inform the Bidder who shall take back the LTDB components within 15 days from the date of intimation at his own cost and replace / repair the faulty component within forty-five days of date of intimation with a roll over replaced shall not be counted for arriving at the guarantee period.

Waste Handling:

As per the guidelines issued by NGT/MOEF/CPCB and as per "Plastic Waste Management Rules 2016", we need to make sure that, the collection of waste generated by SMC/FRP Enclosures at the end of the useful

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life for recycling/re-use/proper disposal to be done.

Following this rule, Vendor has to specify the useful life of the enclosure supplied by them. It will be the sole responsibility of the vendor to collect the waste of the enclosures supplied by them at the end of the product life cycle.

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.

13. TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL).

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. 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 AND TOOLS

Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document.


Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall be given a minimum of 12 months' notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment. Any spare 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.

18. DRAWINGS AND DOCUMENTS

Following documents shall be prepared based on TPCODL specifications and statutory requirements with complete BOM and shall be submitted with the bid:

- Completely filled in Technical Particulars.
- General description of the equipment and all components including brochures.
- Type test Certificates
- Experience List./Performance Certificate from reputed customers

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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	Manual/Catalogues/drawings for all components.		√	
3	Technical details and test certificates.		√	√
4	Installation Instructions		√	√
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.

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.

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19. GUARANTEED TECHNICAL PARTICULARS

GUARANTEED TECHNICAL PARTICULARS FOR LTDB 25 KVA DISTRIBUTION TRANSFORMER


Sr No.	PARTICULARS	OFFERED
1	Material of the Meter Box	Thermosetting Plastic, Sheet Moulding Compound (SMC) As per confirming IS 13410
2	Manufacturing Process.	Hot Press Moulding
3	Color of Box	Off White
4	Dimension of Box (HeightXWidthXDepth)	800X1000X300
5	<i>THICKNESS OF BOX,door,support SMC</i>	3 mm
i	<i>Load Bearing Size</i>	3mm (Min.)
ii.	<i>Non Load Bearing size</i>	3. mm (Min.)
iii	<i>Door</i>	Centre Opening Double Door Swing
6	<i>Strip Hinges</i>	Minimum 4 Hinges on each door.Stringes-Stainless Steel
7	<i>Pad Lock arrangement</i>	Provided
9	<i>Whether sufficient sealing provided to make dust, water and vermin proof?</i>	Rubber Gasket
10	<i>Provided Louvers For ventilation</i>	Yes 4 Nos
11 a	<i>Whether inlet and outlet arrangement for service cable provided. Please mention dimension of holes?</i>	Bottom Entry
b	<i>Whether for incoming and outgoing cables provisions of glands of suitable size have been made. Please mention its dimension?</i>	1) suitable for l/c cable -4C x35Sqmm -1No's 2) 6 Nos. O/g PVC glands suitable for 27mm Cable dia entry hole at bottom side
12	<i>In coming aluminum Bus Bar R, Y, B, N</i>	25X3mm
13	<i>Outgoing Aluminum Riser /Dropper</i>	25x3 mm
16	<i>No. of connections on each bus bar</i>	Each phase bus bar 01 no. Incomer and 02 nos outgoing circuit

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17	<i>Bus bar arrangement</i>	Step mounting arrangement
18	<i>Busbar mounting insulator</i>	SMC mounting Insulator
19	<i>Clearance between busbars.</i>	40 mm Min
20	<i>Clearance between busbar & Box walls.</i>	40 mm Min
21	<i>Sealing arrangement</i>	Hole for Wire Sealing
22	<i>Markings</i>	Danger name Plate, Supply voltage-440V ,SL no & Property of 'TPCODL' ,Screen Printed
23	<i>Degree of protection</i>	IP-55 (Min)
24	<i>Packing</i>	Standard Corrugated box packing
25	<i>Earthing Provision</i>	M8 x 40 mm-2nos,
26	<i>Incoming arrangement</i>	40 Amp MCCB, 40KA TP MCCB -01 Nos
27	<i>Make of MCCB</i>	ABB,Siemens,L&T,EATON,Schneider,Legrand. MCCB Should have intregated OL,SC & E/F Protection
28	<i>Outgoing arrangement</i>	25 Amp HRC Fuse (06 Nos)- L&T, Siemens,EATON,ABB,Schnieder
29	<i>Terminal Spreader rating</i>	Minimum cross sectional are must be equivalent to the Incomer bus bar size. Spreader needs to be L-shaped for R and B-phase and straight type for Y-phase
30	<i>Glands</i>	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	<i>Provision of LT switch & socket</i>	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	<i>Provision of Space for Energy Meter</i>	To be provided by Bidder
33	<i>CT (0.5S Accuracy Class on 3 Phase and neutral)</i>	To be provided by Bidder
34	<i>Provision of LED Indication on Incoming supply R, Y, B with Fuse protection</i>	To be provided by Bidder
35	<i>Provision of NO & NC Contact for status monitoring of MCCB</i>	To be provided by Bidder


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GUARANTEED TECHNICAL PARTICULARS FOR LTDB 63 KVA DISTRIBUTION TRANSFORMER


Sr No.	PARTICULARS	OFFERED
1	Material of the Meter Box	Thermosetting Plastic, Sheet Moulding Compound (SMC) As per confirming IS 13410
2	Manufacturing Process.	Hot Press Moulding
3	Color of Box	Off White
4	Dimension of Box (HeightXWidthXDepth)	1050x1305X325 mm
5	THICKNESS OF BOX	3 mm
i	Load Bearing Size	3mm (Min.)
ii.	Non Load Bearing size	3mm (Min.)
iii	Door Type	Centre Opening Double Door Swing
6	Strip Hinges	Minimum 4Hinges on each door.Hinges should be stainless steel
7	Pad Lock arrangement	Provided
9	Whether sufficient sealing provided to make dust, water and vermin proof?	Rubber Gasket
10	Provided Louvers For ventilation	Yes 4 Nos
11 a	Whether inlet and outlet arrangement for service cable provided. Please mention dimension of holes?	Bottom Entry
b	Whether for incoming and outgoing cables provisions of glands of suitable size have been made. Please mention its dimension?	1).Incoming cable suitable for 4CX95Sqmm 2). 2 Nos. holes for outgoing suitable Cable of dia 4CX95Sqmm
12	In coming aluminum Bus Bar R, Y, B, N	25 x 6 mm ,
13	Outgoing Aluminum Riser /Dropper	25 x 6 mm
16	No. of connections on each bus bar	Each phase bus bar 01 no. Incomer and 02 nos. outgoing circuit
17	Bus bar arrangement	Step mounting arrangement

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18	<i>Busbar mounting insulator</i>	<i>SMC mounting Insulator</i>
19	<i>Clearance between busbars.</i>	40 mm Min
20	<i>Clearance between busbar & Box walls.</i>	40 mm Min
21	<i>Sealing arrangement</i>	Hole for Wire Sealing
22	<i>Markings</i>	Danger name Plate, Supply voltage-440V ,SL no & Property of 'TPCODL', Screen Printed
23	<i>Degree of protection</i>	IP-55 (Min)
24	<i>Packing</i>	Standard Corrugated box packing
25	<i>Earthing Provision</i>	M8 x 40 mm-2nos,
26	<i>Incoming arrangement</i>	100 Amp 40KA TP MCCB- 01 Nos
27	<i>Make of MCCB</i>	ABB, Siemens, L&T, EATON,Schneider, Legrand.MCCB Should have intregated OL,SC & E/F Protection.
28	<i>Outgoing arrangement</i>	63 Amp HRC Fuse (03 Nos), 25 Amp HRC Fuse (03 Nos). L&T, Siemens, EATON,ABB,Schnieder
29	<i>Terminal Spreader rating</i>	Minimum cross sectional are must be equivalent to the Incomer bus bar size. Spreader needs to be L-shaped for R and B-phase and straight type for Y-phase
30	<i>Glands</i>	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	<i>Provision of LT switch & socket</i>	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	<i>Provision of Space for Energy Meter</i>	To be provided by Bidder
33	<i>CT (0.5S Accuracy Class on 3 Phase and neutral)</i>	To be provided by Bidder
34	<i>Provision of LED Indication on Incoming supply R,Y, B with Fuse protection</i>	To be provided by Bidder
35	<i>Provision of NO & NC Contact for status monitoring of MCCB</i>	To be provided by Bidder


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GUARANTEED TECHNICAL PARTICULARS FOR LTDB 100 KVA DISTRIBUTION TRANSFORMER


Sr#	PARTICULARS	OFFERED
1	Material of the Meter Box	Thermosetting Plastic, Sheet Moulding Compound (SMC) As per confirming IS 13410
2	Manufacturing Process.	Hot Press Moulding
3	Color of Box	Off White
4	Dimension of Box (HeightXWidthXDepth)	1050x1305x325 mm
5	<i>THICKNESS OF BOX</i>	
i	<i>Load Bearing Size</i>	3.0 mm (Min.)
ii.	<i>Non Load Bearing size</i>	3.0 mm (Min.)
iii	<i>Type of Door</i>	Centre opening double door swing Type
6	<i>Strip Hinges</i>	Minimum 3 Hinges on each door.
7	<i>Panel Type Lock arrangement</i>	Provided
9	<i>Whether sufficient sealing provided to make dust, water and vermin proof?</i>	Rubber Gasket
10	<i>Provided Louvers For ventilation</i>	Yes 4 Nos
11 a	<i>Whether inlet and outlet arrangement for service cable provided. Please mention dimension of holes?</i>	Bottom Entry As per drawing
b	<i>Whether for incoming and outgoing cables provisions of glands of suitable size have been made. Please mention its dimension?</i>	For 100 KVA: 1) Incoming cable Hole suitable to 4CX150Sqmm 2) For Outgoing cable 2 Nos. holes suitable to 4CX150Sqmm cable
12	<i>In coming aluminum Bus Bar R, Y, B, N</i>	25 x 8mm ,
13	<i>outgoing Aluminum Riser/Dropper</i>	25 x 8mm

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16	<i>No.of connections on each bus bar</i>	Each phase bus bar 01 no Incomer and 02 nos outgoings circuit
17	<i>Bus bar arrangement</i>	Step mounting arrangement
18	<i>Busbar mounting insulator</i>	SMC mounting Insulator
19	<i>Clearance between busbars.</i>	40 mm Min
20	<i>Clearance between busbar & Box walls.</i>	40 mm Min
21	<i>Sealing arrangement</i>	Hole for Wire Sealing
22	<i>Markings</i>	Danger name Plate, Supply voltage-440V , SL no & Property of 'TPCODL', Screen Printed
23	<i>Degree of protection</i>	IP-55 (Min)
24	<i>Packing</i>	Standard Corrugated box packing
25	<i>Earthing Provision</i>	M6 x 35 mm, 02 Nos
26	<i>Incoming arrangement</i>	For 100 KVA : 160 Amp 40KA TP MCCB -01 No.
27	<i>Make of MCCB</i>	ABB, Siemens, L&T, EATON, Schneider, Legrand. MCCB Should have integrated OL , SC & E/F Protection
28	<i>Outgoing arrangement</i>	For 100 KVA : 100Amp HRC Fuse base (03 Nos) and 63Amp HRC Fuse base (03 Nos). HRC Fuse make- L&T, Siemens, EATON, ABB, Schneider
29	<i>Terminal Spreader rating</i>	Minimum cross sectional area must be equivalent to the Incomer bus bar size. Spreader needs to be L-shaped for R and B-phase and straight type for Y-phase
30	<i>Glands</i>	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	<i>Provision of LT switch & socket</i>	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	<i>Provision of Space for Energy Meter</i>	To be provided by Bidder
33	<i>CT (0.5S Accuracy Class on 3 Phase and neutral)</i>	To be provided by Bidder
34	<i>Provision of LED Indication on Incoming supply R, Y, B with Fuse protection</i>	To be provided by Bidder
35	<i>Provision of NO & NC Contact for status monitoring of MCCB</i>	To be provided by Bidder

Initiator		HOG (Engineering)	
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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:

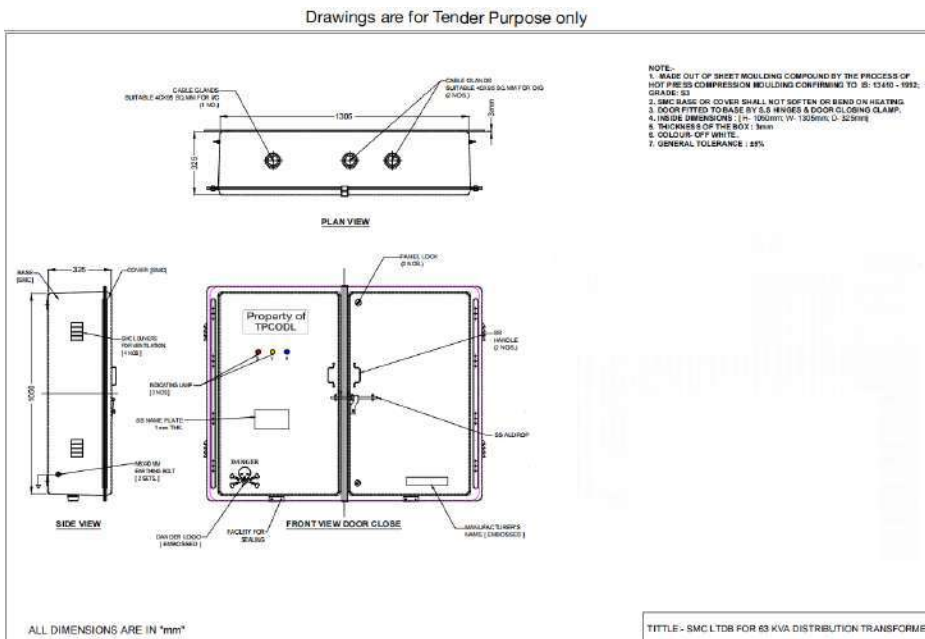
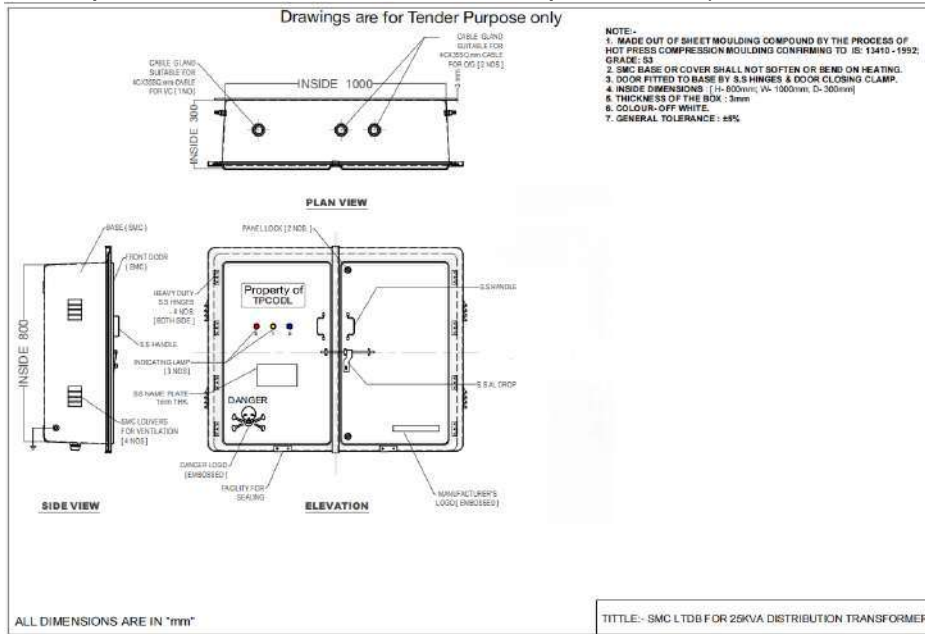
Signature

Designation

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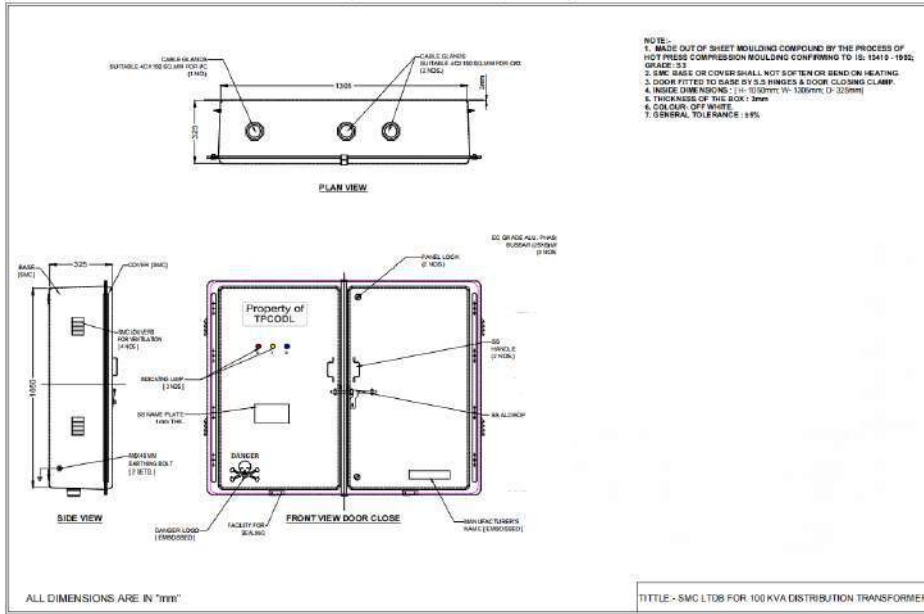
22. DRAWING (Subject to minor changes as per manufacturers design while maintaining required clearances and relevant Specification)




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Drawings are for Tender Purpose only



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Annexure-2

TECHNICAL SPECIFICATION FOR RESIN CAST RING TYPE CURRENT TRANSFORMERS FOR USE INSIDE THE BOX. (To be Housed Inside the DSS Box)

1.0 SCOPE

This specification covers resin cast ring type LT Current Transformers confirming to IS-2705/1992 or the latest version thereof are of class 0.5s accuracy, 5VA burden, for use in conjunction with -/5A or 100/5A energy meters of class 0.5s. CTs will be design for indoor use to install in the metering box.

2.0 APPLICABLE STANDARDS:


LT CTs shall comply with the Indian Standard Specification IS: 2705/1992 (Part- I & II) and the latest version thereof.

3.0 TYPE AND RATING OF L.T.CURRENT TRANSFORMERS:

LT CTs shall be of the following type and ratings:

SI.No.	Particulars	Requirement
1.0	Capacity or Rating	
	a) Rated Voltage b) No. of Cores c) Primary Current / Ratio d) Rated Output Burden. e) Rated Continuous Thermal current temperature rise over ambient f) Continuous Primary Current g) One Minute withstand Power Frequency Voltage for Primary & secondary winding h) ISF i) Rated Short Time Current j) Frequency k) Type	a) 415 V, 50 Hz (Phase to phase) b) One c) 50/5 ,100/5A, 200/5A, 400/5A, 800/5A, 1000/5A, 1500/5A d) 5VA e) As per IS:2705/1992 or latest version thereof f) 1.2 times of rated current g) 3 KV h) Less than 5 i) 5 kA for 1 Second j) 50 Hz k) Ring Type
2.0	Class of Accuracy	0.5s

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	Material i. Core ii. Conductor iii. Insulation	High-grade non-ageing electrical low loss core Super enamelled copper wire of requisite diameter. Resin cast
3.0	Primary & secondary Terminals i. Primary ii. Secondary terminal	Primary Conductor (Bus Bar of required current carrying capacity) will pass through Ring type CT. Proper marking will be provided for current direction identification. Inner diameter (I.D.) of CT will be minimum 45mm or as per size of bus bar for all ratings of CT & will increase as per the current rating of CTs. Secondary Terminals S1 & S2 will be clearly marked.

4.0 TESTS:

4.1 Routine Test

Current Transformer shall comply with all routine tests including accuracy test prescribed in relevant IS: 2705/1992.


4.2 ACCEPTANCE TEST:

All routine tests as stipulated in the relevant standards shall be carried out by the manufacturer and to produce at the time of inspection before the inspector.

4.3 TYPE TEST

Type test of CT shall be submitted with the bid carried out as per IS:2705 by NABL approved laboratory / test house. Type test shall be not earlier than 5 years from the date of bid opening. Drawing of the CT and its arrangement on bus bar shall be submitted with the offer .

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5.0 RATING PLATE:

Following shall be printed/engraved on the name plate of CTs.

- i- Sl.No.
- ii- CT ratio
- iii- VA burden
- iv- Class of accuracy.
- v- Name of manufacturer
- vi- Year of manufacturing
- vii- PO No. & Date
- viii- "Property of TPCODL" should be mentioned on name plate
- viii- Polarity should be marked on the body of the offered LT CTs.


6.0 GENERAL TECHNICAL SPECIFICATION

- i) Current transformer shall have an opening in the center to accommodate a primary conductor that will be bus-bar.
- ii) Current transformers shall be of Resin cast type, suitable for indoor installation, type of resin shall be "Cycloaliphatic Resin" class of insulation shall be "F" as specified in IS:2705.
- iii) The minimum internal diameter for ring type CTs should suitable to accommodate a primary conductor i.e. bus-bar of Distribution transformer.
- iv) The polarity marking on the offered CT primary & secondary side should be embossed.
- v) A two core (2.5sq. mm, as per relevant IS) HR FR PVC insulated flexible multi strand copper cable shall come out directly from the CT as secondary terminal. The length of the wire shall be around 2 Mtrs. Which is directly connected to the energy meter's terminals, pin type lugs shall be required on open end of cable.

Core details of cable shall be : Core-1 : S1, Core -2 : S2.


LT CTs shall be of Brick red colour.

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1. SCOPE:


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	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)

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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. 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 b/w Poles (dry test for 1 min)	70 kV
b	Across the isolating distance(dry test for 1 min)	80 kV
c	To earth and b/w Poles and across the isolating distance(wet test for 10 sec)	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	66 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)

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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)	60 ms
4.18	Closing time (max)	60 ms
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	320 mm
4.22.2	phase to earth	320 mm
4.23	Min. Creepage distance of insulator	25 mm 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	3.7 Meters
4.29	Mechanical Endurance	M2
4.3	Electrical Endurance	E2
4.31	Restriking Class	C2
4.32	Class	S2
4.33	Material of main contact	Copper chromium, silver plated

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4.34	Interrupter	Vacuum Interrupter should be of same make as that of Breaker manufacturer. TPCODL Representative shall visit Interrupter manufacturing Facility during Factory Inspection.
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Circuit Breaker shall be suitable fo 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 Circuit breaker shall be housed in a weather proof & dust proof cabinet made of Galvanized steel, the thickness of which shall not be less than 3 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. All the cable glands used for connections shall be of double compression type. 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 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. The terminal box shall be provided with DC supply.
- 5.1.5 Vent outlets of circuit-breakers shall be so situated that a discharge of gas shall not cause electrical breakdown and is directed away from any location where persons may be present. The necessary safety distance shall be stated by the bidder. The construction shall be such that gas cannot collect at any point where ignition can be


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caused, during or after operation, by sparks arising from normal operation of the circuit breaker or its auxiliary equipment.

- 5.1.6 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 $\pm 10\%$ 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 85% 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

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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. All contacts shall be silver coated (Thickness shall be specified) and made of Copper Chromium alloy.

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. All current carrying contact surfaces shall be silver-plated. Silver plating shall not be less than one mm thickness. Bushings shall satisfactorily withstand the insulation level specified in the relevant IS.


5.5 PRIMARY TERMINALS:

Primary terminals shall be Silver plated copper suitable for wedge type connectors with ZEBRA conductors. Successful bidder shall supply connectors. It should have Primary terminals (connected at Fixed contact) on either 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.

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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 " " mark \perp in a legible and indelible manner on case or frame to be earthed adjacent to the terminals.

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", along with the following information:

Manufacturer'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:

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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. Dynamic contact resistant measurement (Signature test)

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. Short line fault tests
12. Out of phase making and breaking tests
13. Electrical endurance tests
14. Double earth fault tests
15. 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 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

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'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

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- 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. INSPECTION AFTER RECEIPT AT STORES

The material received at TPCODL 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 eplacement" 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

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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. The purchaser while placing the order will decide the exact quantity. Bidder should quote unit rates for spares.

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

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 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	√		√

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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)	

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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		

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

Seal of the Company:


Signature

Designation

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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)

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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. 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/ $\sqrt{3}$: 110/ $\sqrt{3}$ Volt	33000/ $\sqrt{3}$: 110/ $\sqrt{3}$ Volt
11	Winding Connection for PT	Star-Star	
12	Class of Accuracy	3P/3P/0.2	3P/3P/0.2

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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 Temorise 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'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

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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 earthing 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

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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

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- 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 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 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

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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

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- 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	

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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				

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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

22. DRAWING (Subject to change as per manufacturers design while maintaining required clearances and relevant Specification)

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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 400 sq.mm.
3C X 120 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

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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	Colours 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:

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

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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. 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	+/- 5%	
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 colour 'Crimson Red shade' code: 355 as per IS 5:2007	

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S. No.	Description	Requirement	
		3 CORE CABLE	1 CORE CABLE
14	Outer sheath (for co-extruded cable)	a) Inner layer: HDPE ST-7, Crimson Red shade b) Outer sheath: HDPE ST-7, Black colour	NA

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 of conductor mm ²	95	120	150	300	400	630	1000
6	Min. number of strands	15	15	15	30	53	53	30
7	Max. DC resistance @ 20 deg C (Ohm/km)	0.32	0.25	0.206	0.1	0.08	0	0.03
8	Conductor Short circuit current rating for 1 second	9 kA	11.3kA	14.2kA	28.3kA	37.7 kA	59.4 kA	94.3 kA
9	Min. weight of conductor (kg/km/core)	244	308	390	780	1080	1650	2600

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S.No.	Parameter	Requirement
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 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 only.
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 only


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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 only. 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.

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S. No.	Parameter	Requirement
		<p>Min. thickness shall be 0.3 mm at any point of measurement.</p> <p>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%.</p> <p>Core identification strip:</p> <p><u>3 CORE CABLE:-</u> Each of the three core identification strips shall be applied longitudinally beneath copper screen. Width of the coloured strip shall be 7-10 mm.</p> <p><u>1 CORE CABLE:- NA</u></p> <p>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.</p>
3	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz., Dow/Borealis/Hanwa only
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 colour	NA
2	Configuration	Virgin Polypropylene fibers shall be tightly filled in empty space as fillers.	

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5.6 Inner Sheath:

S. No.	Parameter	Requirement				
		3 CORE CABLE			1 CORE CABLE	
1	Material	Black coloured Polyvinyl chloride (PVC) type ST-2 compound				
2	Configuration	The laid up cores shall be provided with <i>pressure extruded</i> 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				
		95 sq.mm.	120 sq.mm.	150 sq.mm.	300 sq.mm.	400 sq.mm.
		0.6 mm	0.6 mm	0.6 mm	0.7 mm	0.7 mm
		1 CORE CABLE				
		400 sq.mm.	630 sq.mm.		1000 sq.mm.	
		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 dipped galvanized round steel wires	H4 Grade Aluminium wires
2	Compliance to Standard	It shall comply with the requirements of IS 3975 along with latest amendments. Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires. Zinc coating shall be 290 g/m ² as per IS 4826:1979.	It shall comply with the requirements of IS 8130 along with latest amendments.

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S. No.	Parameter	Requirement				
		3 CORE CABLE			1 CORE CABLE	
3	Nominal Dimensions	3 Core cable				
		95 sq.mm	120 sq.mm	150 sq.mm	300 sq.mm	400 sq.mm.
		2.5 (GI Wire)	2.5 (GI Wire)	2.5 (GI Wire)	3.15 (GI Wire)	4.00 (GI Wire)
		1 CORE CABLE				
		400 sq.mm		630 sq.mm		1000 sq.mm
		2 mm (Aluminum wire)		2 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	120 sq.mm	150 sq.mm	300 sq.mm	400 sq.mm.
		9	12	15	15	15
		1 CORE CABLE				
		400 sq.mm		630 sq.mm		1000 sq.mm
		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 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 from reputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL only.			Aluminium armour shall be procured from reputed raw material suppliers viz., BALCO/HINDALCO/NALCO/Vedanta Only.	

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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										
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">95 sq.mm</td> <td style="text-align: center;">120 sq.mm</td> <td style="text-align: center;">150 sq.mm</td> <td style="text-align: center;">300 sq.mm</td> <td style="text-align: center;">400 sq.mm.</td> </tr> <tr> <td style="text-align: center;">2.2 mm</td> <td style="text-align: center;">2.2 mm</td> <td style="text-align: center;">2.36 mm</td> <td style="text-align: center;">2.84 mm</td> <td style="text-align: center;">3.0 mm</td> </tr> </table>	95 sq.mm	120 sq.mm	150 sq.mm	300 sq.mm	400 sq.mm.	2.2 mm	2.2 mm	2.36 mm	2.84 mm	3.0 mm
		95 sq.mm	120 sq.mm	150 sq.mm	300 sq.mm	400 sq.mm.						
		2.2 mm	2.2 mm	2.36 mm	2.84 mm	3.0 mm						
		1 CORE CABLE										
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">400 sq.mm</td> <td style="text-align: center;">630 sq.mm</td> <td style="text-align: center;">1000 sq.mm</td> </tr> <tr> <td style="text-align: center;">1.72 mm</td> <td style="text-align: center;">1.88 mm</td> <td style="text-align: center;">2.2 mm</td> </tr> </table>	400 sq.mm	630 sq.mm	1000 sq.mm	1.72 mm	1.88 mm	2.2 mm						
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400 sq.mm	630 sq.mm	1000 sq.mm										
1.72 mm	1.88 mm	2.2 mm										
4	Colour	Crimson Red color, colour 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. 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 colour code 540, Minimum thickness at any point of measurement – 3 mm
2	Outermost layer	HDPE ST-7, Black colour, 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 only.

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S.No.	Parameter	Requirement
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	To be provided by bidder
2	Weight of Overall cable	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%.

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.

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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) TPCODL
- 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


- 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

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- 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
- Colour 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 (for Normal cable)

- Thickness
- Tensile strength and Elongation at break (before ageing)
- Colour of outer sheath
- Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void,

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nick, cavity

- Presence of lead naphthenate in PVC outer sheath
- Flammability test
- Oxygen index
- Temperature index
- Acid gas generation
- Smoke density

Test on Outer sheath (for 3 Core extruded cable)

INNER LAYER

- Thickness
- Tensile strength and Elongation at Break (before ageing)
- Colour

OUTER LAYER

- Thickness
- Tensile strength and Elongation at Break (before ageing)
- Carbon Content
- Colour
- Surface uniformity of outer sheath (on full drum)/ shall be free from any damage- void, nick, cavity

Test on Complete Cable

- Partial discharge test
- High voltage test

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

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- 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

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- Smoke density

Tests on Outer Sheath - HDPE ST 7 (for Co-extruded cable)

- Thickness
- Tensile strength and Elongation at break (before ageing)
- Tensile strength and Elongation at break (after ageing)
- Shrinkage test
- Carbon Black Content

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

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Additional Test (To be checked by Inspector)

- Raw material consumption
- Colour coding identification over copper screen (for 3C cable)
- Sequential marking check
- Cable drum length verification
- Packaging of cable on cable drum
- Diameter over outermost sheath of co-extruded cable
- Weight of outer sheath of co-extruded cable/ km
- 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. 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.

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

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10. INSPECTION AFTER RECEIPT AT STORE:


The material received at TPCODL, 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 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 TPCODL 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

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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.

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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

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Prepared by: Swarup Nayak	Reviewed By: Srastanth Mohanty	Approved By: Khajan C. Bhardwaj	Issued By: Pourush Garg

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1. SCOPE

This Specification covers the design, manufacture, testing at works and supply of L.T Distribution Boxes made out of GI for controlling the L.T. feeders from the L.T. side of Distribution for Feeders . The system shall be A.C. 3 phase, 4 wires, 433 V, 50 HZ with effectively grounded neutral.

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 confirm to the regulations of the local authorities.

S.NO	Indian Standard	Title
1	IS 5039	Specification for distribution pillars below 1000V AC
2	IS :13947/1993 (Part 3)	Specification for Isolator (Switch Disconnecter)
3	IS: 13947/1993 (Part2) (amended upto date)	Specification for L.T. MCCBs.
4	IS: 8623/1993 (amended upto date)	Specification for enclosure Box & for degree of protection provided by enclosures of electrical equipments.
5	IS: 4237/1982 IS: 8623/1993 (amended upto date)	Specification for general requirement of L.T. switchgears.
6	IS 13703/1993 (Part I & II amended upto date)	Specification for HRC Fuse Base and HRC Fuse Link.
7	IS 4759 : 1996	Hot-Dip Zinc Coating On Structural Steel and Other Allied Product
8	IS 2705	Current Transformer

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 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.

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4. GENERAL TECHNICAL REQUIREMENTS

Standard General Arrangement MCCB In the incoming & HRC fuse base with HRC fuse links in the Outgoing Circuit. Provision space for fixing 3 Phase energy meter to be given

5.GENERAL CONSTRUCTIONS

Distribution Boxes shall have triple-pole MCCB on incoming circuit and HRC fuse base with HRC fuse links on outgoing circuits with necessary interconnecting Bus Bars/Links. The distribution box shall have provision for installation of 3 Phase energy meter.

Enclosure shall be of GI (Hot Dip Galvanised).

LTDB for 250KVA & 500KVA LTDB will be Plinth mounted.

Bidder has to supply GI frame along with Distribution box for 250KVA & 500KVA LTDB.

Process for Galvanisation shall be as per Annexure-1

Note: Before starting Mass Production, Supplier has to fabricate one prototype and get it Inspected and Approved by TPCODL Engineering & Quality Dept .

5.1 INCOMING CIRCUIT

Each distribution box shall have 1 nos. of triple-pole MCCB rating suitable for 250 KVA /500 KVA Box to protect outgoing circuits. MCCB shall be conforming as mentioned below table. The bidder shall indicate the makes and types of MCCBs offered in GTP. The Bidder shall furnish detailed type test reports before or on due date & time of submission of tender. Opening & Closing of MCCB shall be manual .MCCB should electrically open during fault. The MCCB should be front operated triple pole type.

5.2 OUTGOING CIRCUIT

1. HRC FUSE :

HRC Fuse of suitable capacity shall be provided on outgoing terminal of MCCB to facilitate electrical breaking of the circuit. Each Distribution Box shall have HRC Fuse Base with HRC Fuse (Blade type Contacts) on Outgoing Circuit. The bidder shall indicate in GTP, the make, type,Fault Rating and capacity of HRC Fuse Base and Fuse offered.

2. HRC FUSE BASE

The base of the HRC Fuse shall be of non-tracking, heat resistant insulating material of Dough Moulding Compound (DMC) of D3 Grade as per IS: 13411/1992. The Fuse Base shall be sturdy in construction. The extension terminal connector strips of the Fuse Base shall be projecting out on both sides, made with two pieces (half portion of the terminal contact and extension strip should be continuous in one piece).


DT RATING	LTDB Incoming MCCB-3P	O/G-I HRC Fuse Rating	O/G-II HRC Fuse Rating	O/G-III HRC Fuse Rating	O/G-IV HRC Fuse Rating
250KVA	630A	200A	200A	160A	100A
500KVA	800A	315A	315A	200A	160A

3. The Bidder shall furnish detailed type test reports before or on due date & time of submission of tender. The HRC fuse base with HRC fuse to be provided in the Distribution Box.

4. Each Distribution box shall have provision for fixing Smart Energy meter in attached Metering Compartment with suitable rating CTs for DT metering.

Metering Compartment Size: (in mm): 450 X 350 X 250

CT arrangement will be on the incoming side of MCCB.

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The Metering Compartment shall be IP55 and to be fixed to the side-wall of LTDB (Drawing Attached) .

All required Wirings for Current and Voltage measurement, from LTDB to Metering Box TB is in scope of supplier.

TTB to be used for CT/PT wirings to Energymeter. Provision for CT Shorting to be provided in TB.

2 Amp MCB to be used for isolation purpose in Voltage circuit wiring to Metering Compartment.

5. Current Transformers :The Bidder has to supply Base Mounted Current Transformers .
6. CT Specification as per Annexure-2.
7. Suitable CT Ratios to be selected by Bidder.

5.3 BUSBARS AND CONNECTIONS:

The Incomer feeder should be on Left side of the distribution box and all outgoing feeders will be on Right side of the distribution box, with phase sequence RYB to be maintained. The phase bus bars and feeder droppers from bus bars shall be of electrolytic grade Aluminium with purity 99.5%.

Bus-Bar sizing subject to minor changes as per Manufacture's Type Tested Design ensuring adequate clearance between electrical components as per relevant Standards.

- 1) **The Incomer Feeder dropper & Bus Bar for 250KVA LTDB will be 50 x 8 mm cross section.**
- 2) **The Incomer Feeder dropper & Bus Bar for 500KVA LTDB will be 50 X 8 & 75 X 12 mm cross section respectively.**

All bus bars and droppers shall be properly drilled and deburred. Each bus bars shall be of one single strip without any joint. At the joint with copper part the aluminium end piece shall be bimetallic with sufficient thickness. There should be Heat Shrinkable bus bar insulation Sleeves of Red, Yellow, Blue & Black. . Bus bars shall be mounted on suitable size support insulators which should be tightened from inside. i.e. once fitted, should not be able to removed. Minimum clearances, wherever shown, shall be as per General

Arrangement shall be as per requirement of IS: 4237/1982 amended up to date.

- 1) Minimum Clearance between Phase to Earth after all Cable Connections : 40mm
- 2) Minimum Clearance between Phase to Phase after all Cable Connections : 40mm

5.4 ENCLOSURE:

The L.T. Distribution Cabinets shall be Plinth Mounted .These Distribution Cabinets are to be outdoor type and to be fabricated out of 3 mm GI sheet. The body of the boxes shall have sufficient re- enforcement with suitable size of channels keeping a provision for fixing these boxes on plinths.Enough reinforcement should be provided to make the enclosure suitable to be used in Cyclone prone/High intensity wind areas.

All GI Sheets and Supports shall be Hot Dip Galvanised.

The general clear dimensions of Distribution boxes shall be as follows:

Note:(Dimensions are subject to small variations as per Manufacturer's Type Tested Design ensuring necessary clearance as per relevant IS between all Electrical Components)

Dimensions in mm (Height X Width X Depth) :


For 250KVA Distribution box :1550x1650x500

For 500KVA Distribution box :1700x1900x500

The above dimension are indicative, the box should be able to accommodate all equipments with sufficient rating & required clearances as per relevant standards . The design should also be maintenance friendly so that the replacement of any equipment can be done without any difficulty.

The nuts, bolts, washers used in the box shall be galvanized to avoid rusting.

The box shall have two nos of solid Earthing points on either side .

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Boxes shall have centre opening swing double door type with four number of hinges. On closing of doors, right door shall rest on the left door. Base and doors shall have flange / collars. Collar of Base and doors shall overlap by 10mm. Rubber gasket of suitable size shall be provided in between base and doors, such that it provides proper sealing between the door and base of box to avoid penetration of dust & ingress of water. **Degree of protection shall be IP-55**. Rubber Gasket shall be fixed with suitable adhesive. Hinges shall be stainless type ,minimum 50 mm in length & made from 2mm thickness or suitable size to provide enough strength.. The hinges shall not be visible from outside.Padlocking arrangement should be provided outside the Door. The MCCBs, HRC Fuse, Meter, CT and HRC fuse base shall be housed inside the enclosure.

Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per drawings

Painting

All paint shall be applied on clean dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The overall paint thickness shall not be less than 70 microns.

The paint shall not scale off or crinkle or be removed by abrasion during normal handling.


The enclosure of the Panel shall be painted with shade light Grey, i.e. RAL 7032. The Panel should be painted with Anticorrosive paints. If any damage observed after delivery same need to be touch-up painted after delivery at site.

The paint should sustain for harsh environment & saline weather , Corrosion Protection for Panel entire life cycle(minimum 10 yrs) .

5.5 LOCKING ARRANGEMENT TO THE BOX

- A. The door should be front operated with a common handle provided outside the door. In addition to this, Pad lock to be provided in Centre & C&R panel door locks shall be provided to the door at top & bottom. Key way shall be provided on the door for operating the lock from outside. Key way shall be provided with cover. A nylon washer shall be provided between the handle and door to avoid penetration of water.
- B. Electrolytic grade aluminium neutral busbar will be same rating as phase bus bar with current density 1 Amp/sqmm.
- C. Neutral Busbar shall be isolated with respect to body. The bimetallic lugs of adequate size, as per enclosed specification & drawing, shall be provided. Neutral Busbar shall be as shown in the drawing attached with the specifications.
- D. Two galvanized earthing Bolts of M8 x 40 mm size shall be fixed from inside and projecting outside of the box . There should be no powder coating on the earthing bolts. Two Nuts with washers shall be provided on each bolt.
- E. All the components inside the Box shall be mounted on GI BOX. The mounting strips shall be provided with required bends or ribs to give the extra strength and shall be powder coated or zinc plated.
- F. All joints of current carrying parts shall be bolted with 8.8 grade High Tensile SS Nuts & Bolts, Corrugated/spring & Plain Washers. The nuts & bolts should be of hexagonal type. All the nuts, bolts & washers should be properly zinc plated.
- G. Each distribution box shall be supplied with proper packing in five ply - corrugated box.
- H. Name plate having details such as Month & year of manufacturing, Name of manufacturer/Trade mark, Sr.No, and rating of Distribution box,Danger Plate shall be riveted on the Distribution box door. The name plate should be of stainless steel of thickness 1 mm. TPCODL logo shall be embossed on the door of the distribution box.
- I. Incoming and outgoing circuit should be duly highlighted with paint by stencil printing.
- J. Adequate slope on the top of box shall be provided to drain out rainwater from the top. Good-quality plastic sticker leaflet should be reveted inside of distribution box door. The matter of instruction leaflet is given along with this specification. All the instructions in leaflet should be in Odia/Hindi/English language.

6. MARKING

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The LTDB box shall carry the following information contained in a label attached to it:

- a) Reference to the Standards.
- b) Manufacturer's name
- c) Year of manufacture.
- d) The following shall be embossed on the LTDB," PROPERTY OF TPCODL."
- e) Danger Name plates, Supply voltage-440v (In Odia,Hindi and English as per IS 2551)
- f) Purchase Order number
- g) Warranty has to be marked on the nameplate of the enclosure with another warranty sticker (Metal Riveted) to be placed inside the enclosure with date and other details related to warranty.

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 shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the LTDB components in additions to others specified in the IS/IEC Standards.All these Type Test should be conducted at CPRI/ERDA.Type Test report validity should not exceeded timespan as per CEA Latest Guidilines from the date of testing.

TYPE TESTS

ON COMPLETE BOX:

- Temperature rise test:-The temperature rise test should be carried out as per IS: 8623 -1993 .
- High voltage test shall be carried out as per IS:8623/ 1993 amended upto date.
- Short Time Withstand Current Test on Distribution Box shall be carried out as per IS 8623 or latest version.
- Degree of protection for IP- 55 on complete box shall be carried out as per IS: 13947/1993 or the latest version thereof.
- Time /current characteristic test on MCCBs shall be carried out as per clause 7.2 of this specification as stated above.

ON HRC fuses base and HRC fuse :

Type tests on HRC fuses and HRC fuse links IS 13703 (Part I & II) for HRC Fuse Base and HRC fuse link shall be carried out.

ON MCCB:


Type tests on MCCB as per IS-13947

ACCEPTANCE TESTS

Following tests shall be carried out as per acceptance tests in addition to routine tests on one random sample of each rating out of the lot offered for inspection:

1. Temperature rise test on one sample of each rating. Temperature rise test will be carried out as per the procedure given below: For temperature rise test, a distribution box with all assembly of MCCBs / HRC fuse base with HRC fuse link shall be kept in an enclosure such that the temperature outside the box shall be maintained at 50 ° C.
20% more current than transformer secondary capacity i.e. for 63 KVA Distribution Transformers full load current 84A, 20 % more is 100 A shall be kept in incoming circuit keeping outgoing circuits short, till the temperature stabilizes and maximum temperature rise should be recorded.
2. Time-Current Characteristics The MCCB should be tested for time current characteristics at 1.05 & 1.2 times of overload release setting current.

ROUTINE TESTS

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1. Overall Dimensions Checking.
2. Insulation Resistance Tests.
3. High Voltage Test at 2500 V, 50 Hz AC for one minute.
4. Operation Test on MCCB/Link Disconnecter / HRC fuse base and HRC fuse links.
5. Thermal overloading Test for MCCB
6. Contact Resistance Test

For MCCBs and HRC Fuse, Routine Test reports of OEM is accepted.

8. TYPE TEST CERTIFICATES

The Bidder shall furnish the type test certificates of the LTDB 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 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

9. 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 TPDDL
- 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 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 Purchaser 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 later. 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 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. In case of any issue in LTDB and its components within the guarantee period the purchaser will immediately inform the Bidder who shall

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take back the LTDB components within 15 days from the date of intimation at his own cost and replace / repair the faulty component within forty-five days of date of intimation with a roll over replaced shall not be counted for arriving at the guarantee period.

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.

13. TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL).

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. 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 AND TOOLS


Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document.

Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall be given a minimum of 12 months' notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment. Any spare 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.

18. DRAWINGS AND DOCUMENTS

Following documents shall be prepared based on TPCODL 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.

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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	Manual/Catalogues/Autocad drawings for all components.		√	
3	Technical details and test certificates.		√	√
4	Installation Instructions		√	√
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.


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.

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19. GUARANTEED TECHNICAL PARTICULARS

GUARANTEED TECHNICAL PARTICULARS FOR LTDB 250 KVA DISTRIBUTION TRANSFORMER

Sr	PARTICULARS	OFFERED
1	Material of the Meter Box	Galvanised Iron
2	Manufacturing Process.	Fabrication with GI
3	Color of Box	RAL 7032 as per IS 5
4	Dimension of Box (Height X Width X Depth)	1550x1650x500 (Dimensions are subject to small variations as per Manufacturer's Type Tested Design ensuring necessary clearance as per relevant IS between all Electrical Components)
5	<i>THICKNESS OF BOX</i>	
i	<i>Load Bearing Size</i>	4.0 mm (Min.)
ii	<i>Non Load Bearing size</i>	3.0 mm (Min.)
iii	<i>Type of Door</i>	The Door should be centre opening , Double door with Swing Type
6	<i>Strip Hinges</i>	Minimum 4 Hinges on each door.
7	<i>Panel Type Lock arrangement Padlock Arrangement</i>	Provided
9	<i>Whether sufficient sealing provided to make dust, water and vermin proof?</i>	Rubber Gasket
10	<i>Provided Louvers For ventilation</i>	No
11 a	<i>Whether inlet and outlet arrangement for service cable provided.</i>	Removable Gland Plate shall be provided. Required Holes shall be done at site.
b	<i>Whether for incoming and outgoing cables provisions of glands of suitable size have been made. Please mention its dimension?</i>	Cable Glands are not required. Suitable arrangement to be made for Cables as follows: 1) I/C :Single Core Cable 400Sqmm . 2) O/G: Cable 4CX185Sqmm
12	<i>In coming aluminum Bus Bar R,Y,B,N</i>	For 250 KVA: 50 x 8mm , (R,Y,B,N)


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13	<i>Outgoing Aluminum Riser /Dropper</i>	50 x 8 mm
16	<i>No.of connections on each bus bar</i>	Each phase bus bar 01 no Incomer and 03 Nos outgoing circuit
17	<i>Bus bar arrangement</i>	As per drawing (Subject to change as per Manufacturer's Type Tested Design while maintaining Clearance as per Relevant Standards)
18	<i>Busbar mounting insulator</i>	Epoxy resin cast bus insulators
19	<i>Clearance between busbars.</i>	40 mm Min
20	<i>Clarence between busbar & Box walls.</i>	40 mm Min
21	<i>Sealing arrangement</i>	Hole for Wire Sealing
22	<i>Markings</i>	Danger Name Plate, Supply voltage-440V ,SL No & Property of 'TPCODL', Metallic Riveted Plate
23	<i>Degree of protection</i>	IP-55 (Min)
24	<i>Packing</i>	Standard Corrugated box packing
25	<i>Earthling Provision</i>	M6 x 35 mm, 02 Nos
26	<i>Incoming arrangement</i>	For 250 KVA : 630 Amp 40KA TP MCCB- 01 Nos
27	<i>Make of MCCB</i>	ABB, Siemens, L&T, EATON, Schneider, Legrand.MCCB Should have integrated OL,SC & E/F Protection
28	<i>Outgoing arrangement</i>	For 250 KVA : OG-1:200A,OG-2:200A,OG-3:160A Fuse make- L&T, Siemens, EATON,ABB,
29	<i>Terminal Spreader rating</i>	Minimum cross sectional are must be equivalent to the Incomer bus bar size. Spreader needs to be L-shaped for R and B-phase and straight type for Y-phase
30	<i>Glands</i>	Not in scope
31	<i>Provision of LT switch & socket</i>	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	<i>Provision of Space for Energy Meter</i>	To be provided by Bidder
33	<i>CT (0.5S Accuracy Class on 3 Phase and neutral)</i>	To be provided by Bidder
34	<i>Provision of LED Indication on Incoming supply R,Y, B with Fuse protection</i>	To be provided by Bidder
35	<i>Provision of NO & NC Contact for status monitoring of MCCB</i>	To be provided by Bidder


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GUARANTEED TECHNICAL PARTICULARS FOR LTDB 500 KVA DISTRIBUTION TRANSFORMER

Sr#	PARTICULARS	OFFERED
1	Material of the Meter Box	Galvanised Iron
2	Manufacturing Process.	Fabrication with GI
3	Color of Box	RAL 7032 as per IS 5
4	Dimension of Box (Height X Width X Depth)	1900x1700x500 mm
5	<i>THICKNESS OF BOX</i>	
i	<i>Load Bearing Size</i>	4.0 mm (Min.)
ii	<i>Non Load Bearing size</i>	3.0 mm (Min.)
iii	<i>Door Type</i>	Centre opening Double Door Swing Type
6	<i>Strip Hinges</i>	Minimum 4 Hinges on each door. Hinges of Stainless Steel
7	<i>Panel Type Lock arrangement</i>	To be Provided
9	<i>Whether sufficient sealing provided to make dust, water and vermin proof?</i>	Rubber Gasket
10	<i>Provided Louvers For ventilation</i>	No.
11 a	<i>Whether inlet and outlet arrangement for service cable provided. Please mention dimension of holes?</i>	Removable Gland Plate shall be provided. Required Holes shall be done at site.
b	<i>Whether for incoming and outgoing cables provisions of glands of suitable size have been made. Please mention its dimension?</i>	1) Incoming Cable :1CX400Sqmm. 2) Outgoing Cables: 4CX400Sqmm.
12	<i>In coming aluminum Bus Bar R,Y,B ,N</i>	For 500 KVA: 75 x 12mm, (R,Y,B,N)
13	<i>Outgoing Aluminum Riser /Dropper</i>	50 x 8 mm

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16	<i>No.of connections on each bus bar</i>	Each phase bus bar 01 no Incomer and 04 nos outgoing circuit
17	<i>Bus bar arrangement</i>	As per drawing (Subject to change as per Manufacturer's Type Tested Design while maintaining Clearance as per Relevant IS)
18	<i>Bus bar mounting insulator</i>	Epoxy resin cast bus insulators
19	<i>Clearance between bus bars.</i>	40 mm Min
20	<i>Clearance between bus bar & Box walls.</i>	40 mm Min
21	<i>Locking arrangement</i>	As per drawing
22	<i>Markings</i>	Danger name Plate, Supply voltage-440V ,SL no & Property of 'TPCODL',Screen Printed
23	<i>Degree of protection</i>	IP-55(Min)
24	<i>Packing</i>	Standard Corrugated box packing
25	<i>Earthing Provision</i>	M8x40mm, 2Nos.
26	<i>Incoming Arrangement</i>	For 500KVA :800 Amp 50KA TP MCCB-01No.
27	<i>Make of MCCB</i>	ABB, Siemens, L&T, EATON,Schneider, Legrand.MCCB Should have intregated OL , SC & E/F Protection
28	<i>Outgoing Arrangement</i>	For 500 KVA : OG-1:315A,OG-2:315A,OG-3:200A,OG-4:160A Fuse make- L&T, Siemens, EATON
29	<i>Terminal Spreader rating</i>	Minimum cross sectional are must be equivalent to the Incomer bus bar size. Spreader needs to be L-shaped for R and B-phase and straight type for Y-phase
30	<i>Glands</i>	Not in Scope
31	<i>Provision of LT switch & socket</i>	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	<i>Provision of Space for Energy Meter</i>	To be provided by Bidder
33	<i>CT (0.5S Accuracy Class on 3 Phase and neutral)</i>	To be provided by Bidder
34	<i>Provision of LED Indication on Incoming supply R,Y, B with Fuse protection</i>	To be provided by Bidder
35	<i>Provision of NO & NC Contact for status monitoring of MCCB</i>	To be provided by Bidder

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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

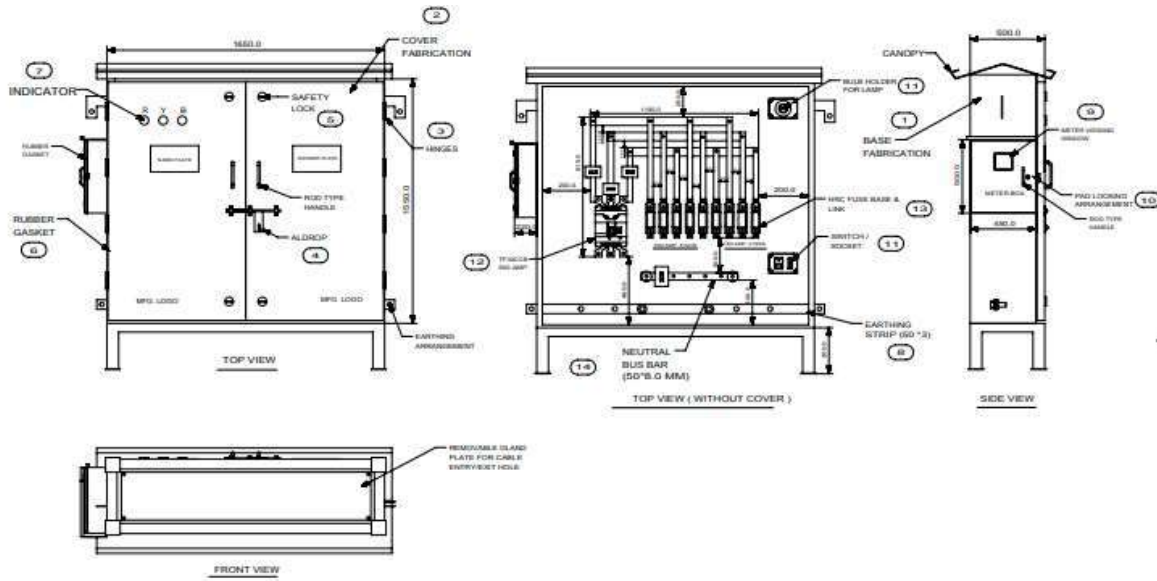
Designation

22. DRAWING (Subject to change as per manufacturers design while maintaining required clearances and relevant Specification)

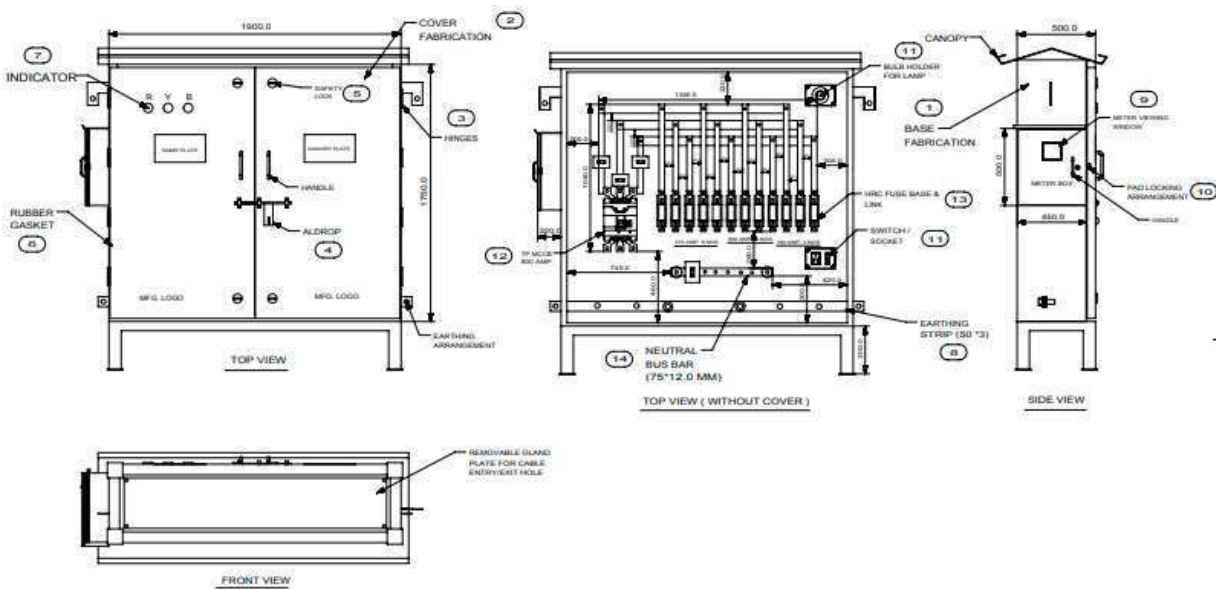
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Annexure-1


250 KVA



500KVA



GALVANIZATION (Spec: TPCO-OTH-010)

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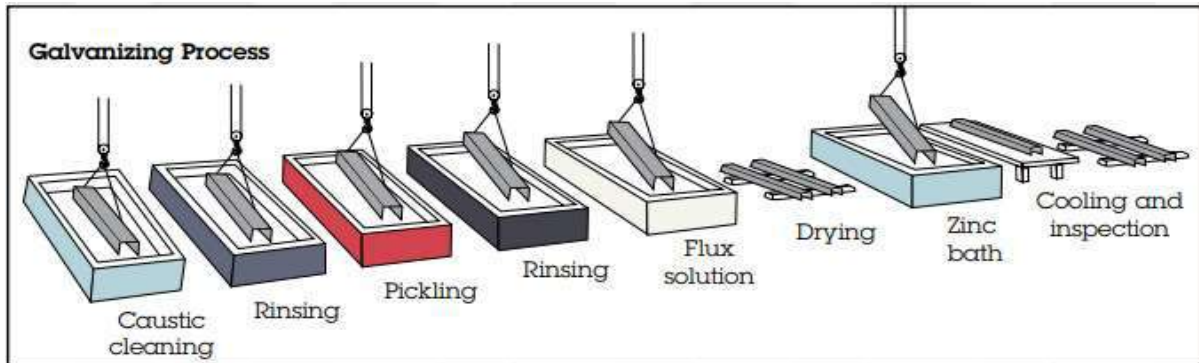
Zinc Coating thickness/ Mass of Zinc Coating to be as per mentioned in Tender /TPCODL requirements. Minimum Zinc Coating to be as detailed below:

Sl.No.	Product	Minimum Value for Average Mass of Coating (g/m ²)	Coating thickness in microns (No of Dip)
1	Fabricated steel articles:		
	a) 5 mm thick and over	705	100 (6Dip)
	b) Under 5mm, but not less 2mm	610	86 (5 Dip)
	c) Under 2 mm, but not less than 1.2mm	340	48 (3 Dip)
	d) All type Steel Pole	850	120 (7 Dip)
2	Threaded items(Not bolts etc.)other than tubes and tubefittings:		
	a) 10 mm dia and over	460	65
	b) Under 10 mm dia	320	45

NOTES:


- The requirements for the minimum mass of coating shall be increased as agreed to between the galvanizer and the purchaser.

Detailed Process Flow of Galvanization Steps:



Annexure-2

TECHNICAL SPECIFICATION FOR RESIN CAST RING TYPE CURRENT TRANSFORMERS FOR USE INSIDE THE BOX.

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(To be Housed Inside the DSS Box)

1.0 SCOPE

This specification covers resin cast ring type LT Current Transformers confirming to IS-2705/1992 or the latest version thereof are of class 0.5 accuracy, 5VA burden, for use in conjunction with -/5A or 100/5A energy meters of class 0.5. CTs will be design for indoor use to install in the metering box.


2.0 APPLICABLE STANDARDS:

LT CTs shall comply with the Indian Standard Specification IS: 2705/1992 (Part- I & II) and the latest version thereof.

3.0 TYPE AND RATING OF L.T.CURRENT TRANSFORMERS:

LT CTs shall be of the following type and ratings:

Sl.No.	Particulars	Requirement
1.0	Capacity or Rating	
	a) Rated Voltage b) No. of Cores c) Primary Current / Ratio d) Rated Output Burden. e) Rated Continuous Thermal current temperature rise over ambient f) Continuous Primary Current g) One Minute withstand Power Frequency Voltage for Primary & secondary winding h) ISF i) Rated Short Time Current j) Frequency k) Type	a) 415 V, 50 Hz (Phase to phase) b) One c) 50/5,100/5A, 200/5A, 400/5A, 800/5A, 1000/5A, 1500/5A d) 5VA e) As per IS:2705/1992 or latest version thereof f) 1.2 times of rated current g) 3 KV h) Less than 5 i) 5 kA for 1 Second j) 50 Hz k) Ring Type
2.0	Class of Accuracy	0.5s
	Material i. Core ii. Conductor iii. Insulation	High-grade non-ageing electrical low loss core Super enamelled copper wire of requisite diameter. Resin cast

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3.0	Primary & secondary Terminals i. Primary ii. Secondary terminal	Primary Conductor (Bus Bar of required current carrying capacity) will pass through Ring type CT. Proper marking will be provided for current direction identification. Inner diameter (I.D.) of CT will be minimum 45mm or as per size of bus bar for all ratings of CT & will increase as per the current rating of CTs. Secondary Terminals S1 & S2 will be clearly marked.
4.0	Clamping of CT	Sufficient Clearance must be kept between CTs to ensure Safe Operation and Efficient Heat Dissipation . The CTs are to be suitably clamped on to LTDB Mounting plate and Should not touch the Busbars going through it.

4.0 TESTS:

4.1 Routine Test

Current Transformer shall comply to routine tests including accuracy test as per IS: 2705/1992.

4.2 ACCEPTANCE TEST:

All routine tests as stipulated in the relevant standards shall be carried out by the manufacturer and to produce at the time of inspection before the inspector.


4.3 TYPE TEST

Type test of CT shall be submitted with the bid carried out as per IS:2705 by NABL approved laboratory / test house. Type test shall be not earlier than 5 years from the date of bid opening. Drawing of the CT and its arrangement on bus bar shall be submitted with the offer .

5.0 RATING PLATE:

Following shall be printed/engraved on the name plate of CTs.

1. Sl.No.
2. CT ratio
3. VA burden
4. Class of accuracy.
5. Name of manufacturer
6. Year of manufacturing
7. PO No. & Date
8. Property of TPCODL" should be mentioned on name plate
9. Polarity should be marked on the body of the offered LT CTs.

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6.0 GENERAL TECHNICAL SPECIFICATION

Current transformer shall have an opening in the center to accommodate a primary conductor that will be bus-bar.

Current transformers shall be of Resin cast type, suitable for indoor installation, type of resin shall be "Cycloaliphatic Resin" class of insulation shall be "F" as specified in IS:2705.


The minimum internal diameter for ring type CTs should suitable to accommodate a primary conductor i.e. bus-bar of Distribution transformer.

The polarity marking on the offered CT primary & secondary side should be embossed.

A two core (2.5sq. mm, as per relevant IS) HR FR PVC insulated flexible multi strand copper cable shall come out directly from the CT as secondary terminal. The length of the wire shall be around 2 Mtrs. Which is directly connected to the energy meter's terminals, pin type lugs shall be required on open end of cable.

Core details of cable shall be : Core-1 : S1, Core -2 : S2.

- i) LT CTs shall be of Brick red colour.

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1. SCOPE:

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	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)

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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. 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	62.5kA
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)	60 ms
4.18	Closing time (max)	60 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


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4.21	No. of auxiliary contacts	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	25mm/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 manufacturers 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	Copper chromium
4.34	Make of Interrupter	Make to Vacuum Interrupter should be of same make as that of Breaker manufacturer. TPCODL 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 Galvanized steel, the thickness of which shall not be less than 3 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. All the cable glands used for connections shall be of double compression type. 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

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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 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. The terminal box shall be provided with DC supply.
- 5.1.5 Vent outlets of circuit-breakers shall be so situated that a discharge of gas shall not cause electrical breakdown and is directed away from any location where persons may be present. The necessary safety distance shall be stated by the bidder. The construction shall be such that gas cannot collect at any point where ignition can be caused, during or after operation, by sparks arising from normal operation of the circuit breaker or its auxiliary equipment.
- 5.1.6 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 $\pm 10\%$ 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 85% 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.

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- 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. All contacts shall be silver coated (Thickness shall be specified) and made of Copper Chromium alloy.

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. All current carrying contact surfaces shall be silver-plated. Silver plating shall not be less than one mm thickness. Bushings shall satisfactorily withstand the insulation level specified in the relevant IS.

5.5 PRIMARY TERMINALS:

Primary terminals shall be Silver plated copper suitable for wedge type connectors with ZEBRA conductors. Successful bidder shall supply connectors. It should have Primary terminals (connected at Fixed contact) on either side at top in case of bypassing CB.

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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.

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", 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:

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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. Dynamic contact resistant measurement (Signature test)

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. Short line fault tests
12. Out of phase making and breaking tests
13. Electrical endurance tests
14. Double earth fault tests
15. 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/International Labs 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 .

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9. 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. INSPECTION AFTER RECEIPT AT STORES

The material received at TPCODL 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 eplacement" 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

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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. The purchaser while placing the order will decide the exact quantity. Bidder should quote unit rates for spares.

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

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 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

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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)

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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	

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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		

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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

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Seal of the Company:


Signature

Designation

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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


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10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)
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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. GENERAL TECHNICAL REQUIREMENTS

GENERAL TECHNICAL REQUIREMENTS								
S.	Description	As specified by TPCODL						
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			

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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 (mm)	450 X 450				310 X 310			

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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

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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 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".

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

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- 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"
- xv) Relevant standards
- xvi) SAP item code

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

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- 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
- 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

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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

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- 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 CP	✓		✓
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

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GENERAL TECHNICAL REQUIREMENTS									
S.	Description	11kV				33kV			
1	Service								
2	Rated voltage								
3	Rated								
4	Rated Lightning								
5	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								

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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)		

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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:


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Signature
Designation

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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 95 sq.mm	1C X 400 sq.mm
3C X 300 sq.mm	1C X 630 sq.mm.
3C X 400 sq.mm	1C X 1000 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 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

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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	Colours 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:

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

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10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)
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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. 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	+/- 5%	
5	Conductor	Watertight Stranded Aluminum (compacted circular)	
6	Conductor screen	Semi conducting tape and screen	
7	Insulation	XLPE	
8		Shall have three layers:	Shall have three layers:
9	Insulation screen	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 colour 'Yellow Lemon shade' code: 355 as per IS 5:2007	

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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 conductor mm ²	95	300	400	630	1000
6	Min. number of strands	15	30	53	53	30
7	Max. DC resistance @ 20 deg C (Ohm/km)	0.32	0.1	0.0778	0.0469	0.0291
8	Conductor Short circuit current rating for 1 second	9 kA	28.3kA	37.7 kA	59.4 kA	94.3 kA
9	Min. weight of conductor (kg/km/core)	244	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.				

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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 only.
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 only

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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 procured from reputed raw material suppliers viz., Dow/Borealis/Hanwa only. 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
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 0.5 mm at any point of measurement. b) 2nd layer: Water Swellable tape: Semi-conducting water swellable tapes shall be

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S. No.	Parameter	Requirement
		<p>applied over non-metallic screen. Minimum thickness of water swellable shall be 0.3 mm and minimum overlapping shall be 15%.</p> <p>Core identification strip: <u>For 3 Core Cable</u> Each of the three core identification strips shall be applied longitudinally beneath copper screen. Width of the coloured strip shall be 7-10 mm.</p> <p><u>For 1 Core Cable</u> NA</p> <p>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.</p>
3	Raw material supplier	Semiconducting compound shall be procured from reputed raw material suppliers viz., Dow/Borealis/Hanwa only
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 colour	NA
2	Configuration	Virgin Polypropylene fibers shall be tightly filled in empty space as fillers.	

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5.6 Inner Sheath:

S. No.	Parameter	Requirement		
		3 CORE CABLE		1 CORE CABLE
1	Material	Black coloured Polyvinyl chloride (PVC) type ST-2 compound		
2	Configuration	<p>The laid up cores shall be provided with <i>pressure extruded</i> 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.</p>	<p>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.</p>	
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		
		95 sq.mm.	300 sq.mm.	400 sq.mm.
		0.7 mm	0.7 mm	0.7 mm
		1 CORE CABLE		
		400 sq.mm.	630 sq.mm.	1000 sq.mm.
		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 dipped galvanized round steel wires	H4 Grade Aluminium wires
2	Compliance to Standard	<p>It shall comply with the requirements of IS 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.</p>	<p>It shall comply with the requirements of IS 8130 along with latest amendments.</p>

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S. No.	Parameter	Requirement		
		3 CORE CABLE		1 CORE CABLE
3	Nominal Dimensions	3 Core cable		
		95 sq.mm	300 sq.mm	400 sq.mm.
		3.15 (GI Wire)	4.00 (GI Wire)	4.00 (GI Wire)
		1 Core cable		
		400 sq.mm	630 sq.mm	1000 sq.mm
		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	300 sq.mm	400 sq.mm.
		9	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 from reputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL only.		Aluminium armour shall be procured from reputed raw material suppliers viz., BALCO/HINDALCO/NALCO/ Vedanta Only.

5.8 Outer Sheath

S.No.	Parameter	Requirement
1	Material	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with 'lead naphthenate' additive

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S.No.	Parameter	Requirement		
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	300 sq.mm	400 sq.mm.
		2.68 mm	3.0 mm	3.0 mm
		1 CORE CABLE		
		400 sq.mm	630 sq.mm	1000 sq.mm
		2.04 mm	2.36 mm	2.52 mm
4	Colour	Yellow Lemon color, colour 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 material suppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam. 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 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	To be provided by bidder
2	Weight of Overall cable	To be provided by bidder

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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%.

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) TPCODL
- 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: -

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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
- Colour of inner sheath

Test on Armour (For 3 Core)

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- 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)
- Colour 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

- i) Conductor resistance test
- ii) Partial discharge

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iii) High voltage test with power frequency

iv) 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

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- 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

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Additional Tests


- Raw material consumption
- Colour 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 TPCODL.

9. 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.

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Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPCODL
- c) TPCODL 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, 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 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 TPCODL 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

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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.

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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-2002

**Specification Name : Technical Specification for 11/0.4kV 250kVA to 2000kVA
Distribution Transformer (Cu)**

YASHOBANTA ROUT	SHANTAPRIYA JENA	Vijender Goyal	JYOTIPRAKASH MOHANTY	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPSODL	TPWODL	TPCODL	TPCODL
06-12-2022	06-12-2022	07-12-2022	07-12-2022	07-12-2022	07-12-2022

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TPWODL*



Specification No: ENG-HV-2002

Specification Name: Technical Specification for 11/0.4kV 250kVA to 2000kVA Distribution Transformer (Cu)

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19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

- I. 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 Oil immersed, non-sealed, naturally cooled, three Phase 11/0.433 kV, 50Hz, outdoor conventional type, copper winding, Distribution Transformer of 250kVA to 2MVA ratings.
- II. The transformer shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions specified in clause no. 3
- III. Such of the parts that may have not been specifically included, but otherwise form part of the transformer as per standard trade and/or professional practice and/or are necessary for proper operation of transformer, 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. notwithstanding the fact that at the time of an initial offer bidder had segregated such items and quoted for them separately.

2. APPLICABLE STANDARDS:

The equipment (and the materials used) covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian standards & other relevant standards for components, BEE & CEA guidelines with latest amendment from time to time, thereof, some of which are listed below:

Indian Standards	Title
IS 1180	Outdoor Type Oil Immersed Distribution Transformers Upto and Including 2500 KVA, 33 kV-Specification
IS 2026 (all parts)	Specification for Power Transformers
IS 104	Specification for ready mixed paint, brushing, zinc chrome, priming
IS 335	Specification for new insulating oil.
IS 649	Testing for steel sheets and strips and magnetic circuits.
IS 5	Specification for Colors for ready mixed paints and enamels
IS 1576	Solid Pressboard for Electrical Purposes -Specification
IS 2099	Specification for bushings for alternating voltages above 1000 volts

IS 2362	Determination of water content in oil by Karl in oil Fischer Method – Test Method.
IS 3024	Grain oriented electrical steel sheets and strips
IS3347 (Part I & Part-3)	Dimensions for Porcelain Transformer Bushings for Use in Normal and Lightly Polluted Atmospheres - Part 1 : Up to and including 1 kV
IS 4253: Part II:	Specification for cork composition sheets- Part II : Cork and Rubber
IS 4257(Part I):	Dimensions for Clamping Arrangements for Porcelain transformer Bushings - Part I: For 12 kV to 36 kV Bushings
IS 5082	Wrought Aluminum and Aluminum Alloy bars, Rods , Tubes, Sections, Plates and Sheets for Electrical Applications
IS 5561	Specification for Electric Power Connectors
IS 6103	Specification for Testing of specific resistance of electrical insulating liquids
IS 2026 part 7	Guide for loading of Oil-immersed transformer
IS 6792	Method for Determination of Electric Strength of Insulating Oil
IS 7404 (Part-1):	Paper Covered conductors: Round Conductors
IS 7421	Specification for porcelain bushings for alternating voltages up to and including 1000kv
IS 8603 (Part-1) :	Dimensions for Porcelain Transformer Bushings for Use in Heavily Polluted Atmospheres - Part I:12 kV and 17.5 kV Bushings
IS 9335	Specification for Cellulosic Papers for Electrical Purposes
IS 10028	Code of Practice for Selection, Installation and Maintenance of Transformers
IS 11149	Specification for rubber gaskets
IS 12444	Specification for Continuously Cast and Rolled Electrolytic Copper Wire Rods for Electrical Conductors.
IS/IEC 60947 (PART 1& PART 2)	Specification for LV Switchgear & Control gear
IS 6160	Rectangular electrical conductors for electrical machines
IS 13964	Methods of measurement of transformer and reactor sound levels
IS 3401	Specification of silica Gel

IS 1897	Copper strip for electrical purposes
IS 60529	Degree of protection provided by enclosure
IS 816	Welding of Mild Steel
CEA	Guidelines for specifications of energy efficient outdoor type single and three phase distribution transformers
IS 6262	Method of test for power factor and dielectric constant of electrical insulating liquids
IS 16659	Fluids For Electro technical Applications - Unused Natural Esters For Transformers And Similar Electrical Equipment
IS 16081	Insulating liquids — Specifications for. Unused synthetic organic esters for Electrical purposes
IEC 60156	Method of determination of electric strength of insulating oils.
IEC 60296	Specification for unused mineral insulating oils for transformers and switchgear.
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IS 1852	Rolling and cutting tolerances for hot rolled 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)
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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:

S. No.	Description	Requirements									
			*	*		*	*		*	*	
1.	Continuous Rated Capacity (kVA)	250 kVA	315 kVA	400 kVA	500 kVA	630 kVA	800 kVA	1 MVA	1.25 MVA	1.6 MVA	2 MVA
2.	Application	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
3.	System voltage (max.)	12 kV	12 kV	12 kV	12 kV	12 kV	12	12	12	12	12
4.	Rated voltage HV	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv
5.	Rated voltage LV (V)	433-250	433-250	433-250	433-250	433-250	433-250	433-250	433-250V	433 V-250V	433 V-250V
6.	Line current HV (A)	13.12 A	16.53 A	20.96 A	26.25 A	33.06 A	42A	52.4 A	65.6 A	83.98 A	104.97A
7.	Line current LV (A)	333.34 A	420.02 A	533.36 A	666.68 A	840.02 A	1066.7A	1333.4 A	1666.7 A	2133.5 A	2666.7
8.	Frequency (Hz)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50Hz	50Hz	50Hz	50Hz
9.	No. of Phases	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
10.	Connection HV	Delta	Delta	Delta	Delta	Delta	Delta	Delta	Delta	Delta	Delta
11.	Connection LV	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)
12.	Vector group	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11
13.	Type of cooling	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN
14.	Tap changing arrangement (off load)	+5.0% to – 10% in steps of 2.5%		+5.0% to –10% in steps of 2.5%			+5.0% to - 10% in steps of 2.5%		+5.0% to –10% in steps of 2.5%		
15.	No. of tap positions	7	7	7			7	7		7	

16.	Noise level at rated voltage and frequency	55 dB	56 dB	56 dB	56 dB	57 dB	58 dB	58 dB	60 dB	60 dB	61 dB
17.	Permissible temperature rise over ambient:										
17.1	Of top oil	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
17.2	Of winding	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
18.	Max. Total Losses at 50% loading at 75°C (watts)	920	955	1150	1430	1745	2147	2620	3220	3970	4790
19.	Max. Total Losses at 100% loading at 75°C (Watts).	2700	2750	3330	4100	4850	5838	7000	8400	11300	14100
20.	Short circuit impedance voltage at 75°C (±10% tolerance)	4.5%	4.5%	4.5 %	4.5%	4.5%	5%	5%	5%	6.25%	6.25%
21	Insulation Class	A	A	A	A	A	A	A	A	A	A
22.	Normal Flux Density (at rated voltage and frequency)	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T
23.	Maximum current density (A/mm ²)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24.	Impulse withstand voltage	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp
25.	Power frequency withstand voltage	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV
26.	Max. flux density (Increase of +12.5 % combined voltage & frequency variation from rated voltage & frequency)	1.9 T(Max.)									
27.	Voltage fluctuations permissible	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5 % to -12.5%	+12.5% to -12.5%
28.	Metering CT for	400/5	500/	600/	800/	1000	1200	1500	2000	2500/	3000/5A

	LV side		5	5	5	/5	/5	/5	/5 A	5 A	
28.1	Accuracy Class for metering CT	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s
28.2	Burden	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA
28.3	ISF (Instrument security factor)	5	5	5	5	5	5	5	5	5	5
29.	Neutral terminal	Two separate brought out neutral from main neutral bus bar, One for taking out the neutral for 4 wire system and other additional neutral for solid earthing.									
30.	Minimum clearances in air (mm) :										
30.1	HV phase to phase/ phase to earth	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140
30.2	LV phase to phase/ phase to earth	75 / 40	75 / 40	75 / 40	75 / 40	75 / 40	75/40	75 / 40	75 / 40	75 / 40	75 / 40
31.	Minimum clearances in Cable Box (mm) :										
31.1	HV phase to phase/ phase to earth	130 / 90	130 / 90	130 / 90	130 / 90	130 / 90	130 / 90	130 / 90	130 / 90	130 / 90	130 / 90
31.2	LV phase to phase / phase to earth	25 / 20	25 / 20	25 / 20	25 / 20	25 / 20	25/20	25 / 20	25 / 20	25 / 20	25 / 20
32	Wheels	The transformer shall be provided with four uni-directional rollers with locking arrangement suitable for rail gauges in both the axis for movement of transformer in either direction. Distance between wheels shall be center to center 820mm									
* : Ratings are for optional/ future use											

5. GENERAL CONSTRUCTION:

- I. The transformer shall be stacked core, copper coil, oil immersed, naturally cooled (ONAN), non-sealed type with plain rectangular tank.
- II. The transformer shall be suitable for service with fluctuations in supply voltage up to +12.5% to -12.5%.
- III. The transformer shall be designed suitable for service life of 25years.
- IV. The transformer and accessories shall be designed to facilitate trouble free operation, inspection, maintenance and repairs under the various operating and atmospheric conditions specified in clause no. 3.

- V. The design shall incorporate every precaution and provision for the safety of the equipment as well as staff engaged in operation and maintenance of the equipment.
- VI. All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.

5.1 CORE:

- I. Transformer core shall be stack type, 2D, constructed from high grade cold rolled, non-ageing, grain oriented, silicon steel lamination which shall be properly annealed (under inert atmosphere, if required) to relieve stresses.
- II. The core shall have low loss and good grain properties.
- III. Core should be coated with hot oil proof, with insulation coating, an inorganic coating equivalent to C-5 type as ASTM A976 or IS 3024, like Carlite -3.
- IV. All core should be clamped together with frames to prevent vibration and noise. The core clamping shall be preferably without through bolts and if any bolt used same shall be effectively insulated.
- V. The core thickness should be 0.23mm or less. 23HP85 as per IS 3024 or better with Minimum Polarization in Tesla at a Field Strength of 800 A/m
- VI. Only single grade and same thickness of core stampings shall be accepted and mixing of different grades shall not be allowed.
- VII. The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.
- VIII. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated. The vendor shall submit the calculations in support of the same.
- IX. The handling of core lamination and stacking should be smooth and uniform.
- X. The transformer shall be suitable for continuous service without damage under 'over fluxing' where the ratio of voltage over frequency exceeds the corresponding ratio at rated voltage and rated frequency up to 12.5% and the core shall not get saturated. The BH graph to be submitted by bidder for core material.
- XI. The No Load current shall not exceed 2% of the Full Load current for $\geq 250\text{kVA}$ and will be measured by energizing the transformer at rated voltage and frequency. Increase of 12.5% of rated voltage shall not increase the no-load current by 5% maximum of full load current for $\geq 250\text{kVA}$ rating
- XII. The bidder shall be required to submit the following documents in regard to procurement of core material during stage inspection:



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- a. Invoice of supplier
- b. Mill's test certificate
- c. Packing list
- d. Bill of landing
- e. Bill of entry certificate by custom (if required)
- f. Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.

XIII. The bidder shall offer the core for inspection and approval of TPCODL/TPNODL/TPSODL/TPWODL during manufacturing stage. Heavy penalty or black listing shall be imposed on the bidders using defective CRGO sheets i.e in case of nonconformance w.r.t TPCODL/TPNODL/TPSODL/TPWODL Specifications.

XIV. Transformer core assembly shall have enclosed type lifting lugs for lifting arrangement.

XV. **Bidder shall provide the below details in below table:**

Sl. No.	Description	Unit	To be furnished by bidder
1	Magnetizing (No Load) Current		
	90% Voltage	%	
	100% Voltage	%	
	112.5% Voltage	%	
2.	Core grade		
3.	Thickness of core Lamination	Mm	
4.	Core Dimension: Length X height X diameter	mm x mm	
5.	Gross core area	Sq.cm	
6.	Net core area	Sq.cm	
7.	Flux density (calculated)	Tesla	
8.	Over fluxing without saturation (BH curve to be submitted)	Tesla	
9.	Mass of core	Kg	

10.	Loss per Kg of core at the above specified flux	Watt	
11.	Core window height	Mm	
12.	Center to center distance of the core	Mm	
13	Mass of Core Lamination (min.)	Kg	
14	Make of Core offered		

5.2 WINDING CONNECTIONS

- I. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 25% overlap per layer of paper.
- II. The conductor should be drawn uniformly without any deformation and any burr.
- III. No metallic or non-metallic dust should be present in-between DPC conductor.
- IV. The current density for HV and LV winding should not be more than 2.5 Ampere per sq.mm.
- V. The insulation between core and bolts, core and clamps shall withstand **2.5 kV for one minute**.
- VI. Proper bonding of inter layer insulation with the conductor shall be ensured.
- VII. All turns of windings shall be adequately supported (by which material) to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- VIII. **The joints in the winding shall be avoided but if it is necessary then, they shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.**
- IX. LV winding shall be such that neutral formation is at the top.
- X. **Bidder shall provide the below details in below table:**

Sl. No.	Description	Unit	To be furnished by bidder
1.	No. of LV coils		
2.	No. of HV coils		
3.	HV conductor grade		
4.	Dia of HV conductor (Bare)	Mm	
5.	Dia of HV conductor with (DPC)	Mm	
6.	Conductivity of HV conductor	%	
7.	Purity of HV conductor	%	
8.	No. of HV Turns	Nos.	



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9.	Current density of HV winding(calculated)		
10.	Wt. of the HV winding copper without insulation	Kg	
11.	LV conductor grade		
12.	Dimension of LV conductor (Bare)	mm x mm	
13.	Dimension of LV conductor with (DPC)	mm x mm	
14.	Conductivity of LV conductor	%	
15.	Purity of LV conductor	%	
16.	No. of LV Turns	Nos.	
17.	Current density of LV winding(calculated)	A	
18.	No. of parallels of LV conductor	Nos.	
19.	Wt. of the LV winding copper without insulation	Kg	
20.	Resistance of windings at 20°C		
	HV winding	Ohm	
	LV winding	Ohm	
21.	Height of LV winding	Mm	
22.	Height of HV winding	Mm	
23.	ID of HV winding	Mm	
24.	OD of HV winding	Mm	
25.	ID of LV winding	Mm	
26.	OD of LV winding	Mm	
27.	Thickness of the duct in LV winding	Mm	
28.	Thickness of the duct in HV winding	Mm	
29.	Thickness of the duct between HV & LV	Mm	



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30.	Make of the copper winding conductors		
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5.3 INSULATING PAPER AND INSULATING PRESSBOARD

- I. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and compressed pressboard of make (refer Clause no.5.32) subject to approval of TPCODL/TPNODL/TPSODL/TPWODL
- II. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 25% overlap per layer of paper.
- III. Kraft paper and Pressboard should be made of pure Cellulose from soft wood pulp manufactured from sulphate process. No additive, adhesive or coloring matter shall be present.
- IV. Kraft paper and Pressboard should be of class A (105°C) insulation material.
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard.
- VI. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.
- VII. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr, sharp edges and dimensional variations.
- VIII. Kraft paper self-adhesive tape to be used for bonding of insulating paper layer, spanner and paperboards that are immersed in the oil filled transformer.
- IX. **Below required values could be verified if required at any stage of the inspection and it should fulfill the requirement as per below table:**

Characteristics	Kraft Paper	Pressboard (all Sizes)
1. Dimension	As specified by bidder with <u>+5%</u> tolerance.	As specified by bidder with tolerance as per IS1576.
2. Apparent Density	>0.80 g/cm ³	as per IS 1576 w.r.t Thickness
3. pH of Aqueous extract	6-8%	6-8%
4. Electrical strength i) in air ii) In Oil	7KV/mm -----	12KV/mm 35KV/mm
5. Ash content	Maximum 1%	Maximum 0.7
6. Moisture content	Maximum 8%	Maximum 8%
7. Oil absorption	-----	Minimum 9%
8. Heat stability	As per IS 9335-part 3	As per IS 1576
9. Tear index	As per IS 9335-part 3	As per IS 1576

Bidder has to submit the test certificates as per IS-9335, IS-1576 for all type of insulating materials covering above stated parameters along with **below parameters during stage inspection** :

- a. Substance (Grammage) (g/m³)
- b. Compressibility
- c. Tensile strength
- d. Conductivity of water extract

- e. Shrinkage in air
- f. Flexibility
- g. Cohesion between plies.
- h. Elongation
- i. Air permeability
- j. Bidder shall provide the below details in below table**

Sl. No.	Description	Unit	As furnished by bidder
1.	DPC Paper for HV and LV conductors :		
	Type of DPC Paper		
	Make of DPC Paper		
	Thickness DPC Paper	mm	
	Percentage Overlapping (25% overlap per layer of paper)	%	
2.	Type of Paper for Interlayer Insulation		
	Make of Paper for Interlayer Insulation		
	Thickness of Paper for Interlayer Insulation	mm	
3.	Type of Paper for Insulation Between HV and LV winding		
	Make of Paper for Insulation Between HV and LV winding		
	Thickness of Paper for Insulation Between HV and LV winding (for all sizes)	mm	
4.	Type of Pressboards used for Insulation Between HV and LV winding		
	Make of Pressboards used for Insulation Between HV and LV winding		

	Thickness of Pressboards for Insulation Between HV and LV winding (all size)	mm	
5.	Type of Paper used for insulation between core and LV		
	Make of Paper used for insulation between core and LV		
	Thickness of Paper used for insulation between core and LV (All sizes)		
6.	Type of Pressboard used for insulation between core and LV		
	Make of Pressboard used for insulation between core and LV		
	Thickness of Pressboard used for insulation between core and LV (All sizes)		
7.	Material used for top and bottom yoke insulation		
	Make of material used for top and bottom yoke insulation		
	Thickness of material used for top and bottom yoke insulation	mm	
8.	Type of material used for Spanner, wedge and Axial for insulation		
	Make of material used for Spanner, wedge and Axial for insulation		
	Thickness of material used for Spanner, wedge and Axial for insulation (all sizes)	mm	

5.4 LOSSES

- I. The bidder shall individually guarantee No load loss (Iron loss at rated voltage and frequency) and full load Copper Loss (at 75°C) without any positive tolerance.



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- II. **The bidder shall also guarantee the total loss at 50% and 100% load condition (at rated voltage and frequency and these should be within the limits of maximum total losses declared by TPCODL/TPNODL/TPSODL/TPWODL for both 50% and 100% loading values (as per table below) :**

Description	Rating (kVA)				
	250	315 *	400 *	500	630*
Maximum Losses at 50% loading at 75°C (Watts)	920	955	1150	1430	1745
Maximum Losses at 100% loading at 75°C (Watts)	2700	2750	3330	4100	4850

Description	Rating (kVA)				
	800*	1000	1200*	1600*	2000
Maximum Losses at 50% loading at 75°C (Watts)	2147	2620	3220	3970	4790
Maximum Losses at 100% loading at 75°C (Watts)	5838	7000	8400	11300	14100

No positive tolerance shall be allowed on the losses as mentioned above. However, bidder can offer losses less than specified but no consideration in cost will be given for the same.

*** : Ratings are for optional/ future use**

- III. **The successful bidder shall guarantee the quoted losses for at least five years.** If at any point of time during operation if it is found that the total losses at 50% and 100% load are more than the values given in specifications, then bidder shall be liable to pay a fine of Rs 250 per watt to the amount by which losses at 50% loading and 100% loading increase with respect to the values given in specifications.
- IV. During testing at Bidder's works if it is found that the actual measured losses are more than the values quoted by the Bidder, **TPCODL/TPNODL/TPSODL/TPWODL shall have the right to reject the complete lot.**
- V. During testing at Bidder's works, if the temperature rise exceeds the specified values, **the entire lot shall be rejected by TPCODL/TPNODL/TPSODL/TPWODL.**
- VI. During testing at Bidder's works, if the impedance values differ from the guaranteed values including tolerance, **the entire lot shall be rejected by TPCODL/TPNODL/TPSODL/TPWODL.**
- VII. Transformer losses shall be checked on any one of DT from supplied lot at TPCODL/TPNODL/TPSODL/TPWODL workshop. If it is found that the actual measured



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losses are more than the values quoted by the Bidder, **TPCODL/TPNODL/TPSODL/TPWODL shall have the right to reject the complete lot.**

VIII. **Bidder shall provide the below details in below table:**

Sl. No.	Description	Unit	To be furnished by bidder
1	No Load losses	Watt	
2	Load losses at 50%loading at 75° C	Watt	
3	Load losses at 100% loading at 75° C	Watt	
4	Total losses at 50%load at 75° C	Watt	
5	Total losses at 100% load at 75° C	Watt	
6	Efficiency at 75 deg. C		
7	Efficiency at Unity P.F.		
7.1	100% load	%	
7.2	80% load	%	
7.3	60% load	%	
7.4	40% load	%	
7.5	20% load	%	
8	Efficiency at 0.8 P.F.		
8.1	100% load	%	
8.2	80% load	%	
8.3	60% load	%	
8.4	40% load	%	
8.5	20% load	%	
9	Regulation at :		
9.1	Unity P.F. at 75 deg. C	%	
9.2	0.8 P.F. at 75 deg. C	%	
9.3	% Impedance at 75 deg. C	%	

5.5 TRANSFORMER TANK AND TANK CONSTRUCTION



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- I. The transformer tank shall be of robust construction, **rectangular in shape** and shall be built up of electrically tested welded mild steel plates.
- II. The tank shall be fabricated by welding at corners. No horizontal or vertical joints in tank side walls and its bottom or top cover shall be allowed.
- III. All welding operations should be carried by **qualified welders** (performance qualification certificates to the customer) as per the relevant ASME standards and a copy of the **welding procedure** has to be submitted to TPCODL/TPNODL/TPSODL/TPWODL at the time of drawing approval.
- IV. The **thickness of tank** should be as below:
For top and bottom : 6 mm (min.)
For Sides : 5 mm (min.)
Tolerance shall be applicable as per IS 1852 as per above thickness band.
- V. In addition the cover of the main tank shall be provided with an **air release plug**.
- VI. The tank plates shall be of such strength that the complete transformer when filled with oil may be lifted bodily by means of the lifting lugs provided. The top cover shall have no cut at point of lifting lug.
- VII. The transformer tank cover shall be bolted with tank rim so as to make a leak proof joint.
- VIII. The tank plate and lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle.
- IX. The tank cover shall have slight slope (10 mm \pm 2mm) towards HV side to drain rain water.
- X. There must be sufficient space from the core to the top cover to take care of oil expansion. The oil volume inside the tank shall be such that even under the extreme operating conditions, the **pressure generated inside the tank does not exceed 0.4 kg/sq. cm positive or negative** and the tank shall be of adequate mechanical strength to withstand it.
- XI. The transformer should be capable of **withstanding 0.8kg/sq.cm air pressure and a vacuum of 0.7kg/sq.cm**. The permanent deflection of the flat plate, when the tank without oil is subjected to a vacuum of 525 mm of mercury shall not be more than the values specified:

<u>Length of Plate</u>	<u>Deflection</u>
Up to 750 mm	5.0 mm
751 mm to 1250 mm	6.5 mm
1251 mm to 1750 mm	8.0 mm
Above 1750 mm	9.0 mm

- XII. **The tank design shall be such that the core and the windings can be lifted freely without dismantling the bushings.**
- XIII. All joints of tank and fittings shall be oil tight and no bulging shall occur during service.
- XIV. Anti –theft stainless steel fasteners with breakaway nut shall be provided at top cover (minimum 4 nos. at corners) placed in between other bolts without affecting pitch of bolts.
- XV. The tightening torque chart to be provided for all bolts used. This shall be submitted along with each rating drawings.
- XVI. The transformer shall be provided with four pulling lugs of MS plate of 8mm thick to pull the transformer horizontally.

Lifting lugs:

- XVII. The transformer shall be provided with a minimum of four welded heavy duty enclosed lifting lugs of Structural steel E250 or better grade quality A (Minimum quality A) as per

IS 2062 plate of minimum 16mm thickness for lower rating and gradually increased for higher rating as per weight suitably reinforced by vertical supporting flat stiffener smooth welded properly on the side walls up to reinforcing angle. They shall be so extended that cutting bend plate is not required. The transformer lifting lug shall be painted with yellow colour.

- XVIII. The location of lifting lugs shall be such that the clearance between lifting chain and nearest part of bushing shall be at least 100 mm.
- XIX. There shall be facilities for lifting the core coil assembly separately.
- XX. The lifting lugs shall be designed in such a way that any two diagonal lugs are capable of lifting two times of the total weight of the transformer. The design of should be such that it should be suitable for 120degree lifting rope angle as per ASME B30.9 and at any point of time the maximum stress allowed on the Lug martial shall be lesser than 82MPa as per ANSI C.57.12.10
- XXI. Calculation sheet for Lifting lug design to be submitted by Bidder. The calculation shall include the Stress on lifting lug material and stress on welding both. The Stress on the welding should be less than 840kg/cm2 as per ANSI C.57.12.10. All calculation to be done for considering lifting on any diagonal opposite two lugs conditions.
- XXII. The lifting lugs shall be located on the side walls only and conservator on LT box side. Separate drawing to be submitted stating welding thickness, welding length and location on tank along with stiffener support for all rating and all lugs.
- XXIII. **Bidder shall provide the transformer size and clearances in below table:**

Sl. No.	Description	Unit	To be furnished by bidder
1	Transformer overall Length x Height x width	mm x mm x mm	
2	Only Tank overall Length x Height x width	mm x mm x mm	
3	HV Cable box overall LxWxH	mm x mm x mm	
4	LV Cable box overall LxWxH	mm x mm x mm	
5	Clearances		
5.1	Core and LV (minimum 5mm)	Mm	
5.2	LV and HV (minimum 8mm)	Mm	
5.3	HV Phase to phase (minimum	Mm	

	10mm)		
5.4	Between HV winding and Yoke (minimum 20mm)	Mm	
5.5	Between LV winding and Yoke (minimum 5mm)	Mm	
5.6	Between yoke and inside of tank to cover (minimum 100mm)	Mm	
5.7	Between yoke and bottom (minimum 10mm)	Mm	
5.8	Any point of winding to tank (minimum 20mm)	Mm	
6	Calculated Impedance	%	
7.1	HV to Earth Creepage distance in oil (minimum 15mm)	Mm	
7.2	LV to Earth Creepage distance in oil (minimum 5mm)	Mm	
8.	Conservator dimension (dia x Length)	Mm xmm	
9.	Size of Pipe used for conservator to Tank	Mm	
10.	Size of Pipe used for Valves	Mm	
11.	Base Channel size	Mm xmm xmm	
12.	No. of Radiators	Nos	
13.	No. of fins per Radiator	Nos	
14	Dimension of radiator fins (L x W)	Mm xmm	
15	Make of Tank material		

5.6 RADIATORS

- I. Radiators of pressed steel type conforming to the design requirement suitable for mineral oil and Ester oil (all type) type transformer.

- II. The Pressed Steel type should be used in vertical formation without any bending and should be individually tested for leakage and pressure test etc. before welding with the main tank.
- III. **Thickness** of sheet for radiators shall be **1.20 mm (min)**.
- IV. The **mounting** of the radiators shall be **non-detachable up to 500KVA and Detachable Type for above 500KVA up till 2MVA**
- V. The number / cross section / length / fixing arrangement of radiators shall be indicated in the general assembly drawing.
- VI. Radiator thickness must be uniform without any dent or damage and also no bulging or concave should occur even after performing pressure/ vacuum test and temperature rise test.
- VII. Corrugated designs are not accepted.

5.7 GASKET

- I. **Cork rubber gaskets** conforming to Type C , grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing & water ingress resistant requirements for components like HV & LV bushings bottom gasket, HV & LV terminal box, Top Cover, Conservator, Valves etc.
- II. **Nitrile/Neoprene rubber gaskets** conforming to Type IV – 4C (heat and oil resistant) as per IS 11149 shall be provided for bushing O ring (oil gaskets).
- III. **Only Joint free Gasket to be used. Only in case of top cover gasket and terminal box gasket up to two dove-tail joints with adhesive shall be allowed. The terminal box gasket joint shall come at bottom part.**
- IV. Cork sheet, Nitrile/Neoprene rubber gaskets shall be free from cracks, pinholes and shall be capable of being cut or punched without crack or tearing.

5.8 TAPS

- I. Rotary/Ring type tap changing mechanism to be mounted on side of the transformer in such way that could be easily operated in smooth way.
- II. Tap changing shall be carried out by means of an externally operated self-position switch and when the transformer is in de-energised condition.
- III. The taps shall be provided in HV winding and each tap change shall result in voltage variation of 2.5%.
- IV. Switch position no.1 shall correspond to the maximum plus tapping (i.e.+5%) and position no.7 shall correspond to minimum tapping (i.e,-10%).
- V. Tap no. 3 to be considered as principal tap position.
- VI. Provision shall be made for locking the tapping switch handle in position. Suitable plate shall be fixed for tap changing switch to know the position number of tap.

5.9 BUSHINGS AND TERMINAL CONNECTORS

A. HT Bushings (17.5 kV/250 A):

- I. The bushings shall be outdoor type, external part shall be made of porcelain material. Rods, nuts and flat washer (Tightening Nut along with Check Nut) shall be made of tinned brass material.
- II. IS to be followed: IS 8603(Part- I) for porcelain, IS 3347 part3 section 2 for metal part and Complete bushing shall comply IS 2099.
Option 1: Outdoor Bushing on Top with Bird Guard
- III. The HV bushings shall have Hot Dipped Galvanized or Alu-zinc coated or SS material arcing horns with 8mm diameter. The thickness of coating shall be **86 microns** (minimum at any point).



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- IV. The HV bushing shall be fitted with bird guard on the bushing connector.
- V. Complete Tinned Brass jointless connectors shall be provided on HV bushing rods suitable for bare dog conductor connections. The connector should have large contact area. Hardware shall be Hot Dipped Galvanized or Aluzinc coated or SS material

Option 2: Side bushing with Cable box

- VI. Transformer shall be with HT cable box on sidewall of tank having porcelain bushing as specified above.
- VII. **In some situation Plinth mounted transformer may require outdoor bushing arrangement. This shall be decided during tender by user group.**

B. LT Bushings(1.1kV/suitable current rating):

- I. The bushings shall be of outdoor type made of porcelain material, The rod shall be Tinned copper for all rating along with neutral. The nuts and washers shall be of (Tightening Nut along with Check Nut) tinned brass material.
- II. IS to be followed: IS 3347(Part-I) (Section-1 for porcelain and Section 2 for metal part) and IS 7421(latest amendment of IS).
- III. The metal portion of the internal HV & LV bushing inside the tank shall remain dipped in oil in all operating condition.
- IV. The LV bushings shall be provided on the side wall of tank along with cable box.
- V. The bushing tinned copper stem sizes to be followed are,

Rating	Size of stem
250kVA	M20
400kVA	M20
500kVA	M30
630kVA	M30
800kVA	M42
1000kVA	M42

5.10 CABLE BOXES

- I. Cable boxes made up of Mild Steel 2.2mm thickness with suitable handle and front cover to be provided for both HV and LV side.
- II. Water should not accumulate on cable boxes and proper slope shall be provided in order to ensure drainage of water.
- III. Cable box protection shall be IP 55. Test reports to be submitted from CPRI /ERDA.
- IV. Cable box should be painted in same way as that of tank painting with treatment.
- V. HV and LV cable boxes shall be fixed on opposite sides on the tank with nuts and bolts (gasket placed in between them) in such a way that they can be completely removed whenever required.
- VI. Canopy shall be provided on all gasket joints, the bend edges of cover overlapping gasket to protect from rain and sunlight shall also accepted.
- VII. Cable cleating arrangements shall be provided just below terminal box (outside) to keep Cable straight and to support cables to avoid tension on bushings due to cable weight.
- VIII. For Cable clamping, **Fire retardant nylon grade material to be used for oval shaped clamping arrangement** with GI nut bolt on both HV & LV Side.
- IX. For HV Cable box, Non-magnetic Gland plate shall have thickness of 3mm and shall be in two parts in such a way that HV cable can be easily removed.

- X. For LV cable box, Non-magnetic Gland plate shall have thickness of 4mm and shall be in two or more parts in such a way that LV cables can be easily removed by removing the gland plates.
- XI. Gland plates shall be mounted separately with nut & bolt arrangement and gasket in between them.
- XII. The size of the cable box cover should be moderate so that only one or two people is enough to lift it.
- XIII. The bidder shall submit **drawings for the box with internal details** along with the transformer for approval.

HV CABLE BOX (option 2, ref: 5.9.A):

- XIV. The HV box shall be designed and fixed on transformer such way that only opening of cover shall facilitate for working on cable termination with ease of accessibility of terminal.
- XV. HV box gland plate shall have Single compression gland designed for 11kV, 3C X 150 or 3CX400 sq.mm XLPE Cable as per drawing approved from TPCODL/TPNODL/TPSODL/TPWODL.
- XVI. Distance between HV gland plate and HV bushings should be minimum 650 mm.
- XVII. Earthing provision (Body earth- outside and for cable earthing- inside of box) shall be provided in the HV box with M12 SS bolt & SS washers.
- XVIII. Gland shall be SCG 18 single compression brass gland suitable for diameter of 91mm cable.
- XIX. Bolted type terminal cover with M14/M16 HDG bolts (M12 bolts for 250KVA DT) with danger marking

LV CABLE BOX:

- XX. Neutral terminal of LV winding shall be brought out on LV phase terminals to form four wire system.
- XXI. Epoxy Insulators shall be provided from top side in LV box to support LV busbar.
- XXII. LV busbar shall be of AL material & shall have clearances as mentioned in GTP.
- XXIII. Lugs shall be of AL material with tin coating & shall comply the IS requirements.
- XXIV. Arrangement in the LV box shall be BYRN from left to right when viewed from LV front.
- XXV. All Nut bolts shall be as per Clause 5.24 and size selection shall with as per the hole size of the AL lugs to be used.
- XXVI. The Neutral to be brought out from box through bushing and shall have same dimension as that of phase bushing.
- XXVII. GI earth strip (Size - 50 x 6 mm) shall be provided from neutral bushing to both side of the box and shall be extended up to bottom of the terminal box both sides.
- XXVIII. Insulator support to be provided on terminal box both sides for GI earth strip so as to avoid tension on secondary neutral bushing.
- XXIX. There shall be gland provision in side wall bottom or base plate of the LV box with gland of size suitable for 10core cable for taking out voltage terminal to box. 10 core cable up to box shall also be provided wired up from bus bar to TB.
- XXX. For Transformer up to 1 MVA ratings, In LV box, there must be provision for flexible mounting arrangement to fix multiple sized CT.
- XXXI. There must be proper provision of connecting voltage wires with closed thimble/lug on LV bus bars (Phases and neutral) with nut bolt size of 6mm & wires to be taken out and connected in the Metering terminal box.

Transformer Rating	Size of cable for Phase & Neutral	Gland Size for LV Box	No. of runs per phase	No. of runs for neutral
315 kVA	1C x 630 sq. mm (1.1 kV Class)	SCG10	1	1
400 kVA			2	2
500 KVA			2	2
630 kVA			2	2
800kVA			3	3
250 kVA	1C x 300 sq.mm (1.1 kV class)	SCG7	2	2

- XXXII. Earthing provision (Body earth) shall be provided in the LV box with M12 bolt.
 XXXIII. The clearance above bushing shall be 120mm and below busbar cable mounting bolt shall be 450mm up to gland plate.
 XXXIV. The no. and size of cables for installation on LV side shall be as follows:

Transformer Rating	Size of cable for Phase & Neutral	No. of runs per phase	No. of runs for neutral
1 MVA	1C x 630 sq. mm (1.1 kV Class)	3	3
1.25MVA		4	4
1.6 MVA		5	5
2 MVA		6	6

- XXXV. The LV busbar shall be one continuous conductor strip with current density of 1A/mm² and length should be min. 225mm for 250kVA. The support insulator shall be provided at the end of busbar such that cable load shall be on top end support. Neutral busbar shall be of same size of phase. The lug shall be have single hole. Busbar shall be connected on four bolts on brass palm connector.
 XXXVI. Bolted type terminal cover with M14/M16 HDG bolts (M12 bolts for 250KVA DT) with danger marking

5.11 TERMINAL CONNECTORS

HT TERMINAL CONNECTOR:

- I. Tinned Brass connectors shall be provided connected with HV bushing rods for bare top plate bushings .
- II. UV resistant polymeric insulating shrouds shall be provided on the HV bare bushing terminals.
- III. For 250 kVA and above ratings Aluminium lugs (with minimum of 2 hole) suitable for 3CX300 sq.mm XLPE shall be provided at HT side for cable connection.

LT TERMINAL CONNECTOR:

- IV. Tinned Brass palm connector (with current rating w.r.t Load current), and Aluminium busbar (current density: not more than 1 A/mm²) shall be provided.
- V. Busbar shall be supported with insulator at the top portion of terminal box.



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- VI. Aluminum lugs (with minimum of two holes) shall be provided with suitable size (no. of lugs as per clause 5.10 and size of lugs as per IS 8309) for the LV cables. (Can be share our drawing or specs)

5.12 METERING CURRENT TRANSFORMERS (This shall be decided during tender by user group.)

- I. Cast Resin Type CTs shall be provided for transformers on the LT side for metering purpose.
- II. The CTs shall be Resin Casted ring type and a thickness of min 2mm of resin above the coil of the CT to be ensured.
- III. The core of the CT shall be of high grade non-ageing electrical silicon CRGO Steel or better grade of first quality having low hysteresis loss and high permeability to ensure accuracy at both terminal and over current/ voltage.
- IV. The grade of the Core shall be M4 or better
- V. The Resin Casted CTs shall be embossed as 'P1' and other side as 'P2'. Lock side pole of coupler shall have S1 terminal and other pole shall have S2 terminal.
- VI. The Coil shall be insulated with electrical grade Polyester Tape and the insulation shall be of high insulation grade, excellent mechanical strength (tensile, tear, and stretch), high purity, chemical stability, and heat resistance.
- VII. The Copper wire used shall be super enameled as per the IS 4800 Part IX/ IEC 317.
- VIII. The wiring shall be enclosed in such a way that it can't be disturbed during maintenance activities.
- IX. The CT shall be mounted outside the tank with suitable clamping arrangement (fiber glass material).
- X. The position of secondary terminals shall be such that, it will face towards outside after installation on bushing or bus bar of transformer.
- XI. Mounting arrangement should be such that the CT shall be replaceable at site.
- XII. The terminals shall have shorting facility and it should not get saturated up to 200% of rated current.
- XIII. The weight of the Ring type CTs shall not exceed approx. 2.5 Kg +/- 10%.
- XIV. The CTs shall have following parameters.

Accuracy class	0.5s
Burden	20 VA
Application	Metering
ISF	5
CT ratio for	As mentioned in clause 4.28

5.13 AUXILIARY TERMINAL BOX

Note: Aux. Terminal Box shall be required for 250kVA to 1MVA and ratings above 1MVA marshalling box shall be required.

- I. Aux. terminal box of suitable size made up of **Mild Steel** and with **theft proof locking arrangement** for box.
- II. Box shall be provided with Stud Type terminal blocks with 2 spare terminals. shorting links required for CT connections.

- III. 10 core multi stranded PVC armored cable (2.5 sq.mm Cu FRLS PVC stranded panel wires) shall be used to terminate connections from CT and voltage terminals (6 CT wires and 4 voltage wires) at LV side to the CT terminal box.
- IV. PVC ferrules engraved with black letters shall be used to mark the wires coming from LV box for CT and volatge.
- V. **PVC ferrules** engraved with black letters shall be used to mark the wires in the terminal box.
- VI. Holes with PVC glands to be provided on bottom side of this box as incoming (01nos.) and outgoing (02Nos.) for 10CX2.5 sq.mm cable and for Auxiliary cables of magnetic float switch, PRV contacts, OTI aux. cable.
- VII. Terminal and cable entry for secondary wiring of Magnetic Float switch in conservator, OTI aux cable, PRV cable (for plinth mount DT) to be provided as required.
- VIII. Terminal box shall have IP 55 protection with rubber gasket and bend cover canopy over joints.
- IX. Terminal box must have provision for connecting I-type or U-type pin arrangement without spring arrangement.

5.14 EQUILISING/ EQUIPOTENTIAL STRIP

- I. The Transformer top cover shall be connected with main tank using **tinned copper strip (30mm wide, 0.7mm thick)** at two places (diagonally opposite with each other).
- II. The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip.
- III. All the covers like inspection cover, LV box cover, HV box cover, Conservator cover must be electrically connected using **tinned copper strip (30mm wide, 0.7mm thick)**.
- IV. Separate arrangement to be made and cover tightening bolt not to be used for equipotential strips.

5.15 EARTHING CONNECTIONS

NEUTRAL EARTHING:

- I. Separate LV neutral bushing to be provided on top of LV box for neutral earthing.
- II. For connecting LV neutral bushing shall be provided with 2 Nos of 50x6 mm GI strip, one on each side of terminal box (The thickness of GI coating of neutral earthing strip shall be **86 microns** (minimum at any point).
- III. At the bottom of the GI strips two concentric holes of 12 mm diameter shall be made and M12 size SS nuts, bolts and SS washer shall be provided for them.

BODY EARTHING:

- I. Two body earthing terminals pads boss arrangement (up to 500sq.mm) shall be provided on Transformer tank with M12 SS Bolt with 70 sq. mm lug. with SS plain washer and spring washer.
- II. It shall be located on the lower side of the transformer, diagonally opposite to each other.
- III. Each Earthing terminal pad on DT shall be provided with two SS M12 bolts on each pad on each side with two 70 sq.mm AL Lugs and washers.

5.16 OIL

Note: Default Oil shall be Mineral oil only if not specified / asked for other oil.

Mineral Oil: In case of Mineral Oil below are the requirements to be fulfilled:

1. All transformers shall be filled with new, unused, clean, standard mineral oil in compliance with IS 335-2018 / IEC 296 type-II and shall be free from all traces of polychlorinated biphenyl (PCB) compounds.
2. The use of recycled oil is not acceptable.
3. Oil shall be filled under vacuum before filling it shall be filtered and tested (as per IS 6103).
4. The test parameters should be as per the table below:

Test parameters	Values
Break Down Voltage (min)	70 kV
Water content ppm, (max.)	30 ppm
Specific resistance (min.) (at 27°C)	2.5 × 10 ¹² ohm-cm

Bidder has to provide the oil data in below table:

Sl. No.	Description	Unit	To be furnished by bidder
1	Type of oil		
2	Oil Qty. for first filling	Ltr.	
3	Grade of Oil		
4	Maker's name		
5	BDV at the time of first filling	kV	

5.17 CONSERVATOR

- I. The conservator shall be supported / fixed on the main body of the transformer tank.
- II. The capacity of the conservator tank shall be designed keeping in view the total quantity of oil and its contraction and expansion due to temperature variations. The total volume of conservator shall be such as to contain **10% quantity of the oil used in transformer.** Normally, at least **30% volume of conservator** shall be filled with Oil.
- III. The connecting pipe of the conservator shall be so fitted to transformer tank that the pipe can be detached from the tank.
- IV. Jointless pipe shall be used which shall be connected with round flanges.
- V. The inside diameter of the pipe connecting the conservator to the main tank shall be within 25 to 50 mm and it should be projected into the conservator so that its end is approximately 20mm above the bottom of the conservator so as to create a sump for collection of impurities. The minimum oil level corresponding to -5°C should be above the sump level.
- VI. The conservator oil filling cap/hole shall be of 32mm diameter & female type cap to be provided.

- VII. For DT up to 1600kVA, the conservator to be fitted with float switches such that it shall operate/open contact when the oil level in conservator goes below -5 degree C /Minimum mark. The float switch shall be with normally closed type. This contact shall be wired up in auxiliary terminal box.
- VIII. Buchholz relay: The pipe should not contain any right angle elbows. Its diameter should correspond to the diameter of the hole for the passage of oil of the relay. The pipe must be arranged to slope upwards towards the conservator at an angle of about 2 to 4 degrees to the horizontal (max 5 degrees). The part of the pipe preceding the relay should be straight for a length equal to at least five pipe diameters; the part of the pipe leading to the conservator immediately adjacent to the relay should be straight for a length equal to at least three pipe diameters.
- IX. The Oil conservator shall be provided with:
- Oil level indicator** (as per clause no. 5.18).
 - Dehydrating breather** (as per clause no. 5.22).
 - Drain plug**
 - Oil filling hole** (1.25 inch/32mm with thread size of BSP 1.25inch, 11TPI) with cover.
 - Detachable end plate** on one side (the side on which the gauge glass is fitted), to enable the maintenance staff to periodically clean the inside of the conservator tank

Center of Gravity

The transformer should be designed in such a way that the centre of gravity of complete transformer with oil and with all accessories shall fall at the vertical centre at lower height such that the transformer should be stable on flat surface ground and while lifting at lifting hooks.

5.18 OIL LEVEL INDICATOR

- Oil level indicator with **prismatic glass and red colour background** shall be provided.
- The oil gauge glass shall be removable and so embodied in the end plate so as to prevent oil leakage.
- The Oil level indicator should indicate oil level at minimum, normal and maximum as -5°C, 30°C and 90°C respectively.

5.19 PRESSURE RELEASE DEVICE

- All DTs, 250 kVA and above shall be provided with PRV with auxiliary contacts. The contact to be wired up in the auxiliary terminal box.
- PRV shall be provided to operate before reaching the test pressure as specified in the above class.
- PRV shall not have air release arrangement.
- The PRV shall seal-off after the excess pressure has been released and it shall have mechanical flag arrangement.
- The PRV shall have NO, NC contacts wired up in auxiliary terminal box.

5.20 AIR RELEASE PLUG

The cover of the main tank shall be provided with an **air release plug on all ratings.**

5.21 DRAIN VALVE AND FILTER VALVE

- The drain valve and filter valve shall be of Brass with gate valve.
- The drain valve and filter valve shall have double round flanges. One side shall be fixed with tank and other side should be left open for oil filling/filtration purpose.

- III. The drain valve and filter valve shall be provided with embossed name plate stating drain valve and filter valve.
- IV. The drain valve shall be located on the bottom and filter valve shall be provided at side top of tank.
- V. Locking arrangement shall be provided to stop movement of hand wheel.
- VI. The valves shall be covered with a MS box of 2mm thickness by welding on tank. The paint thickness shall be min. 80 micron on the box.

5.22 DEHYDRATING BREATHER

- I. The breather pipe shall enter the conservator from the upper side of the conservator.
- II. The breather shall contain 1 kg of silica gel for 250/315/400/500/630 kVA/800kVA & 1MVA DTs and 2kg for above 1 MVA rating.
- III. The silica gel shall be blue colored as per IS: 3401 – 1992. The granules size should be 3-5 mesh (4 to 6.73mm) up to 2kg capacity breather.
- IV. The body of the breather shall be unbreakable, transparent, UV stabilized seamless polycarbonate tube of minimum thickness 3mm
- V. The top cover shall be of pressure die cast aluminum and powder coated.
- VI. The oil cup shall be of UV protected polycarbonate.
- VII. Oil cup shall have marking of oil filling level
- VIII. The breather shall be supplied as per approved make and as per specifications.
- IX. The gasket should be of Class 3B, Type III as per IS 11149 Nitrile rubber (Oil resistant gaskets)
- X. All tie rods and all hardware should be of stainless steel material (SS 304)
- XI. Breather mounting arrangement,
 - a. Up to 2 kg capacity of Silicagel breather shall have top threaded mounting arrangement with 1/2”pipe having BSP threading.
 - b. 2kg and above capacity shall have flange mounting with 4 holes of 12mm diameter on 83 PCD.
- XII. While fixing of breather on transformer Teflon tape should be used to make it air tight & water tight. This shall be checked during inspection and after receipt at our stores on each transformer.
- XIII. The breather should have passed air pressured test as per our specification i.e. Breather shall be tested at an air pressure of 0.35kg/cm² (5 PSI) for period of 30 minutes. NABL lab test report to be submitted from OEM. For further details please refer our specifications of breathers.

5.23 OIL TEMPERATURE INDICATOR

- I. Dial Type Oil temperature indicator shall be provided on the top cover of the transformer. It should be suitable for outdoor mounting with maximum indicator pointer. Fixing union shall be of female thread.
- II. Range: 0- 120 °C, Accuracy: ± 4 °C.
- III. The OTI shall have auxiliary contacts for alarm and trip contacts at preset temperatures, both the contacts should be wired up in the auxiliary terminal box.
- IV. The IP65 gland should be used for dial for taking out auxiliary wires.
- V. The OTI shall be IP55 tested.

5.24 FASTENERS

- I. All the bolts or studs shall be **at least 6 mm in diameter** except when used for small wiring terminals. **All bolts shall be of grade 8.8.**
- II. All nuts/bolts/washers exposed to atmosphere shall be as follows:

Size 12mm (or below)	Stainless Steel
Above 12mm	Steel with antirust coating (aluzinc coated), Hot dip galvanized

- III. All ferrous bolts, nuts and washers placed in outdoor positions shall be hot dip galvanized to prevent corrosion (except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals).
- IV. In case the galvanization is removed due to welding or manufacturing, the parts should be properly cleaned and painted to avoid exposure to atmosphere.
- V. The cup type washers to be used as spring washers, cut spring washers are not accepted.
- VI. Taper washers shall be provided where necessary. Protective washers of suitable material shall be provided on front and back of the securing screws.
- VII. Each bolt shall project at least one thread but more than three threads through the nut. If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided. The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.
- VIII. Core bolts shall be black colored high tensile grade-8.8

5.25 SURFACE PREPARATION AND PAINTING

- I. The paint shall be applied by airless spray.
- II. Steel surfaces shall be prepared by **shot blast cleaning** (IS-9954) to grade Sq.2.5 of ISO 8501-1 or **chemical cleaning** including phosphating of the appropriate quality (IS 3618).
- III. **Heat resistant (Hot oil proof) paint** shall be used for the **inside surface** and whereas for **external surface one coat of thermosetting powder paint or one coat of epoxy primer (zinc chromate/Zinc Phosphate) followed by two coats of polyurethane (P.U.) base paint.** as per table given below

S.No.	Paint type (should be UV restraint, non-fading)	Area to be painted	No of coats	Total dry film thickness (min); micron
1.	Thermosetting powder paint	Inside	01	30
		Outside	01	60
2.	Liquid Paint			
a.	Epoxy (primer)	Outside	01	30
b.	P.U. Paint (finish paint)	Outside	02	25 (each)
c.	Hot oil resistant paint	Inside	01	35

The two coats shall be of oil and weather-resistant nature with final coat as glossy and non-fading paint of shade 631 as per IS 5.

- IV. The dry film thickness shall not exceed the specified minimum dry film thickness by more than 25%.
- V. Any damaged part shall be cleaned to bare metal with an area extending 25 mm around its boundary. A priming coat shall be immediately applied followed by full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage. The repainted surface shall present a smooth surface which shall be obtained by carefully chamfering the paint edges before and after priming.
- VI. Tank Paint thickness of 120 Micron
- VII. Painting shall not be affected by weather changes & performance against pilling out or fading etc. to be guaranteed for 5 Years.

5.26 RADIO INTERFERENCE

When operated at voltages up to **12.5%** in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.

5.27 OVERLOAD CAPACITY

The transformer shall be suitable for loading as per IS 2026 part 7

5.28 FITTINGS

The following standard fittings shall be provided:

- I. Two earthing terminal pads/ boss with earthing symbol \perp for body earthing on opposite sides with 70sq.mm AL lug and M12 SS bolt and washers.
- II. Air Release Device.
- III. Thermometer Pocket with cap.
- IV. 1MVA and above with Inspection Cover.
- V. Drain cum Sampling Valve & filter valve (Double Flanged for 630kVA and above & Up to 500kVA with T type drain valve without filter valve) and (0.75 inch nominal size thread, IS 554) with locking arrangement and a valve cover made of M.S. steel painted with minimum 70 micron layer.
- VI. Pressure relief Valve with auxiliary contacts for DT up to 250 kVA and above.
- VII. Welded fixed type Radiators for above 500KVA to 2MVA
- VIII. LV cable box for all DT. For HV side, cable box or Bare bushings can be provided. User group shall decide this during tender.**
- IX. For HV bare bushing DT- bird guard on bushings terminals connectors
- X. Terminal Connectors for HV (Tinned brass for pole mounted DT) /LV side (tinned brass palm connector, Al busbar with support insulator on top and Al lugs) up to 500kVA DT.
- XI. 1000kVA and above DT, epoxy bushing in HV and LV with tinned copper busbar shall be accepted for compact designs with top cover terminal & cable box.
- XII. HV and LV two part Gland plates (Non-Magnetic and with Single compression Brass glands).
- XIII. Conservator with Dehydrating Breather on LV side.
- XIV. Prismatic Oil level Gauge and magnetic float switch in conservator.
- XV. Lifting lugs (enclosed type) for the top cover, complete transformer and core and winding assembly.
- XVI. Pulling Lugs.

- XVII. Jacking Pads
- XVIII. Stiffener Angle.
- XIX. 2 Base channels all DT
- XX. Marking Plates as asked in clause 6.1
- XXI. Oil Temperature indicator with alarm & trip contact ($\geq 250\text{kVA}$ rating)
- XXII. Magnetic float switch for 250kVA to 1MVA and MOG for 1600kVA & above conservator tank.
- XXIII. Two GI earth strip of Size 50x6 mm for neutral earthing from both side of LV box with minimum GI coating thickness of 86 microns. With SS nut bolts and washer.
- XXIV. Magnetic Oil level Gauge ($>1600\text{kVA}$), Winding Temperature Indicator ($>1600\text{kVA}$), Magnetic Reed type Buchholz relay (for ratings above 1MVA) in line with IS 1180.
- XXV. Marshalling Box with stud type terminals (for ratings above 1000kVA).

5.29 WINDING TEMPERATURE INDICATOR (WTI)

- I. WTI shall be provided in one winding of each phase.
- II. WTI shall be **indicating type**, responsive to the combination of top oil temperature and winding current, calibrated to follow the hottest spot temperature of the transformer winding.
- III. WTI shall operate a remote alarm and trip in the event of attaining the predefined temperature.

5.30 BUCHHOLZ RELAY

- I. Only for $>1\text{MVA}$ DT.
- II. Magnetic Reed type Buchholz relay shall be provided with alarm and tripping contacts to detect accumulation of gas.
- III. The installation shall be fixed and weather proof to avoid any water seepage inside the relay.
- IV. Round flange of nominal pipe bore of **50mm diameter** shall be used.
- V. In addition, pocket with heater coil along with Resistance Temperature Indicator (RTD) shall be provided for WTI and OTI. CT for RTD for winding hot spots shall be provided.

5.31 MARSHALLING BOX AND PROTECTION

- I. Marshalling Box of suitable size, made up of **Mild Steel** and with **theft proof locking arrangement** shall be provided.
- II. Marshalling box shall have IP 55 protection.
- III. Above 1MVA DT - Marshalling Box shall have provision for wiring the **WTI, OTI, MOG, PRV, Buchholz relay and LT CT terminals**. The terminals shall be provided as per table below:

Element	Alarm	Trip
Oil Temperature Indicator	NO,NC,COM	NO,NC,COM
Winding Temperature Indicator HT Side	NO,NC,COM	NO,NC,COM
Winding Temperature Indicator LT Side	NO,NC,COM	NO,NC,COM
Buchholz	NO,NC,COM	NO,NC,COM
Magnetic Oil Level Gauge	NO,NC,COM	



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PRV	NO,NC,COM	
LT Neutral CT Secondary Terminal	N	
LT Phase CT Secondary Terminal	RYB	
LT Voltage terminals	RYBN	
Spare TB	4 No.	

- IV. WTI meter shall be wired/ installed in the marshalling box.
- V. 10 core PVC wire (4 sq.mm Cu FRLS PVC stranded panel wires) shall be used to terminate connections from CTs at LV side to the Marshalling box.
- VI. Plastic ferrules engraved with black letters shall be used to mark the wires in the marshalling box.
- VII. Wiring in Marshalling box shall be done by 2.5 sq.mm Cu FRLS PVC stranded panel wires.
- VIII. For TPCODL/TPNODL/TPSODL/TPWODL, The equipments connected into marshalling box shall be compatible with power pack relay as per attached specification for 1MVA & above ratings.
- IX. All the cables and conduits between the transformer and control cabinet shall be included in the scope of supply by the bidder.

5.32 MAKE OF MAJOR COMPONENTS & RAW MATERIALS

The BA shall procure the following constituent items from the designated vendors as follows:

S.no	RAW MATERIAL/EQUIPMENT	MAKE
a)	Copper	M/S Sterlite, M/S Hindustan Copper, M/S Hindalco.
b)	Core	M/S AK Steels, POSCO, Kawasaki/JFE, Nippon Steel.
c)	Insulation paper and Pressboards	ITC paper, ABB, Raman Boards-Mysore, Senapathy Whiteley – Bangalore
d)	Transformer Oil (Mineral oil)	Savita, Apar, Gandhar
e)	Gaskets & Corks	Nu Cork, Anchor Corks
f)	Steel For Tank	M/s, TATA Steel, M/s SAIL, M/s. JSW Steel, M/s. IISCO, M/s. RINL/Vizag Steel, M/s. Jindal Steel,
g)	Dehydrating Breather	Yogya, Anushree, Electrical



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		engineers
h)	Bushings HV & LV	GE,Hindustan Chemicals, Rashtriya Electricals,LAMCO
i)	Bucholz, PRD, SPR, OTI , WTI, and other devices	Reputed make to be approved by TPCODL/TPNODL/TPSODL/TPWODL during detailed engineering.

Also, Bidder has to provide all test certificates from original manufacturers & relevant sourcing documents. BA shall also have shot blasting facility.

6. MARKING:

6.1 MARKING PLATES

I. Name Plate (Rating) Plate : SS material

A rating plate shall be fitted to each transformer in a visible position and shall carry all the information as **specified in clause no. 6.2**

II. Terminal Marking Plate : on same name plate also accepted

- The terminal marking plate shall be provided which shall be strictly in accordance with **figure 4 of IS 1180-Part 1: 2014**. This plate may be combined with the rating plate or can be provided separately.
- Value of short circuit impedance on extreme tapping and on principal tapping and indication of winding to which impedance is related has to be displayed additionally.

III. Details Plate : MS sheet of 2.5mm with punched details and welded on tank.

A separate plate of **size 125 mm x 125 mm** shall be provided having following details:

- Name of the firm.
- Serial No.
- Rating of transformer.
- Order no. and date.
- Date of dispatch.

IV. Guarantee Plate :

A separate warranty plate made of **Stainless Steel** with following clause written on it.

“THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE OF COMMISSIONING OR 60 MONTHS FROM THE DATE OF LAST SUPPLY”

All the plates described above (clause 1 to 4) should be as followings:

Material	Stainless Steel
Thickness	1 mm



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Engraving	The letters on the rating plate shall be engraved black on the white/silver back ground.
Fixing	Fixing screws shall be of stainless steel.

V. Danger Plate: On all cable boxes

Danger notice shall have red lettering on a white background on a plate as specified in **IS: 2551 – 1982**.

VI. BIS Certification Mark: On main name plate

The Bidder is required to get approval from BIS and display BIS mark on the name plate.

VII. BEE LABEL:

A label shall be affixed on the front of the distribution transformer near the name plate, so as to be prominently visible. The label shall be non-detachable weather proof type with the following particulars shall be displayed on its label, namely:

- a. the logo of the Bureau of Energy Efficiency
- b. that the equipment is a distribution transformer
- c. that it is an oil filled, naturally cooled type
- d. name of the manufacturer and brand
- e. Capacity in KVA as tested
- f. Voltage is up to 11 KV
- g. Total losses at 50% loading in watts
- h. Total losses at 100% loading in watts
- i. Star level
- j. Model and year of manufacturing.
- k. Bureau's authorisation number

VIII. Control Circuit drawing Plates:

- Engraved drawing for control circuit unit shall be available on Marshalling box.

6.2 NAME PLATE DETAILS

The name plate shall be strictly as per **IS 1180: 2014 (figure 1)**. Additionally, following points shall be displayed :

- I. **Actual no load losses of transformer.**
- II. **Actual total losses of transformer at 50% load and 100% load.**
- III. Standard mark (BIS certification).
- IV. **“PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL”** shall be written in bold letters.
- V. PO number with date has to be mentioned.
- VI. Overall dimensions of the transformer

6.3 MARKING

- I. All transformers shall have HV phase windings marked in both, the terminal boards inside the tank and outside with capital letter 1U, 1V, 1W.
- II. The LV winding for the same phase shall be marked by corresponding small letter 2u, 2v, 2w. The neutral point terminal shall be indicated by the letter 2n.

- III. The markings shall be done by steel strips in which marks had been engraved in black colour.
- IV. Colour marking of the bushings shall be done.
- V. On the top cover of tank and the core channel, Manufacturer's name and Manufacturer's serial no. shall be engraved.
- VI. On the body of tank, Manufacturer's name, rating, serial no. and year of manufacturing shall be written with black paint on yellow base. It should be written in suitable place in approved format that it is readable from ground after installation on pole.
- VII. Durable QR code Sticker with name plate details and warranty details to be fixed on two accessible places i.e one on side wall of LV terminal box and other one is on conservator.

7. TESTS:

- I. All routine, acceptance & type tests shall be carried out in accordance with the IS 2026 and IS 1180: Part-1 (2014).
- II. All routine & acceptance tests shall be witnessed by the TPCODL/TPNODL/TPSODL/TPWODL/his authorized representative.
- III. All the components shall also be type tested as per the relevant standards.

Following tests shall be necessarily conducted on the Distribution Transformers in addition to others specified in IS/IEC standards.

7.1 TYPE TESTS

- I. Lightning Impulse Test [As per IS 2026 (Part 3) Clause no. 12].
- II. Temperature Rise Test [As per IS 2026 (Part 2) Clause no.4].
NOTE: Maximum measured total loss (No load at Rated excitation load loss at maximum current tap converted to 75°C reference temperature) at 100 percent loading shall be supplied during temperature rise test.
- III. Short Circuit Withstand test [As per IS 2026 (Part 5)].
NOTE: Routine tests before and after short circuit test shall be conducted as per IS 2026(Part 1).
- IV. Pressure Test [As per IS 1180: Part 1 (2014)].
- V. Determination of sound levels [IS 2026 (part 10)].
- VI. No load current at 112.5% voltage
- VII. BDV and moisture content of oil in transformer (IS 335).
- VIII. Magnetic balance test.
- IX. Measurement of Zero-phase sequence impedance.
- X. Measurement of Harmonics of no-load current.
- XI. Test to verify IP 55 for CT terminal Box and cable boxes.

Note: - Out of the above mention type test, the tests under sl. No. 1, 2 ,3 and 4 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at TPCODL/TPNODL/TPSODL/TPWODL recommended NABL lab.**In-house test labs are accepted if in-house lab is NABL accredited for these tests.**

7.2 ROUTINE TESTS

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Sr. No.	Test to be done	Reference BIS	Clause no.
1	Measurement of Winding Resistance on each tap.	IS 2026 (Part 1)	16.2.1 & 16.2.3
2	Measurement of voltage ratio, check of voltage displacement, polarity, phase sequence and vector group	IS 2026 (Part 1)	16.3
3	Measurement of short circuit impedance (principal tapping, when applicable) and load loss at 50% and 100% load	IS 2026 (Part 1)	16.4
4	Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 112.5% of rated voltage	IS 2026 (Part 1)	16.5
5	Measurement of insulation resistance	IS 2026 (Part 1)	16.6
6	Induced over voltage withstand test	IS 2026 (Part 3)	11
7	Separate Source voltage withstand test	IS 2026 (Part 3)	10
8	Oil leakage test	IS 1180 (Part 1)	21.5.1.3
9	Neutral current measurement	IS 1180	7.9.2
10	BDV and moisture content of oil in transformer (Type-2 oil)	For mineral oil : IS 335 (2018) For Ester oil : IEC 60247 & IEC61099	For mineral oil : IS 335 Table 2

7.3 ACCEPTANCE TESTS

- I. Temperature Rise test on one unit of first lot against every release order / PO for each rating. For further lots, TPCODL/TPNODL/TPSODL/TPWODL reserves the right to perform Temperature rise if required. [As per IS 2026 (Part 2) Clause no.4]
- II. Oil leakage test for acceptance shall be conducted at pressure of 0.35kg/sq.cm for one hour. (IS 1180 (Part 1) clause 21.5.1.3)
- III. The painted surface shall pass the Cross Adhesion Test (IS1180 part 1 clause no. 21.4.d).
- IV. Calibration of WTI and OTI.
- V. Magnetic Balance Test.
- VI. OEM test reports for CT if used.
- VII. OEM test reports for breather for air pressure test.
- VIII. At stage inspection -Checking of weight, dimensions, fitting and accessories, tank sheet thickness, oil quantity, material finish and workmanship, physical verification of core coil assembly and measurement of flux density on one unit of each rating of the offered lot with reference to the GTP and contract drawings. Oil BDV of all offered lot.
- IX. At least 10% transformer of the offered lot (minimum of one) shall be subjected to all the tests mentioned under the section 'ROUTINE Test" in presence of TPCODL/TPNODL/TPSODL/TPWODL's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS: 1180 and IS: 2026.
- X. Device trails & test for 1MVA & above (Buchholz trip, Buchholz alarm, PRV trip, WTI alarm, WTI trip and OTI alarm.
- XI. At Stage and Final inspection, the incoming raw material and its movement/consumption record in the related jobs of



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TPCODL/TPNODL/TPSODL/TPWODL will be verified by inspecting officer. In case of any deviation or non-availability of such records, the offered lot may get rejected.

8. TYPE TEST CERTIFICATES:

- I. The Bidder shall furnish the type test certificates of the offered rating and design of transformer for the tests as mentioned above as per the corresponding standards.
- II. All the tests shall be conducted at CPRI / ERDA or as defined in 7.1 as per the relevant standards.
- III. 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/TPNODL/TPSODL/TPWODL.
- IV. Type tests should have been conducted in CPRI/ERDA during the period not exceeding 5 years from the date of opening the bid.

9. PRE-DISPATCH INSPECTION:

- I. Bidder to raise the inspection calls for stage inspection and only after getting clearance from TPCODL/TPNODL/TPSODL/TPWODL shall proceed for further manufacturing. The bidder shall raise the inspection call for Final Inspection or prototype Inspection in TPCODL/TPNODL/TPSODL/TPWODL format.
- II. If the prototype inspections asked for during drawing approval then bidder to make one unit of transformer and raise for inspection call for stage and final for prototype inspection.
- III. Equipment shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL.
- IV. 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.
- V. 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.
- VI. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
- VII. The BA shall ensure that 100% of the lot must be ready for inspection and atleast 10% must be ready with all mounting and accessories during inspection.
- VIII. Material shall be dispatched only after getting MDCC (Material Dispatch Clearance Certificate) from TPCODL/TPNODL/TPSODL/TPWODL.
- IX. 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)
- X. To ascertain the quality of the transformer oil, the original manufacturer's tests report shall be submitted at the time of inspection.

- XI. Arrangements shall also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of TPCODL/TPNODL/TPSODL/TPWODL's representative.
- XII. In respect of raw material such as core stampings, winding conductors, insulating paper and oil, bidder shall use materials manufactured/supplied by standard manufacturers and furnish the manufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the TPCODL/TPNODL/TPSODL/TPWODL.
- XIII. The bidder shall furnish following documents along with their offer in respect of the raw materials:
 - a) Invoice of supplier.
 - b) Mill's certificate
 - c) Packing List.
 - d) Bill of Landing
 - e) Bill of entry certificate by custom.
- XIV. To ensure about the quality of transformers, the inspection shall be carried out by the TPCODL/TPNODL/TPSODL/TPWODL's representative at following two stages:
 - a) Online anytime during receipt of raw material and during manufacturing/assembly Stage.
 - b) At finished stage i.e. transformers are fully assembled and ready for dispatch.
- XV. Advance intimation of 7Days (Within Odisha)/12 Day (Outside Odisha) is required for both Stage and final inspections.
- XVI. All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and TPCODL/TPNODL/TPSODL/TPWODL at the time of purchase.
- XVII. The manufacturer shall offer the inspector representing the TPCODL/TPNODL/TPSODL/TPWODL all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage Inspection during manufacturing stage as well as Active Inspection during Acceptance Tests.
- XVIII. During the stage inspection a few assembled core coil and assembled Tanked transformer shall be dismantled (only in case of CRGO material) to ensure that the CRGO laminations, Windings and workmanship are of good quality. TPCODL/TPNODL/TPSODL/TPWODL also reserves the right to review any document or certificates related to material, manufacturing process, quality checks at any point of stage inspection.
- XIX. TPCODL/TPNODL/TPSODL/TPWODL also reserves the right to inspect the tank of transformer before surface preparation and painting. The same shall be informed to TPCODL/TPNODL/TPSODL/TPWODL accordingly.
- XX. Final inspection Call for carrying out acceptance tests as per relevant IS/IECs shall be sent by the Bidder along with routine test certificates.
- XXI. The bidder shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-contractors to ensure the mechanical / electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9000.
- XXII. The TPCODL/TPNODL/TPSODL/TPWODL has the right to have the test carried out at his own by an independent agency wherever there is a dispute regarding the quality supplied. **Also TPCODL/TPNODL/TPSODL/TPWODL has right to test 1% of the supply selected either from the stores or field** to check the quality of the product. In case of any deviation TPCODL/TPNODL/TPSODL/TPWODL have every right to reject



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the entire lot or penalize the bidder, which may lead to blacklisting, among other things.

- XXIII. At the time of inspection the material should be ready as specified, In case of material non-readiness or material failure in acceptance, Cost of re-inspection shall be borne by bidder.

10. INSPECTION AFTER RECEIPT AT STORE:

- I. The material received at the TPCODL/TPNODL/TPSODL/TPWODL store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection.
- II. In case the transformers proposed for supply against the order are not exactly as per the tested design, the Bidder shall be required to carry out the short circuit test and impulse voltage withstand test at its own cost in the presence of the representative of TPCODL/TPNODL/TPSODL/TPWODL.
- III. The supply shall be accepted only after such test is done successfully, as it confirms on successful withstand of short circuit and healthiness of the active parts thereafter on un-tanking after a short circuit test.
- IV. Apart from dynamic ability test, the transformers shall also be required to withstand thermal ability test or thermal withstand ability will have to be established by way of calculations
- V. TPCODL/TPNODL/TPSODL/TPWODL reserves the right to conduct all tests on Transformer after arrival at site / stores and the manufacturer shall guarantee test certificate figures under actual service conditions.
- VI. TPCODL/TPNODL/TPSODL/TPWODL reserves the right to conduct short circuit test and impulse voltage withstand test in accordance to IS, afresh on each ordered rating at purchaser cost, even if the transformer of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by TPCODL/TPNODL/TPSODL/TPWODL either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies already made to TPCODL/TPNODL/TPSODL/TPWODL stores. The findings and conclusions of these tests shall be binding on the bidder.

11. GUARANTEE:

- I. 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 Purchaser 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.
- II. 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 TPCODL/TPNODL/TPSODL/TPWODL, failing which the TPCODL/TPNODL/TPSODL/TPWODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPCODL/TPNODL/TPSODL/TPWODL's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.
- III. In case of Distribution transformer fails within the guarantee period TPCODL/TPNODL/TPSODL/TPWODL will immediately inform the Bidder who shall take

back the failed Distribution Transformer within 15 days from the date of intimation at his own cost and replace / repair the transformer within forty five days of date of intimation with a roll over guarantee. The outage period i.e. period from the date of failure till unit is repaired / replaced shall not be counted for arriving at the guarantee period.

- IV. 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:

- I. Bidder shall ensure that all 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.
- II. Transformers shall be delivered filled with oil and supplied with all accessories mounted. Screws and bolts shall be thoroughly tightened to ensure no leakage of oil.

Note: Single use plastic not to be used for packing of the material.

13. TENDER SAMPLE:

All offered transformer detailed documents to be submitted as per clause no.18. The sample shall be not applicable

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. TPCODL/TPNODL/TPSODL/TPWODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

The following information shall necessarily be submitted with the bid:

- I. List of important raw materials, names of sub-suppliers for raw materials, standards to which raw material is tested and the copies of test reports of the tests carried out on raw materials in presence of Bidder's representatives.
- II. List of manufacturing facilities available, level of automation achieved and the areas where manual process exists.
- III. List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of these tests and inspections
- IV. List of testing equipment for final testing with valid calibration reports. Manufacturer shall possess 0.1 class instruments for measurement of losses.
- V. QAP withhold points for TPCODL/TPNODL/TPSODL/TPWODL inspection.

15. TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests, acceptance tests and pre-dispatch inspection as per relevant International / Indian standards.

16. MANUFACTURING FACILITIES:

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The successful bidder will have to submit (after placement of RC) technical compliance document and drawing of each part along with CCA, breather, bushings, terminal box etc. as per RC line items to be submitted for getting approval before mass manufacturing.

The first time supplier will have to make one prototype sample of each line item of RC as per CAT-B approved drawing within 30 days of drawing approval. Inspection call to be raised by bidder before 7 days of date of proposed inspection. TPCODL/TPNODL/TPSODL/TPWODL shall arrange inspectors and intimate or confirm the date. Any observation during inspection shall have to be addressed within 7 days and revised improved drawing & technical details to be shared to TPCODL/TPNODL/TPSODL/TPWODL for final approval.

Manufacturing mass quantity to start only after getting CAT-A approved drawings or as per intimation from TPCODL/TPNODL/TPSODL/TPWODL

17. SPARES, ACCESSORIES AND TOOLS

Bidder shall give an assurance that the reparability of transformer is ensured by using standard spare parts and accessories available in market in India.

18. DRAWINGS AND DOCUMENTS:

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

- a. Completely filled in compliance to each clause of Technical Specification and any Additional Details and Fittings.
- b. Description of the transformer and all components drawings.
- c. General arrangement for Transformer.
- d. LV terminal box drawing along with CT if applicable and cleat arrangement and gland plate drawing.
- e. Bill of material.
- f. Design calculation details of transformer losses, cooling, efficiency and current density, weight of coils and components
- g. Experience Certificate and list
- h. Type test certificates.
- i. List of makes of major components as listed above.

Drawings / documents to be submitted for approval after the award of the order within 7 days before mass manufacturing 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 Transformer (Front view, Top view and both sides view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
- c. Internal Core arrangement drawing.

- d. Internal Core-coil assembly drawing.
- e. Foundation Plan drawing.
- f. Marking plates and Markings (as mentioned in clause 6)
- g. HV and LV bushings drawing (with internal view and metal parts)
- h. HT connector, LT connector (palm connector), Aluminum Busbar
- i. HV and LV Box drawing.
- j. Gland Plate for HV/LV box.
- k. Conservator drawing.
- l. Prismatic oil level gauge drawing.
- m. Silica Gel Breather drawing.
- n. Auxiliary Terminal Box drawing with internal wiring arrangement.
- o. Gland plate of drawing
- p. BH curve & Loss/Kg graph of core material offered.
- q. The tightening torque chart to be provided for all bolts used in specific rating.
- r. Type Test Certificates.
- s. Installation/ Mounting Instructions/Drawing.
- t. Efficiency vs Load curve of the offered design.
- u. Quality Assurance plan.

List of Calculations to be submitted:

- a. All the calculations shall be step by step showing the use of formulas and other practical considerations. **Concise calculations in table or excel sheet shall not be accepted.** Also, the reference (only standard sources as IS, IEC or any such standard is acceptable) of the formulas shall be mentioned.
- b. Resistance Calculation (75 deg. C)
- c. Load Losses Calculation (at 75 deg. C)
- d. No load Losses.
- e. Stray Losses.
- f. Weight of Copper (Bare and with Insulation also).
- g. Weight of Core.
- h. Flux Density calculations.
- i. Current Density Calculations.
- j. Short Circuit withstand.
- k. Temperature Rise Calculations.
- l. Conservator Volume calculations
- m. Cooling Calculations showing cooling with tank and radiators separately with no. of radiators and fins mentioned specifically (For both Mineral oil and Ester oil)
- n. Calculation sheet for Lifting lug design and mounting lug design to be submitted by Bidder.

Additional Documents to be submitted :

- a. List of raw materials as well as bought out accessories and name 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.



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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/TPNODL/TPSODL/TPWODL 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:

Completely filled-in clause wise compliance of this specification along with bid.

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-2005

**Specification Name : ENG-ELC-071- SPECIFICATION FOR ACCESSORIES OF
11kV XLPE COVERED CONDUCTOR- 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

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TPWODL*



Specification No: [ENG-HV-2005](#)

Specification Name:
SPECIFICATION FOR ACCESSORIES OF 11kV XLPE
COVERED CONDUCTOR

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4. GENERAL TECHNICAL REQUIREMENTS
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15. TESTING FACILITIES
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17. SPARES, ACCESSORIES AND TOOLS
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19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS



Specification No: [ENG-HV-2005](#)

Specification Name:
SPECIFICATION FOR ACCESSORIES OF 11kV XLPE COVERED CONDUCTOR

1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of Accessories for All Aluminum Alloy Stranded XLPE Covered Conductors for use on 11 kV Distribution System.

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	Description
EN 50397-1:2006	Covered Conductor Specification- Up to 33 kV
EN 50397-2:2006	Covered Conductor Accessories Specification- up to 33 kV
EN 50397-2 (MARCH 2010)	Covered conductors for overhead lines and the related accessories for rated voltages above 1kV a.c. and not exceeding 36kV a.c. PART 2: Accessories for covered conductors: tests and acceptance criteria
IS 398:1996 (Part IV)	Specification for aluminum conductors for overhead distribution purpose
EN 61238-1: 2003	Compression and mechanical connectors for power cables for rated voltages up to 36 kV Test methods and requirements
ANSI C119.4 :2011	Electric Connectors - Connectors for Use Between Aluminum-To-Aluminum and Aluminum-To-Copper Conductors Designed for Normal Operation at Or Below 93 °C and Copper-To-Copper Conductors Designed for Normal Operation at Or Below 100 °C

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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



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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. Cm/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 Accessories of 11 kV XLPE Covered Conductor are specified below and shall consist of the following:

4.1 TENSION ASSEMBLY-WEDGE TYPE (TA)/ CRIMPING TYPE

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor size	50 Sq.mm to 240 Sq.mm/as per covered conductor size
4	Installation (with/without disassembly)	Ready-to-use (without disassembly)
5	Type & grade	Heat treated aluminium Alloy for Body and Weather resistant Thermoplastic for wedge/ crimping type
6	Operating/Rated voltage	11 kV/12kV



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Sl. No.	Technical Parameters	Desired Values
7	Mechanical Strength	80% of the breaking load of the Conductor
8	Dimensions (mm)	To be furnished by bidder
9	Tension Load	To be furnished by bidder

4.2 NON-METALLIC ALIGNMENT TIES

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor size	50 Sq.mm to 240 Sq.mm /as per covered conductor size
4	Mounting	Can mount directly on cable without any accessories
5	Type	Top Tie/side tie/Helical tie
6	Material	UV Resistant Thermoplastic
7	Operating/Rated voltage	11 kV/12kV
8	Dimensions (mm)	To be furnished by bidder

4.3 MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	IEC 61238-1
3	Range of Conductor size	For Phase conductor of diameter range 50-240 sq.mm/as per covered conductor size
4	Installation	Crimping by shear head bolt compression
5	Type of connection required	Connection by compression pressure
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Material	Aluminium Alloy For mechanical connector UV resistant polymer for heat shrink sleeve
8	Connector ID	Ø 14 mm to Ø 33 mm



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4.4 INSULATION PIERCING CONNECTOR

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor sizes accommodated for Main & Branch	Main : 50 - 240 sq.mm Tap : 50 - 240 sq.mm /as per covered conductor size
4	Operating/Rated voltage	11 kV/12kV
5	Type of connection required	Insulation Piercing Type (Covered to Covered)
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Are end caps of branch cable a) Slide on type (b) Rigid	Slide on type
8	Are torque limiting shear heads provided to tightening bolts	Yes
9	Specified Torque	18±1.5 Nm
10	Torque for establishing connection between main and Tap (Nm)	Within 70% of Min. Torque specified

4.5 MID SPAN JOINTS

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50483-4
3	Type No & Size Range	For Phase conductor of 50 Sq.mm to 240 sq.mm /as per covered conductor size
4	Operating/Rated voltage	11 kV/12kV
5	Type of connection required	Crimping type
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Installation	Crimping by Hexagonal Compression



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5. GENERAL CONSTRUCTIONS:

5.1 TENSION ASSEMBLY-WEDGE TYPE (TA)

For fitting onto a pole for tensioning at the beginning or end of a length of Covered Conductor, or for anchoring while a major change in direction. The Tension assembly consists of one wedge type Tension anchoring clamp and one Tracking protection IPC.

The following key criterion to be followed for the design of the same: -

- a) There shall be no losable part (except Tracking IPC) in the process of clamping arrangement.
- b) The clamp should consist of an Aluminum alloy corrosion resistant casted body and self-adjusting fully insulating type of mechanical and weather resisting thermoplastic wedges which shall anchor/hold the conductor.
- c) Locking mechanism should be wedge type self-locking. Wedges are to be made of high strength, climatic resistance Engineering Plastic with glass fiber.
- d) The fittings shall be able to withstand the specific minimum failure load (SMFL) and shall not damage the covering of cable. SMFL is the minimum failure load for clamp at which mechanical failure will not take place.
- e) No tools shall be needed for fitting the Covered Conductor into the clamp.
- f) The Anchoring clamp shall have an IPC to avoid tracking phenomenon by maintaining the metallic clamp as well as the cable passing through it at equipotential.

5.2 NON-METALLIC ALIGNMENT TIES:

For supporting and aligning Covered Conductor at an intermediate pole in a length, with small angle of deviation. The Tie hold the Covered Conductor in its position on top of the pin insulator. Tie consists of an "Insulated Plastic" Type for Lin Alignment. The ties shall be designed suitably to hold the Covered Conductor in its position on top of the insulator. The Tie shall be made of Insulating Plastic materials (UV Resistant Thermoplastic) to ensure tracking resistance and to avoid any insulation damage to covered conductor due to abrasion while mechanical or wind induced vibration. Plastic coated metallic ties are not allowed.

5.3 MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE:

It is used for main (Bare) to main (Covered Conductor) networking Connection. This connector is to ensure the electrical characteristics with in the required limits, while ensuring necessary insulation protection against tracking and water penetration on Covered Conductor. The body as well as the shear head screws of the mechanical connector should be made of aluminum alloy. It should have a centered bore with tapered edges and a moisture block barrier in the center of the tube. Heat shrink sleeve shall be rated for up to 12kV



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5.4 INSULATION PIERCING CONNECTOR:

Insulation Piercing Connectors (IPC) are used for making Tee / Tap-off/ connections to a Covered Conductor. Insulation Piercing Connectors are designed to make a connection between the uncut main conductor and a branch cable conductor without having to strip either cable to expose the conductor. Instead, the tightening action of the IPC will first pierce the Insulation, then make good electrical contact between the main and branch conductor while simultaneously insulating and sealing the connection. The connector bodies shall be made entirely of mechanical and weather resistant plastic insulation material made of weather & UV resistant reinforced polymer and no metallic part outside the housing is acceptable except for the tightening bolt or nuts.

Any metallic part that is exposed must be free from potential during or after connector installation.

Screws or nuts assigned for fitting with IPC (Insulating Piercing connector), must be fitted with torque limiting shear heads to prevent over tightening or under tightening.

The min & max torque values should not exceed 27 N mtr for IPC for main conductor < 95 sq mm, and 42 Nmtr for main conductor >95, but < 240 sq mm.

The contact teeth or blade of the connector is made of tinned copper with equivalent Cross Section with respect to % IACS to suit the max branch cable size declared. The shear bolt/nut shall be suitable for tightening with a hexagonal socket of 13 mm or 17mm.

The IPCs shall be water proof and the water tightness shall be ensured by appropriate elastomeric materials and not by grease, gel or paste alone. Grease can be applied to protect the contact blade alone and shall not be visible on the outer surface of the connector. Connector should not be dipped in grease.

Each IPC should be provided with a cap to seal the cut end of the Branch cable. It should be of a design that once the connector is installed, it should not be possible to remove the cap without dismantling the connector.

All the metallic parts of the connector should be corrosion resistant and there should not be any appreciable change in contact resistance & temperature after overloads & load cycling and should confirm to the long duration tests specified in this standard.

5.5 MID SPAN JOINTS:

Mid-span tension joints for jointing covered conductor over a span. The sleeves should be Pre-Insulated type. Sleeve should be made of Aluminum, insulated with an Anti-UV black thermoplastic tube hermetically sealed two ends with 2 flexible rings. Strip length, Hexagonal crimping die reference and size to be marked on the outer surface of plastic sleeve.

5.6 ARC PROTECTION DEVICES:

Arching Horn Assembly is an Arc protection device for power arc evacuation without insulator damage. The arching Horn Assembly protection device consists of:

- a) Two arcing horns with adjustable distance “L” directly mounted on the insulator terminals.
- b) A covered conductor with clamp on the horn side.



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- c) An insulation piercing connector on the main cable side.

6. MARKING:

The following particulars shall be properly legible embossed/Printing on the accessories.

- a) Name & Trade mark of the manufacturer
- b) Product Code
- c) Batch Number
- d) The minimum and maximum cross section of Conductor for which the unit is suitable
- e) Month and Year of Manufacturer
- f) "TPWODL/ TPCODL/ TPNODL/ TPSODL" Name

7. TESTS

A type test shall be performed on the accessories. All the Acceptance test, Type test and Routine test should be as per EN 50397-2 and latest amendment. The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

i) Tension Assembly-Wedge Type (TA)

- a) Visual examination
- b) Dimension verification
- c) Tensile test at ambient temperature
- d) Check for permanent marking

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test



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iv) Insulation Piercing Connector

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test
- e) Short Circuit test

7.2 ROUTINE TESTS

i) Tension Assembly-Wedge Type (TA)

- a) Visual examination
- b) Dimension verification

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test



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- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test

7.3 TYPE TESTS

i) Tension Assembly-Wedge Type (TA)

- g) Visual examination
- h) Dimension verification
- i) Tensile test at ambient temperature
- j) Tensile test at low temperature
- k) Tensile test at high temperature
- l) Corrosion test
- m) Climate ageing test
- n) Check for permanent marking

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests
- g) Thermal Tests under load
- h) Corrosion test



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i) Climate ageing test

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test
- h) Electrical Ageing Test

iv) Insulation Piercing Connector

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test
- h) Electrical Ageing Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test
- e) Short Circuit test



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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/ IEC standard and as per CEA guidelines. Type tests should have been conducted in certified Test laboratories during the period not exceeding **7 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) 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 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 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,



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as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 24 months from the date of commissioning or 30 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.

The guarantee clause is applicable for all the items covered in this specification.

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. 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 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.

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:

- Completely filled in Schedule "A" Guaranteed Technical Particulars & Schedule "B" Deviations
- Work Experience details
- Type test certificates.
- Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.

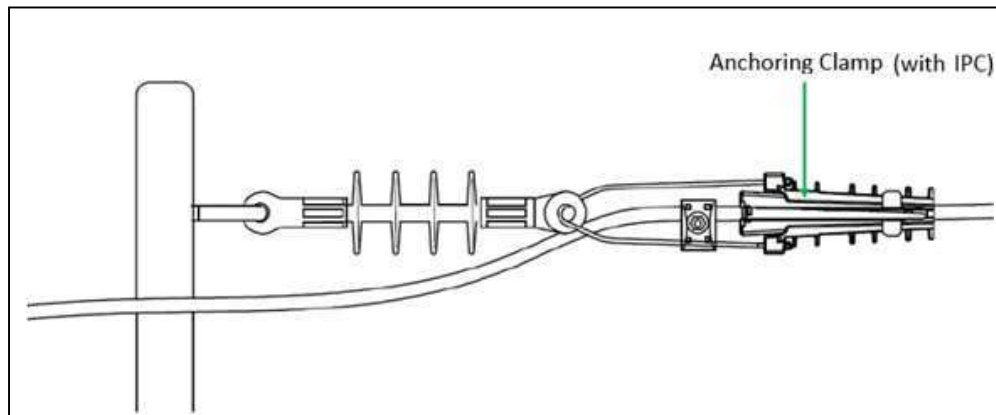


Fig.1: - Tension Assembly (TA) with Anchoring clamp and one Tracking protection IPC

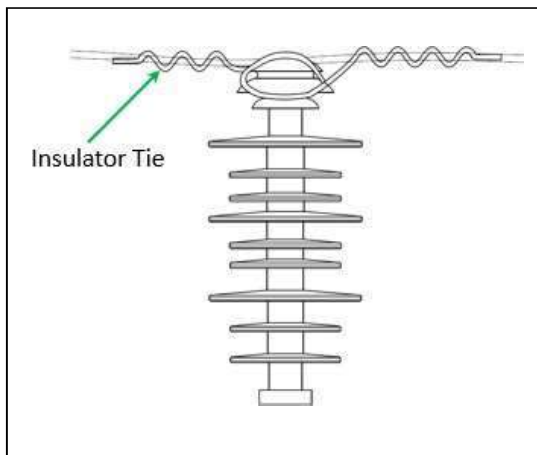


Fig.2: - Non-Metallic Alignment Tie

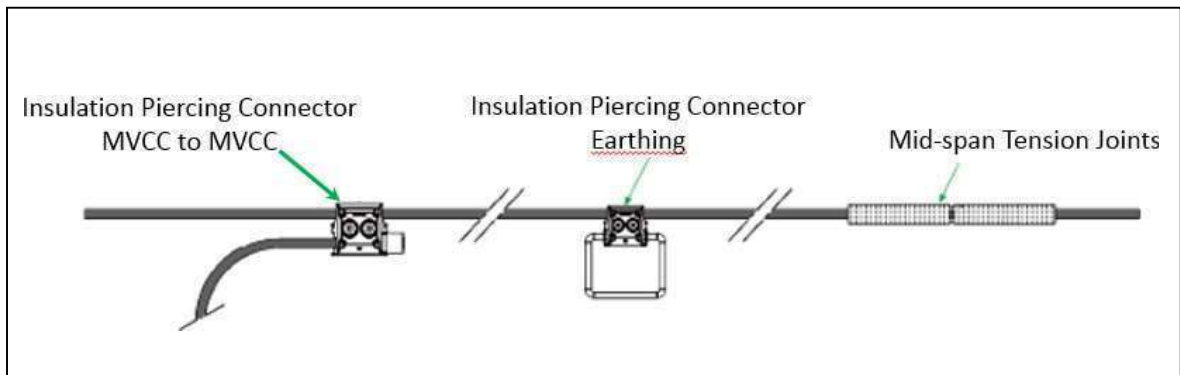


Fig.3: - Insulation Piercing Connector for Networking / Branching /Looping and Midspan Joints

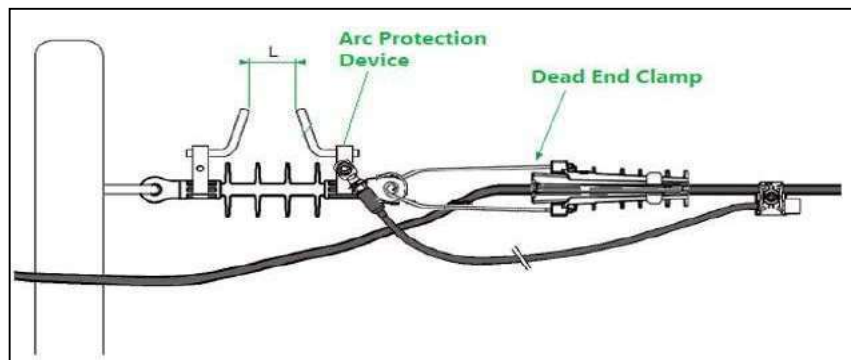


Fig.4:- Arc Protection Device

Note:- These are the Sample Drawing for tender purpose only.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

TENSION ASSEMBLY-WEDGE TYPE (TA)

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Installation (with/without disassembly)	
5	Type & grade	
6	Application	
7	Mechanical Strength	
8	Dimensions (mm)	
9	Tension Load	



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NON-METALLIC ALIGNMENT TIES

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Mounting	
5	Type	
6	Material	
7	Application	
8	Dimensions (mm)	

MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Installation	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Material	
8	Connector ID	

INSULATION PIERCING CONNECTOR

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor sizes accommodated for Main & Branch	
4	Application	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Are end caps of branch cable a) Slide on type (b) Rigid	
8	Are torque limiting shear heads provided to tightening bolts	
9	Specified Torque	
10	Torque for establishing connection between main and Tap (Nm)	



Specification No: [ENG-HV-2005](#)

Specification Name:
SPECIFICATION FOR ACCESSORIES OF 11kV XLPE COVERED CONDUCTOR

MID SPAN JOINTS

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Type No & Size Range	
4	Application	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Installation	

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-2006

**Specification Name : ENG-ELC-069- TECHNICAL SPECIFICATION FOR 11kV
XLPE COVERED CONDUCTOR**

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

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TPWODL*



Specification No: [ENG-HV-2006](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 11kV XLPE
COVERED CONDUCTOR

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18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of 11kV All Aluminum Alloy Stranded XLPE Covered Conductors. The material shall be complete with all components, which are necessary or usual for their efficient performance and trouble-free 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	Description
IS 398:1996 (Part IV)	Specification for aluminum conductors for overhead distribution purpose
EN 50397-1:2006	Covered Conductor Specification for voltage 1KV to 33KV
IS: 10418	Reels and drums for bare conductors

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	VALUES
1	Max. altitude above sea level	1000m
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 as mentioned above.

4. GENERAL TECHNICAL REQUIREMENTS:

The XLPE covered conductor shall comply in all respect with IS: 398 (Part.4)/1996 with latest amendment, if any from the date of its applicability

Sl. No.	Technical Parameters	Desired Values				
1	Name of the manufacturer	To be furnished by Bidder				
2	Applicable Standard	EN 50397-1:2006, IS 398-IV/1994				
3	Type of Conductor	AAAC XLPE Covered Conductor				
4	Rated Voltage/Operating voltage	12kV/11kV				
5	Nominal Cross-sectional area of conductor	55	80	100	148	232
6	Conductor					
a)	Material	Aluminium Alloy (AAAC)				
b)	Shape	Stranded Circular and Watertight				
c)	No / diameter of wire (before stranding)	7x3.15	7x3.81	7x4.26	19x3.15	19x3.94
d)	Approx. conductor diameter	9.45 mm	11.43 mm	12.78 mm	15.75mm	19.70mm
e)	Max. D.C. Resistance at 20°C	0.621 Ω/Km	0.425 Ω/Km	0.339 Ω/Km	0.229 Ω/Km	0.1471 Ω/Km

f)	Resistance Temperature co-efficient	0.004 / °C	0.004 / °C	0.004 / °C	0.004 / °C	0.00004 / °C
g)	Minimum Tensile strength of conductor	16.03kN	23.41 kN	29.26 kN	43.50 kN	68.05 kN
7	Thickness and dimensions					
7.1	Conductor Screen					
a)	Material	Extruded Semi-Conducting Compound				
b)	Nominal Thickness	0.3 mm	0.3 mm	0.3 mm	0.3 mm	0.3 mm
7.2	Insulation inner layer					
a)	Material	Extruded XLPE				
b)	Nominal thickness	1.2 mm	1.2 mm	1.2 mm	1.2 mm	1.2 mm
7.3	Insulation Outer layer					
a)	Material	Track Resistance, UV Resistant and Erosion Resistance XLPE (Black)				
b)	Nominal thickness	1.1 mm	1.1 mm	1.1 mm	1.1 mm	1.1 mm
8	Lightening Impulse withstand strength of XLPE Layer	75kV	75kV	75kV	75kV	75kV
9	Approx. Overall Diameter	15 mm	16 mm	18 mm	21mm	25mm
10	Maximum continuous operating temperature	90 °C	90 °C	90 °C	90 °C	90 °C
11	Max short circuit current, 1 sec (KA)	5.17 kA	7.52 kA	9.4 kA	13.912 kA	21.808 kA
12	Approx. Weight	To be provided by bidder				
13	Standard Packing length	1000 (+/- 5%) as per PO terms				
14	Make of Raw Material	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta				

5. GENERAL CONSTRUCTIONS:

5.1 CONDUCTOR

a) The properties of stranded all aluminum alloy conductors of various sizes are as follows

Actual Area	Stranding & wire dia.	Approx. overall dia.	Approx. mass	Calculated resistance at 20 d.c. (max.)	Approx. calculated Breaking Load	Reactance per km	Current Rating
mm. sq.	mm	mm	Kg/km	Ohm/km	kN	Ohms	Amps
55	7/ 3.15	9.45	149.20	0.621	16.03	0.3556	234
80	7/ 3.81	11.43	218.26	0.425	23.41	0.3394	270
100	7/ 4.26	12.78	272.86	0.339	29.26	0.3394	325

b) The properties of aluminum alloy wires to be used in the construction of the Stranded

conductors are as follows:

Diameter		Cross sectional area of Nominal Diameter	Mass	Minimum Breaking Load after stranding	Resistance at 20 deg.c
Nom	Max				
mm	mm	Sq.mm	Kg	kN	Ohm/kM
3.15	3.18	7.793	21.04	2.29	4.290
3.81	3.85	11.40	30.78	3.34	2.938
4.26	4.30	14.25	38.48	4.18	2.345

- c) No negative tolerance shall be permitted on the nominal diameter aluminum wire used in the manufacture of XLPE COVERED CONDUCTOR. However, positive tolerance in this respect shall be as provided in IS: 398 (Part IV)/1994 (amended up to date).
- d) The wire shall be smooth and free from all imperfections such as spills, splits, slag inclusion, dia. marks scratches, fittings, blow holes, projections, looseness, overlapping of strands, chipping of aluminum layers etc. and all such other defects which may hamper the mechanical and electrical properties of the conductor. Special care should be taken to keep away dirt, grit etc. during stranding.
- e) There shall be no joint in any wire of a stranded conductor containing seven wires, except those made in the base rod or wire before final drawing.
- f) The wires used in the construction of a stranded conductor shall, before stranding satisfy all the relevant requirements of this standard.
- g) Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta
- h) The lay ratio of the different layers shall be within the limits given below: -

No. of wires in Conductors	Lay Ratio in			
	6 - wire layer		12 - wire layer	
	Min.	Max.	Min.	Max.
7	10	14	-	-

5.2 FILLING (WATER BLOCKING):

The Stranded Conductor shall be longitudinally water tight by means of a water blocking material incorporated during the extrusion process. The use of grease/water swell able tape / water swell able powder etc. is not permitted. The water blocking material shall be stable at maximum operating conductor temperature of 90 Deg. Cent. The water blocking compound shall be compatible with the conductor material as well as the semi conducting screen layer above it and not adversely affect its electrical or mechanical properties.



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COVERED CONDUCTOR

5.3 SEMICONDUCTING SCREEN:

An extruded semi conductive compound should be applied over the filled stranded conductor to ensure a lower voltage stress on the Insulation applied over the screen.

5.4 INSULATIONS:

The Insulation should be dual layered with the Inner Layer being XLPE with a nominal thickness of 1.2 mm and the Outer Layer being a suitable XLPE which is UV Resistant, Anti Tracking and Erosion Resistant with a nominal wall thickness of 1.1 mm. The minimum combined Insulation Thickness of both Layers should be 2.3 mm.

The conductor manufacturing and stranding process shall incorporate the longitudinal water blocking also.

The Semiconducting Screen, Inner Insulation and Outer Insulation should be extruded in one step i.e. triple extrusion to ensure a good, permanent bond between the three layers and also with the conductor.

It shall be possible to remove the Semi Conducting Screen, Inner and Outer Insulation Layers without damage to the conductor.

6. MARKING:

The following particulars shall be properly legible embossed on the covered conductor at the intervals of not exceeding one meter throughout the length of the Conductor. The covered conductor with poor and illegible embossing shall be liable for rejection.

- a) Name & Trade mark of the manufacturer
- b) Voltage Grade
- c) Year of manufacture
- d) Size of Covered Conductor
- e) EN 50397-1: 2006
- f) PO Number
- g) "TPWODL/ TPCODL/ TPNODL/ TPSODL" Name

Note: - Sequential meter marking shall be printed (after each meter)

Following details shall be provided on flanges of drum:

- a) Manufacturer's name
- b) Type of Cable/Conductor
- c) Size of Cable/Conductor
- d) Voltage Grade
- e) Length of the cable/conductor 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.

7. TESTS:

A type test shall be performed on every covered conductor type, irrespective of the cross-sectional area. All the type test, Routine test and acceptance test should be as per EN 50397-1:2006 and latest amendment. The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

- a) Visual examination and Dimension Check Test
- b) Conductor Resistance Test
- c) High Voltage Test
- d) Spark Test
- e) Hot Set Test on covering
- f) Longitudinal Water Tightness Test
- g) Anti-tracking test
- h) Marking

7.2 ROUTINE TESTS

- a) Visual examination and Dimension Check Test
- b) Conductor Resistance Test
- c) High Voltage Test
- d) Spark Test
- e) Hot Set Test on covering
- f) Longitudinal Water Tightness Test
- g) Marking

7.3 TYPE TESTS

i) Electrical Test

- a) Conductor Resistance Test
- b) High Voltage Test
- c) Spark Test
- d) Leakage Test
- e) Tracking Resistance

ii) Non-Electrical Test on Covering

- a) Mechanical properties Test
- b) Carbon Black Content
- c) Resistance to UV rays
- d) Ageing of complete product sample
- e) Shrinkage Test
- f) Hot Set Test
- g) Pressure Test at High Temperature
- h) Water Absorbs Test
- i) Hardness Test
- j) Longitudinal Water Tightness Test
- k) Marking
- l) Slippage Test

iii) Visual examination and Dimension Check Test**iv) Mechanical properties of the 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 as per relevant IS/ IEC standard and as per CEA guidelines. Type tests should have been conducted in certified Test laboratories 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.



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Specification Name:
TECHNICAL SPECIFICATION FOR 11kV XLPE
COVERED CONDUCTOR

Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPWODL/ TPCODL/ TPNODL/ 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 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 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 24 months from the date of commissioning or 30 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. The bidder shall provide instructions regarding handling and storage precautions to be taken at site. The Conductor shall be wound on wooden/STEEL drums and packed in line with requirements of IS 10418-1982. The ends of the Conductor shall be sealed by means of non-hygroscopic sealing material. Heat or cold Shrinkable end caps with sealant shall be used for effectively sealing the

end terminals of the covered conductor. The inner diameter range of cap shall be such that it shall tightly fit to the covered conductors to prevent moisture ingress.

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 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.

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



Specification No: [ENG-HV-2006](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 11KV XLPE
COVERED CONDUCTOR

Sl. No.	Technical Parameters	To Be Furnished By Bidder				
1	Name of the manufacturer					
2	Applicable Standard					
3	Type of Conductor					
4	Voltage Grade					
5	Nominal Cross-sectional area of conductor	55	80	100	148	232
6	Conductor					
a)	Material					
b)	Shape					
c)	No / diameter of wire (before stranding)					
d)	Approx. conductor diameter					
e)	Max. D.C. Resistance at 20°C					
f)	Resistance Temperature co-efficient					
g)	Minimum Tensile strength of conductor					
7	Thickness and dimensions					
7.1	Conductor Screen					
a)	Material					
b)	Nominal Thickness					
7.2	Insulation inner layer					
a)	Material					
b)	Nominal thickness					
7.3	Insulation Outer layer					
a)	Material					
b)	Nominal thickness					
8	Lightening Impulse withstand strength of XLPE Layer					
9	Approx. Overall Diameter					
10	Maximum continuous operating temperature					
11	Max short circuit current, 1 sec (KA)					
12	Approx. Weight					
14	Make of Raw Material					

20. SCHEDULE “B” DEVIATIONS:



Specification No: [ENG-HV-2006](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 11KV XLPE
COVERED CONDUCTOR

(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

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Specification No: [ENG-HV-2007](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 11 kV XLPE
ARMOURED CABLE

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18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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.	CONDITIONS	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.



Specification No: [ENG-HV-2007](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 11 kV XLPE
ARMOURED CABLE

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:

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 of conductor mm ²	95	120	150	185	300	400	630	1000
6	Min. number of strands	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 rating for 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 of conductor (kg/km/core)	24 4	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 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 / 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. <u>1 CORE CABLE: - NA</u> 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 <i>pressure extruded</i> 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 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 from reputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL/ Equivalent (in-line with TS)	Aluminium armour shall be procured from 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.m m	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:

- Manufacturer's name
- Type of Cable
- Size of Cable
- Voltage Grade
- Length of the cable on the drum
- Direction of the rotation of the drum
- Gross mass
- Country of manufacture
- Year and month of manufacture



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- 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 XLPE insulation, 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



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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



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- 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 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 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"



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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-2009

Specification Name : Specification for 11KV RMU Motorised Outdoor Type with Metering Unit

Vijender Goyal	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	JYOTIPRAKASH MOHANTY	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPNODL	TPCODL	TPWODL	TPSODL	TPSODL
13-12-2022	13-12-2022	13-12-2022	14-12-2022	14-12-2022	14-12-2022

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20. SCHEDULE "B" DEVIATIONS

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 motorized RMU with Metering panel & all other accessories 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 editions of the following IEC/IS Standards and shall conform to the regulations of local statutory authorities.

IEC 62271-200	HV switchgear and control gear-AC Metal Enclosed switchgear and control gear for voltages above 1 kV and upto and including 52kV.
IEC 62271-1	Common specifications for high voltage switchgear and control gear standards
IEC 62271-102	HV switchgear and control gear-Alternating current disconnectors and earthing switches
IEC 62271-103	High voltage switches — Part 1: Switches for rated voltages above 1 kV and less than 52 kV
IEC 60529.	Degrees of protection provided by enclosures (1P Code)
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK Code)
IEC 60060	High-voltage test techniques
IEC 60947 /IS 13947	Low voltage switchgear and control gear
IEC 60439-1	Low-voltage switchgear and control gear assemblies- Type tested and partially type tested assemblies
IEC 60255-151	Electrical relays - Part 3: Single input energizing quantity measuring relays with dependent or independent time.
IEC 60044-1 / IS 2705	Current Transformers
IEC 60044-2 / IS 3156	Voltage Transformers
IEC 60376	Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment
IEC 61958	High-voltage prefabricated switchgear and control gear assemblies - Voltage presence indicating system

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	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	Descriptions	As Specified	By
		TPCODL/TPNODL/TPSODL/TPWODL	
1	RMU Category	3Way Motorised (1CB+2LBS) 4Way Motorised (2CB + 2 LBS)	
2	RMU application	Outdoor.	
3	Offered Model nos. and OEM type	a. 3 Way Non Extensible b. 4 Way Non Extensible	
4	Dielectric medium	SF6	
5	Interrupting medium	Vacuum- for CB SF6 for LBS and earth switch	
6	System Frequency	50 Hz	
7	Rated Voltage	12 KV	
8	Service Voltage	11 KV	
9	Rated current -Line Switches	630 A	
10	Rated Current-CB and LBS	630 A for all type	
11	Rated Short time current withstand (3 sec)	21 KA	
12	Rated Short time Making capacity	50 KA	
13	Rated cable charging interrupting current of incomer load break switch	10 A	
14	Rated load interrupting line current	630 A	
15	Rated cable charging breaking current of breaker	25 A	

16	No. of operations at rated short circuit current on line switches, earthing switches should be E2	LBS- 5 close ES- 5 close The ES in line with CB
17	Opening time of breaker (max.) Without relay time	2.5 cycle
18	Closing time of breaker (max.)	3 cycle
19	Breaker Duty Cycle	O – 3min - CO - 3min – CO
20	i. Mechanical endurance for Isolator & Earth Switch	Min 1000 Operations
	ii. Mechanical endurance for Circuit Breaker	Min 2000 Operations
21	Electrical operations of at rated current a. LBS/Disconnecter b. Earth Switch	To be provided by bidder
22	Temp rise above ambient of 50 deg.	50 Deg C. (Type Tested as per IEC and complying to requirements)
23	Min Gas pressure in bar	To be provided by bidder based on type tested design
24	SF6 Gas pressure manometer with indicating bars/scale to measure the actual gas pressure (indirect method RFS etc. not accepted)	1. Dial type Manometer to be provided for gas pressure indication 2. Contacts to be provided and wires up on the TB for SCADA communication of gas status.
25	Enclosure	The RMU metal parts shall be 2mm thickness high tensile steel/CRCA. The overall paint thickness shall be 125 microns. (No negative tolerance is allowed)
26	Guaranteed SF6 leakage per annum	Less than 0.1% from main tank
27	Degree of protection	a. IP 67 for the tank and b. IP2X for the front cover / mimic board and c. IP 54 (Main door closed) for Outdoor RMUs. d. IP 54 for cable compartment
28	Internal Arc rating	IAC AFL or better
29	Internal Arc test	20kA for 1 Sec.
30	Lightning Impulse withstand Voltage	75 kVp
31	Power Frequency withstand voltage	28 kVrms.

32	SF6 Tank design	Hermetically/robotically sealed unpainted stainless steel enclosure with SF6 Gas. Sealed pressure system by Laser welding/TIG & MIG welding so that no refilling of gas is required for 30 years. No gas work at site. Complete body shall be tamperproof to prevent access to live parts. No gaskets shall be used. No bolts shall be provided.
32.1	Tank material and grade of SS and welding	Should be of SS and non-corrosive, offered grade of SS to be mentioned. The welding shall be such that there shall be corrosion of welding for useful life of equipment.
33	Earth bus bars	In enclosure to prevent tampering.
34	Material & size of earth bus bar	To be provided by the bidder
35	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open	To be provided by the bidder
36	Incomer Load Break switch: Shall be SF6 insulated with least maintenance. Shall have at least 3 positions, Open, Close & earth with natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock. The electrical interlock for preventing manual closing of earth switch under cable charged condition to be provided.	To be provided by the bidder
37	Circuit Breakers: a. With VCB interrupter and SF6 insulated bus with minimum maintenance and shall have at least 2 positions i.e. Open & Close, Manual operation & fitting of motor at site shall be possible if required. b. In view of safety each VCB shall be assisted with feeder side disconnecter having 3 positions, open disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.	To be provided by bidder as per specs.
38	Protection Relay-Without auxiliary power & shall include , electronic relay, low energy release & fast on test receptacle for protection testing	To be provided by bidder as per specs.

39	Make of self-powered Relay & offered model	a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA – ABB ,Ashida, Schneider, Siemens
40	Flag indication for CB Trip on fault in relay/mechanical or Electrical	To be provided by bidder
41	Testing of Cable- If doors are opened then earth switch shall be in closed position with necessary interlocks and cable test rod fixing provision in bolt head which can be fixed on terminations through boot cap/opening for testing purpose AND if doors are opened it shall not be possible to operate, Isolator, E/Switch or CB through interlocks	To be confirmed. If separate test bushing are provided, it shall be covered with suitable antitheft covers with anti vandal screws
42	Protection against theft	Design of RMU shall be tamper & arc proof. Anti vandal screws shall be provided. Cable covers shall be pad lockable. All live parts and internal parts etc. shall be covered with antitheft covers.
43	Doors	Outer enclosure should be hinged main door with padlock provision. Cable chamber door should not be hinged type. It should be arc proof with bolted arrangement. Note: RMU shall be inside the enclosure.
44	Voltage indicator box shall be fixed type-This device shall be in compliance with IEC 62271-206:2011 standard only	Capacitive dividers type which will supply low voltage to power the lamps and 3 inlets can be used to check phase sequence or presence of voltage in cable
45	Cable cleats (full circle)	HDPE/Nylon (Fire Retardant)
46	Cable termination and bushing suitability	Heat/ Cold shrink terminations
46A	Cable Termination boot /Cable boot	Cable Termination Kit & Termination Boot in scope of Supplier. (Raychem/3M Make only) Cable Size in detailed Engineering Stage
46	Cable compartment suitability shall be	Suitable for cable sizes a. 11kV 3CX400 sq.mm having dia of 92mm in all compartment and b. For three way with two CB the LBS shall be suitable for 11kV 1CX630 sq.mm cable having diameter of 51mm in incomer LBS- the necessary cleat and nonmagnetic base plate cable entry arrangement and 15mm longer bolt than other compartment shall be provided.
47	The cable compartment	All cable compartment shall be bottom entry and front opening type only

48	Size of bimetallic washer in all compartments	Must be suitable for M16 for TPCODL/TPNODL/TPSODL/TPWODL, ODISHA) bolt and bushing sizes with min. 2mm thick.
49	Height of bushing terminal from base plate	Minimum 800mm for proper termination space.
50	Fault passage indicator	FPI on each LBS as a part of each RMU with specified default setting. FPI should be communicable type with remote resettable functionality.
51	Operating handle	To be provided by bidder as a part of RMU with each RMU and to be placed on front or on door
52	Non removable MIMIC Diagram on Front of panel	To be provided by bidder with detailed descriptions as mentioned in specs. And earth switch marking background shall be yellow for TPCODL/TPNODL/TPSODL/TPWODL-ODISHA As per annexure-2
53	Main Bus bar Material	Copper
53.1	Bus bar Cross Section	To be specified by bidder as per current density
54	Opening & Closing times with relay	125 ms maximum
55	Current Transformer for CB compartment	Shall be epoxy resin casted and mounted on cables. The CTs around the cables shall be supported on the sheet steel bracket and should be fixed with bolts. The mounting frame should be moveable up and down or to and fro but shall be fixed at coaxial position with base plat holes and bushing terminal bolts. a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA the CT settings shall be adjustable between 100-200-400/1 Amp at terminal block. Burden is 2.5 VA, Class - 5P10. (CT Ratio to be decided during Detailed Engineering if applicable)
56	Future motorization and SCADA Compatibility with FRTU	To be provided
57	Guarantee	As per specification
58	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder
59	Total weight	To be provided by bidder
60	Paint	Light Gray shade RAL 7032
61	Type test of product	To be provided by bidder as per specification

62	Availability of spares	Assurance by bidder for 25 years, list of spares as mentioned in specification to be provide along with RMU lot
63	VPIS auxiliary contact	The VPIS shall have auxiliary contact such that it can be configured with SCADA for remote status indication of cable charged. The auxiliary contact to be wired up in TB.
64	VPIS	In all compartments
65	Breaker operation counter	To be provided by bidder
66	LBS operation counter	To be provided by bidder
67	Moisture absorption material in SF6 tank	Bidder should provide the detail of the moisture absorption material.
68	Making of earthing operations	a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA All earth operation to be marked with Yellow back ground and permanent in nature.
69	Auxiliary contacts (spare numbers to be provided)	LBS (4NO+4NC) Earth Switch (2NO+2NC) CB (4NO+4NC) CB Disconnecter (2NO+2NC) CB earth switch (2NO+2NC)
70	Control cable entry provision	To be provided
71	Shunt trip coil 24V DC	To be provided
72	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	To be provided
73	RMU Cable Boot/ terminal protector	
A	Terminal protector	Insulating Boots
B	System voltage	12 kV
C	AC High voltage	28kV For 1 min
d	Impulse withstand voltage	75kV
e	Bushing Diameter	To be provided by bidder
f	Bushing Types	To be mentioned by bidder
g	Cable cross section suitability	Bidder to provide complying to specs.
h	Bushing Material & Class	Epoxy bushing-F class
i	Dimensions of cable protector	Suitable for cables & bushing in specs (offered size to be provided by bidder)
j	Material of the component	To be specified by bidder

k	Type test reports	Bidders to provide detailed list of tests conducted at lab name, conducted dates, report number along with full reports.
For motorized RMU		
1	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	To be provided
2	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	To be provided
3	Details of I/O	As per Annexure-IO list of this specs
4	System to prevent mal operation in case of latch command	Bidder to provide inbuilt system to prevent any mal operation in case of latch command at RMU in case of any fuse failure or DC fail situation
5	Technical Details of motors	
a	Operating Voltage	24 V DC
b	Max. power rating	240 Watts
c	Max current drawn	9 Amp (±10%)
d	Operating time	4-8 seconds
e	Power Supply	24VDC from Battery Charger and 230 VAC from Aux PT in scope of Supplier(Aux PT shall be included as the RMU is with metering unit.
f	Metering Unit	Metering Unit Shall be Standalone Type & attached with RMU. It shall have Dedicated CT and PT for metering only and a metering compartment. CTR: 100/5, Acc. Cl: 0.5S ,Burden 15VA PT: 11/rt3:110/rt3, Acc. Cl:0.5 ,30VA Metering Panel shall be Type tested as per Tender Spec. Panel should have Sealing Facility as a part of Metering Requirement. <i>(CT ratio to be decided during detailed engineering after taking consent from metering Dept.)</i>

Type of Ring Main Units shall be as under:

3 Way/4 Way Non Extensible Type (For Outdoor application):

3 Way RMU: 2 LBS 1 VCB with Self powered O/C & E/F Relay and 1 FPI

4 Way RMU: 2 LBS 2 VCB with Self powered O/C & E/F Relay and 1 FPI

5. GENERAL CONSTRUCTIONS

5 GENERAL CONSTRUCTION FOR RMU

5.1.1 The switchgear and bus bar shall be contained in a stainless steel tank filled with SF6 gas and the outer body shall be made of minimum CRCA of 2mm or GI high tensile steel 2mm thick with thick gland plates of 3mm. The sheet steel shall have surface treatment of 7 tank process With powder coating of minimum 70 microns. The tank shall have SS sheet of minimum 2mm thickness with internal Arc Type tested and meet the "sealed pressure system" criteria in accordance with the IEC 62271-200. This is a system for which no handling / refilling of gas shall be required throughout the expected operating life, i.e. 30 years. Sealed pressure systems are completely assembled, filled and tested in the factory. The maximum leakage rate of SF6 gas shall be lower than 0.1 % of the total initial mass of SF6 gas per annum. The filling pressure for the switchgear shall be just above the atmospheric pressure so as to reduce the tendency to leak. SF6 gas used for the filling of the RMU shall be in accordance with IEC 376. It is preferable to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption. The degree of protection for RMU tank (Indoor/Outdoor) shall be IP 67. The mimic board shall be provided with IP2X /IP3X degree of protection for Indoor RMUs and protection for Outdoor RMUs shall be minimum IP 54

The RMU shall be suitable for mounting on plinth with provision for cabling through gland plate in the base and trench below, The RMU shall be designed so that the position of the different devices is visible to the operator on the front and operations are also visible. The RMU shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics. The RMU shall be designed to be tamper proof so as to prevent access to all live parts during operation without the use of tools.

5.1.2 The RMU shall be completed with all connection and electrolytic copper bus bar with continuous current carrying capacity of 630A at 50 Deg C ambient. The bus bar shall be fully encapsulated by SF6 gas inside the steel tank. There shall be continuity between the metallic parts of the RMU and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The earth bus bar shall be preferably enclosed in an enclosure to prevent theft/tampering.

5.1.3. All parts of main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This does not apply to removable parts which become accessible after being separated from the switchgear and control gear. The cables shall be earthed by an earth switch with short-circuit making capacity in compliance with IEC 62271-102. Circuit breaker shall not be closed in case Earth Switch is closed. The earth switch shall be fitted with its own operating mechanism and manual closing shall be driven, by a fast-acting mechanism, independent of operator action. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when cable is charged.

5.1.4 Any accidental over pressure inside the sealed chamber shall be limited by the opening of a pressure limiting device provided in the rear part of the tank. Gas shall be released to the rear of the RMU away from the operator. Bidder shall provide type test report to prove compliance to the 'Internal fault IAC AFLR as per IEC 62271-200. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch-or earth switch. All manual operations shall be carried out on the front of the RMU. The instrument transformers (CT/PT) shall be required and to be incorporated in the drawing for discussion at the final stage.

5.1.5 Circuit Breaker for Transformer Local Feeder Control

The circuit breakers shall be of the maintenance free. The position of the power and earthing contacts shall be clearly visible on the front of the RMU. The circuit breakers shall have at least 2 positions: Open-disconnected and closed and shall be constructed in such a way that natural interlocks prevent all unauthorized operations. They shall be fully mounted and inspected in the factory. Breaker operation counter should be provided.

An operating mechanism can be used to manually close the circuit breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping by, an integrated push button. There will be no automatic re-closing. The operating mechanism shall be compatible for remote/SCADA operation. The circuit breaker shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include three toroid transformers incorporated in the transformer tee-off bushings, an electronic self powered relay, a low energy release, and a "fast-on" test receptacle for protection testing (with or without CB tripping). The protection system shall ensure circuit breaker tripping as of a minimum operating. current which is the rated current of the underground network to be protected. The CT settings shall be adjustable and CT ratio to be decided during detailed engineering as per site requirement. Protection core CT complete details should be furnished (Burden, class, ALF).

The circuit breaker shall be provided with Phase protection of Definite time/ IDMT element for .overcurrent and earth fault with minimum PSM-0.05,Tsm-0.01 having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The Earth Fault Protection shall be provided of. Definite time/ IDMT element having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The "Time Multiplier" with minimum set point of 0.05 TMS shall be available. The breaker shall have the provision of flag Relay for indication of Trip on Fault. High set (DT) for overcurrent and earth fault- min .current setting-0.5 In, minimum Time Delay-20 millisecond. The relays shall be suitable numerical relay with necessary elements or any other relay as per the Purchaser's approval.

There' shall be provision for testing of cable without opening the front door by suitable arrangements. In case cables are to be tested with front door open, doors shall have interlocks such that doors can be opened only with earth switch in closed position. . Termination boots as approved by the Purchaser's should have a proper opening to facilitate the testing. The opening shall be covered by means of removable protection cap

In case of front door opened, it shall not be possible to operate the breaker. All panel covers shall be provided with anti vandal screw bolts so that opening of panel covers is only possible with special tools, which shall be provided by the Bidder. This is required to prevent pilferage. The cable cover door shall be pad lockable and shall be Tamper and Arc proof. There shall be provision of hinged doors in the RMU. The circuit breaker and earth switch shall be lockable in the open or closed positions by 1 to 3 padlocks. Breaker shall have mechanical endurance of at least 2000 operations. The circuit breaker shall be compatible for remote operation and can close (ON) and open (OFF) by remote operation.

5.1.6 Incomer Load Break Switches :

The Load break switches shall have positions, open-disconnected closed, and earthed, and will be constructed in such a way that natural interlocking prevents unauthorized operations

The position indicator shall provide positive contact indication in accordance with IEC 265-1 standard. In addition, manufacturer shall prove reliability of indication in accordance with IEC 129.

The switches shall be fully mounted and inspected in the factory. Manual opening and closing will be driven by a fast-acting mechanism, independent of operator action.

Mechanical Interlock should be provided for Earth switch, If cable is back charged Earth switch should not be closed.

Each switch can be fitted with an electrical operating mechanism in a specially reserved location, without any modification of the operating mechanism and without de-energizing the RMU.

Load break Switch should be operated manually & motorized.

5.1.7 Bushings and Cable terminations:

Each cable compartment shall be provided_ with three-_ bushings _of adequate _ sizes to terminate the incoming and outgoing cables along with a terminal block (TB) located at convenient accessible location so as to wire all inputs & outputs (IOs) up to the terminal block (TB). The bushings shall be conveniently located for proper bend so as to allow easy working and termination of cables. The cable termination shall be done with Heat shrinkable /Push ON termination method so that adequate clearances are maintained between phases & cable shall be held by HDPE (fire retardant) cleat. 2 runs, of 3CX400 Sq mm, OR 1R of 3 NO. 1CX630 Sq mm shall be used for cable termination.(It shall be finalized during detailed engineering) All the cable secondary Wiring should 'be rooted through marshaling box separately for relay, CT etc.BA should provide bimetallic washer for tightening of cable.

5.1.8 Earthing:

The RMU outdoor metal clad, switchgear,, Distribution Transformer, R.S. Joists, M.S Channels/M.S. angles etc, shall be equipped with an earth bus securely fixed along the base of the RMU. The size of earth busbar of GI Strip (75X12 mm) shall be as per IEC/IS. Provision shall be made on end of RMU for connecting the earth bus to the earth grid by erecting suitable 2 earth pipes of 50mm dia. M.S. rod of 3 meter in Pits. Both the earth pipes are also to be connected in a grid formation. Necessary terminal clamps and connectors shall be included in the scope of supply.

5.1.9 Voltage indicator lamps and phase comparators:

Each function shall be equipped with a fixed type voltage indicator box on the front to indicate whether or not there is voltage in the cables. The capacitive dividers Will supply low voltage power to the lamps. Three inlets can be used to check the synchronization of phases. These devices shall be in compliance with IEC 61958 standard.

5.1.10 Front Cover

The front cover shall provide a clear mimic diagram that indicates the different functions. The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The bidder shall provide a marking plate showing RMU's main electrical characteristics.

5.1.11 Fault Passage Indicators

Fault Passage Indicators shall be installed on the Ring Main Unit. These devices shall be, electronic devices with their own energy source and connected to Single 3 phase Split Core CTs (CBCT) . These shall be provided with bright LED s / flag. Indicators, which shall be clearly visible in the day time. These shall have the following resetting facilities:

- Manual reset
- Resetting after a set time duration
- Electrically reset from remote with at least 2-spare potential free Contacts.

The unit shall have Short Circuit and Earth fault adjustable to different settings with separate Current transformer. They shall be fully field-programmable and shall have at least 16 settings for Earth Fault + 4 settings for Phase-Phase. It shall be possible to Test these indicators at site thru "Test" push button. The Fault Passage Indicators shall also be provided with a SCADA output contact. These shall confirm to the following standards:



Specification No: ENG-HV-2009

Specification Name: Technical Specification for 11KV RMU Motorised Outdoor Type with Metering Unit

IEC 60068-2-6, IEC 60068-2-9	: Environmental testing — For Vibration, solar radiations
IEC 60950	: Information Technology equipment - Safety
IEC 1000-2	: Electromagnetic compatibility for low-frequency conducted disturbances and signaling in public low power supply systems
IEC 1000-4	: EMC - Testing & Measurement
IEC 1000-6	: EMC- Immunity for Residential, Commercial and light industrial environments

5.1.12 Remote Control of the RMU:

Remote operation of the RMU line switches shall be possible using pre-fitted motors to the operating mechanism for both line switch and circuit-breaker functions. All the necessary accessories shall be supplied separately, to stores.

Auxiliary contacts for remote indication of switch status are also required.

The fitting of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches. An auxiliary contact to prevent motorized operation of the mechanism while the operating handle is inserted into the operating point shall also be provided.

Preferred Communication protocol for FRTU shall IEC-60870-5-104

Signal requirement for field RTU (which shall be mounted near RMU) is attached (refer Annexure1). Bidder shall quote the cost of field RTU (FRTU) separately with all technical details for acquisition of the signal as described in Annexure-1.

5.1.13 Paint

All paint shall be applied on clean dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The overall paint thickness shall 125 microns (Negative tolerance is not allowed). The paint shall not scale off or crinkle or be removed by abrasion during normal handling. The enclosure of the RMU shall be painted with shade Dark Gray, i.e., BS381C or RAL 7032. Sufficient quantity of touch-up paint shall be furnished for application at site.

6. MARKING

All the components and operating devices of the RMU shall be provided with durable and legible nameplates containing all technical parameters. Name plates shall be suitably embossed with " PO no. with date", "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL & PO Number along with the following information. A Danger plate of appropriate size shall also be provided on the enclosure.

- Manufacturer's Name
- Month and year of supply
- PO Number
- Rated Voltage
- System Frequency
- Rated Short time withstand current for 1 sec
- Rated Impulse withstand Voltage
- Degree of Protection
- Type Designation or Serial no.
- Year of manufacture
- Applicable Rated values
- Mass of unit

- m) SF6 gas filling pressure

7. TESTS

7.0 TESTS FOR RMU

All the Routine and acceptance tests shall be carried out in accordance with the relevant IS/IEC standards. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components within the RMU enclosure shall have been tested for Routine/acceptance and Type tests as per the relevant standards. All Type tests as per latest IS / IEC shall have been carried out on the RMU as a whole as per relevant IS/IEC. Following tests shall be necessarily conducted on the equipment and its components in addition to others specified in the IS/IEC:

Type Test

- a) Power frequency withstand test
- b) Mechanical operation test and checking of interlocks
- c) Dielectric test on main and control circuits.
- d) Temperature Rise test.
- e) Internal Arc withstand test,
- f) Degree of Protection test.
- g) Test to check the capability of main and earthing circuits subjected to rated peak and short time withstand current.
- h) Test to check the total time taken to clear the faults (relay pick up+ Trip coil pick up + breaker trip) for instantaneous & time delay modes.under various settings of relay and trip coil thru secondary current injection.
- i) Salt Spray Test

For Metering Unit

- (a) Dielectric Test
- (b) Short Time Withstand Test
- (c) Temperature Rise test
- (d) IP Test

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.

All Type tests must be conducted from CPRI/ERDA, Govt Laboratory or International Laboratory.

Routine test:

Following routine tests are to be done on 100% of the lot quantity

- 1.
2. Dimensional & Visual Checks
3. Operational & Interlock Tests of breaker & isolator switches
4. Measurement of Circuit Resistance
5. Sf-6 chamber pressure withstands/leakage test.
6. HV withstand test across isolator distance.
7. HV withstand test of control and auxiliary circuits.
8. Voltage Indication Tests.

9. Breaker Contact Resistance Test
10. Total Trip Time Check Test through Current Injection in primary.
11. IR Value.

Below routine test has to be provided on cable Boot for cable termination:

- a) Visual inspection of the final finished product.
- b) Intactness with Bushing.
- c) Insulation Test.
- d) AC HV test.

Acceptance test:

All the tests specified under Routine Test Clause above shall be carried out as acceptance test on random samples as per sampling plan under IEC/IS for each lot.

Bidder should have all the requisite testing equipment's to carry out routine and acceptance test mentioned above including:

- a. Facility for primary current injection up to 1000amp.
- b. Facility to check total trip timing of breaker along with breaker main contacts through primary current injection

8.0 TYPE TEST CERTIFICATE

The Bidder shall furnish the type test certificates of the 11 KV RMU for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or any other International Laboratory as per the relevant standards. Type tests shall have been conducted in certified Test laboratories during the period not exceeding time span as per CEA guidelines. 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/TPNODL/TPSODL/TPWODL.

9.0 PRE-DISPATCH INSPECTION

Equipment shall be subjected to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. 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. Supplier 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 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 TPCODL/TPNODL/TPSODL/TPWODL. 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) Other Documents (as applicable)

10.0 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.

11.0 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 48 months from the date of commissioning or 60 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 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 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

13.0 TENDER SAMPLE

Not applicable.

14.0 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 or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

15.0 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 & SPECIAL TOOLS/GAUGES

Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document. Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall give a minimum of 12

months notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.

Any spare 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.

18.0 DRAWINGS & DOCUMENTS

Following drawings and documents shall be prepared based on TPCODL/TPNODL/TPSODL/TPWODL 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 for RMU
- d) Power flow diagram
- e) Foundation plan
- f) Bill of material
- g) Experience List
- h) Type test certificates

Drawings / documents to be submitted after the award of the contract are as under:

Sl. No.	Description	For Approval	For Review/Information	Final Submission
1	General Technical Particulars	✓		✓
2	General Arrangement drawings	✓		✓
3	Schematic Diagram	✓		✓
4	Bill of materials	✓	✓	✓
5	Foundation Plan & loading details		✓	✓
6	Installation Instructions		✓	✓
7	Instruction for Use		✓	✓
8	Transport/ Shipping dimension drawing	✓	✓	✓
9	QA & QC Plan	✓	✓	✓
10	Test Certificates			

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish five copies of all relevant drawings for TPCODL/TPNODL/TPSODL/TPWODL approval.

Instruction Manuals: Bidder shall furnish two softcopies (CD) 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. GUARANTEED TECHNICAL PARTICULARS

Sl. No	Descriptions	As Specified TPCODL/TPNODL/TPSODL/TPWODL	By
1	RMU Category		
2	RMU application		
3	Offered Model nos. and OEM type		
4	Dielectric medium		
5	Interrupting medium		
6	System Frequency		
7	Rated Voltage		
8	Service Voltage		
9	Rated current -Line Switches		
10	Rated Current-CB and LBS		
11	Rated Short time current withstand (3 sec)		
12	Rated Short time Making capacity		
13	Rated cable charging interrupting current of incomer load break switch		
14	Rated load interrupting line current		
15	Rated cable charging breaking current of breaker		
16	No. of operations at rated short circuit current on line switches, earthing switches should be E2		
17	Opening time of breaker (max.) Without relay time		
18	Closing time of breaker (max.)		
19	Breaker Duty Cycle		
20	i. Mechanical endurance for Isolator & Earth Switch		
	ii. Mechanical endurance for Circuit Breake		
21	Electrical operations of at rated current		
	a. LBS/Disconnecter b. Earth Switch		
22	Temp rise above ambient of 50 deg.		
23	Min Gas pressure in bar		
24	SF6 Gas pressure manometer with indicating bars/scale to measure the actual gas pressure (indirect method RFS etc. not accepted)		
25	Enclosure		
26	Guaranteed SF6 leakage per annum		
27	Degree of protection		
28	Internal Arc rating		
29	Internal Arc test		
30	Lightning Impulse withstand Voltage		
31	Power Frequency withstand voltage		

32	SF6 Tank design	
32.1	Tank material and grade of SS and welding	
33	Earth bus bars	
34	Material & size of earth bus bar	
35	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open	
36	Incomer Load Break switch: Shall be SF6 insulated with least maintenance. Shall have at least 3 positions, Open, Close & earth with natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock. The electrical interlock of cable charge with earth switch is preferred.	
37	<p>Circuit Breakers:</p> <p>a. With VCB interrupter and SF6 insulated bus with minimum maintenance and shall have at least 2 positions i.e. Open & Close, Manual operation & fitting of motor at site shall be possible if required.</p> <p>b. In view of safety each VCB shall be assisted with feeder side disconnecter having 3 positions, open disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.</p>	
38	Protection Relay-Without auxiliary power & shall include , electronic relay, low energy release & fast on test receptacle for protection testing	
39	Make of self-powered Relay & offered model	
40	Flag indication for CB Trip on fault in relay/ mechanical	
41	Testing of Cable- If doors are opened then earth switch shall be in closed position with necessary interlocks and cable test rod fixing provision in bolt head which can be fixed on terminations through boot cap/opening for testing purpose AND if doors are opened it shall not be possible to operate, Isolator, E/Switch or CB through interlocks	
42	Protection against theft	
43	Doors	

44	Voltage indicator box shall be fixed type-This device shall be in compliance with IEC 62271-206:2011 standard only	
45	Cable cleats (full circle)	
46	Cable termination and bushing suitability	
46A	Cable Termination boot /Cable boot	
46	Cable compartment suitability shall be	
47	The cable compartment	
48	Size of bimetallic washer in all compartments	
49	Height of bushing terminal from base plate	
50	Fault passage indicator	
51	Operating handle	
52	Non removable MIMIC Diagram on Front of panel	
53	Main Bus bar Material	
53.1	Bus bar Cross Section	
54	Opening & Closing times with relay	
55	Current Transformer for CB compartment	
56	Future motorization and SCADA Compatibility	
57	Guarantee	
58	Dimension (LxWxH) (mm x mm x mm)	
59	Total weight	
60	Paint	
61	Type test of product	
62	Availability of spares	
63	VPIS auxiliary contact	
64	VPIS	
65	Breaker operation counter	
66	LBS operation counter	
67	Moisture absorption material in SF6 tank	
68	Bidder should provide the detail of the moisture absorption material.	
69	Making of earthing operations	
70	Auxiliary contacts (total numbers and spare numbers)	
71	Control cable entry provision	
72	Shunt trip coil 24V DC	
73	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	
74	RMU Cable Boot/ terminal protector	
a	Terminal protector	
b	System voltage	
c	AC High voltage	

d	Impulse withstand voltage	
e	Bushing Diameter	
f	Bushing Types	
g	Cable cross section suitability	
h	Dimensions of cable protector	
i	Material of the component	
j	Type test reports	
For motorized RMU		
1	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	
2	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	
3	Details of I/O	
4	System to prevent mal operation in case of latch command	
5	Technical Details of motors	
a	Operating Voltage	
b	Max. power rating	
c	Max current drawn	
d	Operating time	
e	Power Supply	

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

TPCODL

TPWODL

TPNODL

TPSODL

Specification No: ENG-HV-2009

**Specification Name: Technical
Specification for 11KV RMU
Motorised Outdoor Type with
Metering Unit**

Seal of the Company:

Signature

Designation

ANNEXURE – 1
SIGNAL LIST FOR AUTOMATION

Description	Analog Inputs(AI)					Status(DI)		Reset Element
	Amp. Loading-R ph	Amp. Loading-Y ph	Amp. Loading-B ph	Phase Voltage	Power factor	Switch close	Switch Open	
RMU Switch *	0	0	0	0	0	1	1	
Breakers *	1	1	1	1	0	0	0	
FPI							1	1
Pressure Gauge (manometer)							1	

FRTU SIGNAL LIST

Description	Analog Inputs (AI)				
	Amp. Loading-R ph	Amp. Loading-Y ph	Amp. Loading-B ph	Phase Voltage	Power factor
Switch *	0	0	0	0	0
Breakers *	1	1	1	1	1
Fault passage indicator *	0	0	0	0	0

Note: 0 indicate functionality not req. for that element, 1 indicate functionality required for that element

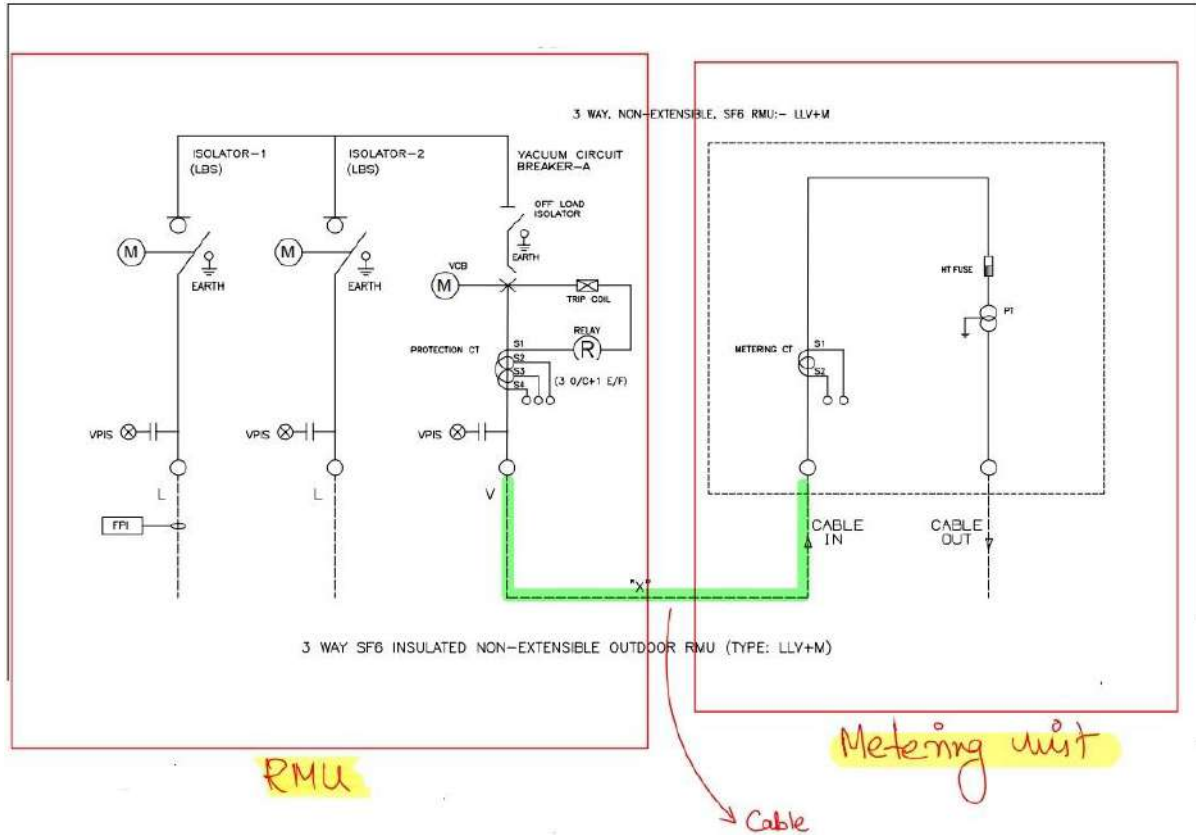
* Denotes the nos of switches/ Breaker s in RMU based on the type of RMU (3way, 4way, 5way & 7way).

Additional IOs

RMU switch Control Command
Earth Sw. 1 Status Input
Earth Sw. 2 Status Input
FPI Reset
FRTU Local/Remote Position
FRTU Door Open
FRTU Battery Charger Faulty
FRTU Battery Faulty
FRTU SwitchGear Supply Off
FRTU Aux Supply Off
FRTU Fault
Relay operation
CB OFF status
CB ON status
CB ON/OFF Command

Tentative Schematic/Layout of Metering Arrangement along with RMU

Shown Schematic diagram is tentative in nature & will be finalized during detailed engineering



STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2010

Specification Name : Specification for 11KV RMU Motorised Outdoor Type

Vijender Goyal	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	JYOTIPRAKASH MOHANTY	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPNODL	TPCODL	TPWODL	TPSODL	TPSODL
09-12-2022	09-12-2022	09-12-2022	09-12-2022	09-12-2022	09-12-2022

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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 motorized Ring Main Units with all accessories 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 editions of the following IEC/IS Standards and shall conform to the regulations of local statutory authorities.

IEC 62271-200	HV switchgear and control gear-AC Metal Enclosed switchgear and control gear for voltages above 1 kV and upto and including 52kV .
IEC 62271-1	Common specifications for high voltage switchgear and control gear standards
IEC 62271-102	HV switchgear and control gear-Alternating current disconnectors and earthing switches
IEC 62271-103	High voltage switches — Part 1: Switches for rated voltages above 1 kV and less than 52 kV
IEC 60529.	Degrees of protection provided by enclosures (1P Code)
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK Code)
IEC 60060	High-voltage test techniques
IEC 60947 /IS 13947	Low voltage switchgear and control gear
IEC 60439-1	Low-voltage switchgear and control gear assemblies- Type tested and partially type tested assemblies
IEC 60255-151	Electrical relays - Part 3: Single input energizing quantity measuring relays with dependent or independent time.
IEC 60044-1 / IS 2705	Current Transformers
IEC 60044-2 / IS 3156	Voltage Transformers
IEC 60376	Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment
IEC 61958	High-voltage prefabricated switchgear and control gear assemblies - Voltage presence indicating system

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	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.

Note: Climatic Condition will be considered as per respective Discoms TPCODL/TPNODL/TPSODL/TPWODL.

4. GENERAL TECHNICAL REQUIREMENTS

Sl. No	Descriptions	As Specified By TPCODL/TPNODL/TPSODL/TPWODL
1	RMU Category	3Way Motorised (1CB + 2 LBS/ 2CB + 1LBS) 4Way Motorised (2CB + 2 LBS / 3CB + 1LBS) <i>(will be decided by user at the time of issuance of tender as per site requirement)</i>
2	RMU application	Outdoor.
3	Offered Model nos. and OEM type	a. 3 Way Non Extensible b. 4 Way Non Extensible
4	Dielectric medium	SF6
5	Interrupting medium	Vacuum- for CB SF6 for LBS and earth switch
6	System Frequency	50 Hz
7	Rated Voltage	12 KV
8	Service Voltage	11 KV
9	Rated current -Line Switches	630 A
10	Rated Current-CB and LBS	630 A for all type
11	Rated Short time current withstand (3 sec)	21 KA
12	Rated Short time Making capacity	50 KA
13	Rated cable charging interrupting current of incomer load break switch	10 A
14	Rated load interrupting line current	630 A
15	Rated cable charging breaking current of breaker	25 A
16	No. of operations at rated short circuit current on line switches, earthing switches should be E2	LBS- 5 close ES- 5 close The ES in line with CB

17	Opening time of breaker (max.) Without relay time	2.5 cycle
18	Closing time of breaker (max.)	3 cycle
19	Breaker Duty Cycle	O – 3min - CO - 3min – CO
20	i. Mechanical endurance for Isolator & Earth Switch	Min 1000 Operations
	ii. Mechanical endurance for Circuit Breaker	Min 2000 Operations
21	Electrical operations of at rated current	To be provided by bidder
	a. LBS/Disconnectors b. Earth Switch	
22	Temp rise above ambient of 50 deg.	50 Deg C. (Type Tested as per IEC and complying to requirements)
23	Min Gas pressure in bar	To be provided by bidder based on type tested design
24	SF6 Gas pressure manometer with indicating bars/scale to measure the actual gas pressure (indirect method RFS etc. not accepted)	1. Dial type Manometer to be provided for gas pressure indication 2. Contacts to be provided and wires up on the TB for SCADA communication of gas status.
25	Enclosure	The RMU metal parts shall be 2mm thickness high tensile steel/CRCA. The overall paint thickness shall be 70 to 125 microns. (will be decided by user at the time of issuance of tender as per site requirement)
26	Guaranteed SF6 leakage per annum	Less than 0.1% from main tank
27	Degree of protection	a. IP 67 for the tank and b. IP2X for the front cover / mimic board and c. IP 54 (Main door closed) for Outdoor RMUs. d. IP 54 for cable compartment
28	Internal Arc rating	IAC AFL or better
29	Internal Arc test	20kA for 1 Sec.
30	Lightning Impulse withstand Voltage	75 kVp
31	Power Frequency withstand voltage	28 kVrms.
32	SF6 Tank design	Hermetically/robotically sealed unpainted stainless steel enclosure with SF6 Gas. Sealed pressure system by Laser welding / TIG & MIG welding so that no refilling of gas is required for 30 years. No gas work at site. Complete body shall be tamperproof to prevent access to live parts. No gaskets shall be used. No bolts shall be provided.

32.1	Tank material and grade of SS and welding	Should be of SS and non-corrosive, offered grade of SS to be mentioned. The welding shall be such that there shall be corrosion of welding for useful life of equipment.
33	Earth bus bars	In enclosure to prevent tampering.
34	Material & size of earth bus bar	To be provided by the bidder
35	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open	To be provided by the bidder
36	Incomer Load Break switch: Shall be SF6 insulated with least maintenance. Shall have at least 3 positions, Open, Close & earth with natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock. The electrical interlock for preventing manual closing of earth switch under cable charged condition to be provided.	To be provided by the bidder
37	Circuit Breakers: a. With VCB interrupter and SF6 insulated bus with minimum maintenance and shall have at least 2 positions i.e. Open & Close, Manual operation & fitting of motor at site shall be possible if required. b. In view of safety each VCB shall be assisted with feeder side disconnecter having 3 positions, open disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.	To be provided by bidder as per specs.
38	Protection Relay-Without auxiliary power & shall include , electronic relay, low energy release & fast on test receptacle for protection testing	To be provided by bidder as per specs.
39	Make of self-powered Relay & offered model	a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA – ABB, Ashida, Schneider, Siemens
40	Flag indication for CB Trip on fault in relay/ mechanical or Electrical	To be provided by bidder
41	Testing of Cable- If doors are opened then earth switch shall be in closed position with necessary interlocks and cable test rod fixing provision in bolt head which can be fixed on terminations through boot cap/opening for testing purpose AND if doors are opened it shall not be possible to operate, Isolator, E/Switch or CB through interlocks	To be confirmed. If separate test bushing are provided, it shall be covered with suitable antitheft covers with anti vandal screws

42	Protection against theft	Design of RMU shall be tamper & arc proof. Anti vandal screws shall be provided. Cable covers shall be pad lockable. All live parts and internal parts etc. shall be covered with antitheft covers.
43	Doors	Outer enclosure should be hinged main door with padlock provision. Cable chamber door should not be hinged type. It should be arc proof with bolted arrangement.
44	Voltage indicator box shall be fixed type-This device shall be in compliance with IEC 62271-206:2011 standard only	Capacitive dividers type which will supply low voltage to power the lamps and 3 inlets can be used to check phase sequence or presence of voltage in cable
45	Cable cleats (full circle)	HDPE/Nylon (Fire Retardant)
46	Cable termination and bushing suitability	Heat/ Cold shrink terminations
46A	Cable Termination boot /Cable boot	Cable Termination Kit & Termination Boot in scope of Supplier.(Raychem/3M Make only) Cable Size in detailed Engineering Stage
46	Cable compartment suitability shall be	Suitable for cable sizes a. 11kV 3CX400 sq.mm having dia of 92mm in all compartment and b. For three way with two CB the LBS shall be suitable for 11kV 1CX630 sq.mm cable having diameter of 51mm in incomer LBS- the necessary cleat and nonmagnetic base plate cable entry arrangement and 15mm longer bolt than other compartment shall be provided.
47	The cable compartment	All cable compartment shall be bottom entry and front opening type only
48	Size of bimetallic washer in all compartments	Must be suitable for M16 for TPCODL/TPNODL/TPSODL/TPWODL, ODISHA) bolt and bushing sizes with min. 2mm thick.
49	Height of bushing terminal from base plate	Minimum 800mm for proper termination space.
50	Fault passage indicator	FPI on each LBS as a part of each RMU with specified default setting. FPI should be communicable type with remote resettable functionality.
51	Operating handle	To be provided by bidder as a part of RMU with each RMU and to be placed on front or on door

52	Non removable MIMIC Diagram on Front of panel	To be provided by bidder with detailed descriptions as mentioned in specs. And earth switch marking background shall be yellow for TPCODL/TPNODL/TPSODL/TPWODL-ODISHA As per annexure-2
53	Main Bus bar Material	Copper
53.1	Bus bar Cross Section	To be specified by bidder as per current density
54	Opening & Closing times with relay	125 ms maximum
55	Current Transformer for CB compartment	Shall be epoxy resin casted and mounted on cables. The CTs around the cables shall be supported on the sheet steel bracket and should be fixed with bolts. The mounting frame should be moveable up and down or to and fro but shall be fixed at coaxial position with base plat holes and bushing terminal bolts. a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA The CT settings shall be adjustable & Primary & Secondary Current and range to be decided by user at the time of issuance of tender as per site requirement Burden is 2.5 VA, Class - 5P20.
56	Future motorization and SCADA Compatibility	To be provided
57	Guarantee	As per specification
58	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder
59	Total weight	To be provided by bidder
60	Paint	Light Gray shade RAL 7032
61	Type test of product	To be provided by bidder as per specification
62	Availability of spares	Assurance by bidder for 25 years,list of spares as mentioned in specification to be provide along with RMU lot
63	VPIS auxiliary contact	The VPIS shall have auxiliary contact such that it can be configured with SCADA for remote status indication of cable charged. The auxiliary contact to be wired up in TB.
64	VPIS	In all compartments
65	Breaker operation counter	To be provided by bidder
66	LBS operation counter	To be provided by bidder
67	Moisture absorption material in SF6 tank	Bidder should provide the detail of the moisture absorption material.

68	Making of earthing operations	a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA All earth operation to be marked with Yellow back ground and permanent in nature.
69	Auxiliary contacts (and spare numbers to be provided)	LBS (4NO+4NC) Earth Switch (2NO+2NC) CB (4NO+4NC) CB Disconnecter (2NO+2NC) CB earth switch (2NO+2NC)
70	Control cable entry provision	To be provided
71	Shunt trip coil 24V DC	To be provided
72	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	To be provided
73	RMU Cable Boot/ terminal protector	
a	Terminal protector	Insulating Boots
b	System voltage	12 kV
c	AC High voltage	28kV For 1 min
d	Impulse withstand voltage	75kV
e	Bushing Diameter	To be provided by bidder
f	Bushing Types	To be mentioned by bidder
g	Cable cross section suitability	Bidder to provide complying to specs.
h	Bushing Material & Class	Epoxy bushing-F class
h	Dimensions of cable protector	Suitable for cables & bushing in specs (offered size to be provided by bidder)
i	Material of the component	To be specified by bidder
j	Type test reports	Bidders to provide detailed list of tests conducted at lab name, conducted dates, report number along with full reports.
For motorized RMU		
1	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	To be provided
2	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	To be provided
3	Details of I/O	As per Annexure-IO list of this specs
4	System to prevent mal operation in case of latch command	Bidder to provide inbuilt system to prevent any mal operation in case of latch command at RMU in case of any fuse failure or DC fail situation

5	Technical Details of motors	
a	Operating Voltage	24 V DC
b	Max. power rating	240 Watts
c	Max current drawn	9 Amp (±10%)
d	Operating time	4-8 seconds
e	Power Supply	24VDC from Battery Charger and 230 VAC from Aux PT in scope of Supplier (Aux PT is optional and to be Quoted Separately)

Type of Ring Main Units shall be as under:

3 Way/4 Way Non Extensible Type (For Outdoor application):

3Way Motorised (1CB + 2 LBS/ 2CB + 1LBS) with Self powered O/C & E/F Relay and 1 FPI

4Way Motorised (2CB + 2 LBS / 3CB + 1LBS) with Self powered O/C & E/F Relay and 1 FPI

(will be decided by user at the time of issuance of tender as per site requirement)

5. GENERAL CONSTRUCTIONS

5 GENERAL CONSTRUCTION FOR RMU

5.1.1 The switchgear and bus bar shall be contained in a stainless steel tank filled with SF6 gas and the outer body shall be made of minimum CRCA of 2mm or GI high tensile steel 2mm thick with thick gland plates of 3mm. The sheet steel shall have surface treatment of 7 tank process With powder coating of minimum 70 microns. The tank shall have SS sheet of minimum 2mm thickness with internal Arc Type tested and meet the "sealed pressure system" criteria in accordance with the IEC 62271-200. This is a system for which no handling / refilling of gas shall be required throughout the expected operating life, i.e. 30 years. Sealed pressure systems are completely assembled, filled and tested in the factory. The maximum leakage rate of SF6 gas shall be lower than 0.1 % of the total initial mass of SF6 gas per annum. The filling pressure for the switchgear shall be just above the atmospheric pressure so as to reduce the tendency to leak. SF6 gas used for the filling of the RMU shall be in accordance with .IEC 376. It is preferable to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption. The degree of protection for RMU tank (Indoor/Outdoor) shall be IP 67. The mimic board shall be provided with IP2X /IP3X degree of protection for Indoor RMUs and protection for Outdoor RMUs shall be minimum IP 54

The RMU shall be suitable for mounting on plinth with provision for cabling through gland plate in the base and trench below, The RMU shall be designed so that the position of the different devices is visible to the operator on the front and operations are also visible. The RMU shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics. The RMU shall be designed to be tamper proof so as to prevent access to all live parts during operation without the use of tools.

5.1.2 The RMU shall be completed with all connection and electrolytic copper bus bar with continuous current carrying capacity of 630A at 50 Deg C ambient. The bus bar shall be fully encapsulated by SF6 gas inside the steel tank. There shall be continuity between the metallic

parts of the RMU and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The earth bus bar shall be preferably enclosed in an enclosure to prevent theft/tampering.

5.1.3. All parts of main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This does not apply to removable parts which become accessible after being separated from the switchgear and control gear. The cables shall be earthed by an earth switch with short-circuit making capacity in compliance with IEC 62271-102. Circuit breaker shall not be closed in case Earth Switch is closed. The earth switch shall be fitted with its own operating mechanism and manual closing shall be driven, by a fast-acting mechanism, independent of operator action. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when cable is charged.

5.1.4 Any accidental over pressure inside the sealed chamber shall be limited by the opening of a pressure limiting device provided in the rear part of the tank. Gas shall be released to the rear of the RMU away from the operator. Bidder shall provide type test report to prove compliance to the 'Internal fault IAC AFLR as per IEC 62271-200. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch-or earth switch. All manual operations shall be carried out on the front of the RMU. The instrument transformers (CT/PT) shall be required and to be incorporated in the drawing for discussion at the final stage.

5.1.5 Circuit Breaker for Transformer Local Feeder Control

The circuit breakers shall be of the maintenance free. The position of the power and earthing contacts shall be clearly visible on the front of the RMU. The circuit breakers shall have at least 2 positions: Open-disconnected and closed and shall be constructed in such a way that natural interlocks prevent all unauthorized operations. They shall be fully mounted and inspected in the factory. Breaker operation counter should be provided

An operating mechanism can be used to manually close the circuit breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping by, an integrated push button. There will be no automatic re-closing. The operating mechanism shall be compatible for remote/SCADA operation. The circuit breaker shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include three toroid transformers incorporated in the transformer tee-off bushings, an electronic self powered relay, a low energy release, and a "fast-on" test receptacle for protection testing (with or without CB tripping). The protection system shall ensure circuit breaker tripping as of a minimum operating. current which is the rated current of the underground network to be protected. The CT settings shall be adjustable & Primary & Secondary Current and range to be decided by user at the time of issuance of tender as per site requirement . Protection core CT complete details should be furnished (Burden, class, ALF).

The circuit breaker shall be provided with Phase protection of Definite time/ IDMT element for .overcurrent and earth fault with minimum PSM-0.05,Tsm-0.01 having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The Earth Fault Protection shall be provided of. Definite time/ IDMT element having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The "Time Multiplier" with minimum set point of 0.05 TMS shall be available. The breaker shall have the provision of flag Relay for indication of Trip on Fault. High set (DT) for overcurrent and earth fault-min .current setting-0.5 In, minimum Time Delay-20 millisecond. The relays shall be suitable numerical relay with necessary elements or any other relay as per the Purchaser's approval.

There' shall be provision for testing of cable without opening the front door by suitable arrangements. In case cables are to be tested with front door open, doors shall have interlocks such that doors can be opened only with earth switch in closed position. Termination boots as approved by the Purchaser's should have a proper opening to facilitate the testing. The opening shall be covered by means of removable protection cap

In case of front door opened, it shall not be possible to operate the breaker. All panel covers shall be provided with anti vandal screw bolts so that opening of panel covers is only possible with special tools, which shall be provided by the Bidder. This is required to prevent pilferage. The cable cover door shall be pad lockable and shall be Tamper and Arc proof. There shall be provision of hinged doors in the RMU. The circuit breaker and earth switch shall be lockable in the open or closed positions by 1 to 3 padlocks. Breaker shall have mechanical life of at least 2000 operations. The circuit breaker shall be compatible for remote operation and can close (ON) and open (OFF) by remote operation.

5.1.6 Incomer Load Break Switches :

The Load break switches shall have positions, open-disconnected closed, and earthed, and will be constructed in such a way that natural interlocking prevents unauthorized operations

The position indicator shall provide positive contact indication in accordance with IEC 265-1 standard. In addition, manufacturer shall prove reliability of indication in accordance with IEC 129.

The switches shall be fully mounted and inspected in the factory. Manual opening and closing will be driven by a fast-acting mechanism, independent of operator action.

Mechanical Interlock should be provided for Earth switch, If cable is back charged Earth switch should not be closed.

Each switch can be fitted with an electrical operating mechanism in a specially reserved location, without any modification of the operating mechanism and without de-energizing the RMU.

Load break Switch should be operated manually & motorized.

5.1.7 Bushings and Cable terminations:

Each cable compartment shall be provided with three bushings of adequate sizes to terminate the incoming and outgoing cables along with a terminal block (TB) located at convenient accessible location so as to wire all inputs & outputs (IOs) up to the terminal block (TB). The bushings shall be conveniently located for proper bend so as to allow easy working and termination of cables. The cable termination shall be done with Heat shrinkable /Push ON termination method so that adequate clearances are maintained between phases & cable shall be held by HDPE (fire retardant) cleat. 2 runs, of 3CX400 Sq mm, OR 1R of 3 NO. 1CX630 Sq mm shall be used for cable termination.(It shall be finalized during detailed engineering) All the cable secondary Wiring should be rooted through marshaling box separately for relay, CT etc. BA should provide bimetallic washer for tightening of cable.

5.1.8 Earthing:

The RMU outdoor metal clad, switchgear, Distribution Transformer, R.S. Joists, M.S Channels/M.S. angles etc, shall be equipped with an earth bus securely fixed along the base of the RMU. The size of earth busbar of GI Strip (75X12 mm) shall be as per IEC/IS. Provision shall be made on end of RMU for connecting the earth bus to the earth grid by erecting suitable 2 earth pipes of 50mm dia. M.S. rod of 3 meter in Pits. Both the earth pipes are also to be connected in a grid formation. Necessary terminal clamps and connectors shall be included in the scope of supply.

5.1.9 Voltage indicator lamps and phase comparators:

Each function shall be equipped with a fixed type voltage indicator box on the front to indicate whether or not there is voltage in the cables. The capacitive dividers Will supply low voltage power to the lamps. Three inlets can be used to check the synchronization of phases. These devices shall be in compliance with IEC 61958 standard.

5.1.10 Front Cover

The front cover shall provide a clear mimic diagram that indicates the different functions. The position indicators shall give a true reflection of the position of the main contacts. They shall be

clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The bidder shall provide a marking plate showing RMU's main electrical characteristics.

5.1.11 Fault Passage Indicators

Fault Passage Indicators shall be installed on the Ring Main Unit. These devices shall be, electronic devices with their own energy source and connected to Single 3 phase Split Core CTs (CBCT) . These shall be provided with bright LED s / flag. Indicators, which shall be clearly visible in the day time. These shall have the following resetting facilities:

- Manual reset
- Resetting after a set time duration
- Electrically reset from remote with at least 2-spare potential free Contacts.

The unit shall have Short Circuit and Earth fault adjustable to different settings with separate Current transformer. They shall be fully field-programmable and shall have at least 16 settings for Earth Fault + 4 settings for Phase-Phase. It shall be possible to Test these indicators at site thru "Test" push button. The Fault Passage Indicators shall also be provided with a SCADA output contact. These shall confirm to the following standards:

IEC 60068-2-6, IEC 60068-2-9	: Environmental testing — For Vibration, solar radiations
IEC 60950	: Information Technology equipment - Safety
IEC 1000-2	: Electromagnetic compatibility for low-frequency conducted disturbances and signaling in public low power supply systems
IEC1000-4	: EMC - Testing & Measurement
IEC 1000-6	: EMC- Immunity for Residential, Commercial and light industrial environments

5.1.12 Remote Control of the RMU:

Remote operation of the RMU line switches shall be possible using pre- fitted motors to the operating mechanism for both line switch and circuit-breaker functions. All the necessary accessories shall be supplied separately, to stores.

Auxiliary contacts for remote indication of switch status are also required.

The fitting of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches. An auxiliary contact to prevent motorized operation of the mechanism while the operating handle is inserted into the operating point shall also be provided.

Preferred Communication protocol for FRTU shall IEC-60870-5-104

Signal requirement for field RTU (which shall be mounted near RMU) is attached (refer Annexure1). Bidder shall quote the cost of field RTU (FRTU) separately with all technical details for acquisition of the signal as described in Annexure-1.

5.1.13 Paint

All paint shall be applied on clean dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The overall paint thickness shall be 70 to 125 microns. (will be decided by user at the time of issuance of tender as per site requirement). The paint shall not scale off

or crinkle or be removed by abrasion during normal handling. The enclosure of the RMU shall be painted with shade Dark Gray, i.e., BS381C or RAL 7032. Sufficient quantity of touch-up paint shall be furnished for application at site.

6. MARKING

All the components and operating devices of the RMU shall be provided with durable and legible nameplates containing all technical parameters. Name plates shall be suitably embossed with " PO no. with date", "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL & PO Number along with the following information. A Danger plate of appropriate size shall also be provided on the enclosure.

- a) Manufacturer's Name
- b) Month and year of supply
- c) PO Number
- d) Rated Voltage
- e) System Frequency
- f) Rated Short time withstand current for 1 sec
- g) Rated Impulse withstand Voltage
- h) Degree of Protection
- i) Type Designation or Serial no.
- j) Year of manufacture
- k) Applicable Rated values
- l) Mass of unit
- m) SF6 gas filling pressure

7. TESTS

7.0 TESTS FOR RMU

All the Routine and acceptance tests shall be carried out in accordance with the relevant IS/IEC standards. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components within the RMU enclosure shall have been tested for Routine/acceptance and Type tests as per the relevant standards. All Type tests as per latest IS / IEC shall have been carried out on the RMU as a whole as per relevant IS/IEC. Following tests shall be necessarily conducted on the equipment and its components in addition to others specified in the IS/IEC:

Type Test

- a) Power Frequency withstand test
- b) Mechanical operation test and checking of interlocks
- c) Dielectric test on main and control circuits.
- d) Temperature Rise test.
- e) Internal Arc withstand test,
- f) Degree of Protection test.
- g) Test to check the capability of main and earthing circuits subjected to rated peak and short time withstand current.
- h) Test to check the total time taken to clear the faults (relay pick up+ Trip coil pick up + breaker trip) for instantaneous & time delay modes.under various settings of relay and trip coil thru secondary current injection.
- i) Salt Spray Test

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.

All Type tests must be conducted from CPRI/ERDA, Govt Laboratory or International Laboratory.

Routine test:

Following routine tests are to be done on 100% of the lot quantity

2. Dimensional & Visual Checks
3. Operational & Interlock Tests of breaker & isolator switches
4. Measurement of Circuit Resistance
5. Sf-6 chamber pressure withstands/leakage test.
6. HV withstand test across isolator distance.
7. HV withstand test of control and auxiliary circuits.
8. Voltage Indication Tests.
9. Breaker Contact Resistance Test
10. Total Trip Time Check Test through Current Injection in primary.
11. IR Value.

Below routine test has to be provided on cable Boot for cable termination:

- a) Visual inspection of the final finished product.
- b) Intactness with Bushing.
- c) Insulation Test.
- d) AC HV test.

Acceptance test:

All the tests specified under Routine Test Clause above shall be carried out as acceptance test on random samples as per sampling plan under IEC/IS for each lot.

Bidder should have all the requisite testing equipment's to carry out routine and acceptance test mentioned above including:

- a. Facility for primary current injection up to 1000amp.
- b. Facility to check total trip timing of breaker along with breaker main contacts through primary current injection

8.0 TYPE TEST CERTIFICATE

The Bidder shall furnish the type test certificates of the 11 KV RMU for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or any other International Laboratory as per the relevant standards. Type tests shall have been conducted in CPRI/ERDA or any other International laboratories during the period not exceeding time span as per CEA guidelines. 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/TPNODL/TPSODL/TPWODL.

9.0 PRE-DISPATCH INSPECTION

Equipment shall be subjected to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. 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. Supplier 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 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 TPCODL/TPNODL/TPSODL/TPWODL. 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) Other Documents (as applicable)

10.0 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.

11.0 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 48 months from the date of commissioning or 60 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 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 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

13.0 TENDER SAMPLE

Not applicable.

14.0 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 or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

15.0 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 & SPECIAL TOOLS/GAUGES

Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document. Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall give a minimum of 12 months notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.

Any spare 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.

18.0 DRAWINGS & DOCUMENTS

Following drawings and documents shall be prepared based on TPCODL/TPNODL/TPSODL/TPWODL 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 for RMU
- d) Power flow diagram
- e) Foundation plan
- f) Bill of material
- g) Experience List
- h) Type test certificates

Drawings / documents to be submitted after the award of the contract are as under:

Sl. No.	Description	For Approval	For Review/Information	Final Submission
1	General Technical Particulars	✓		✓
2	General Arrangement drawings	✓		✓
3	Schematic Diagram	✓		✓
4	Bill of materials	✓	✓	✓
5	Foundation Plan & loading details		✓	✓
6	Installation Instructions		✓	✓
7	Instruction for Use		✓	✓
8	Transport/ Shipping dimension drawing	✓	✓	✓
9	QA & QC Plan	✓	✓	✓
10	Test Certificates			

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish five copies of all relevant drawings for TPCODL/TPNODL/TPSODL/TPWODL approval.

Instruction Manuals: Bidder shall furnish two softcopies (CD) 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. GUARANTEED TECHNICAL PARTICULARS

Sl. No	Descriptions	As Specified By TPCODL/TPNODL/TPSODL/TPWODL
1	RMU Category	
2	RMU application	
3	Offered Model nos. and OEM type	
4	Dielectric medium	
5	Interrupting medium	
6	System Frequency	
7	Rated Voltage	
8	Service Voltage	
9	Rated current -Line Switches	
10	Rated Current-CB and LBS	
11	Rated Short time current withstand (3 sec)	
12	Rated Short time Making capacity	
13	Rated cable charging interrupting current of incomer load break switch	
14	Rated load interrupting line current	
15	Rated cable charging breaking current of breaker	
16	No. of operations at rated short circuit current on line switches, earthing switches should be E2	
17	Opening time of breaker (max.) Without relay time	
18	Closing time of breaker (max.)	
19	Breaker Duty Cycle	
20	i. Mechanical endurance for Isolator & Earth Switch	
	ii. Mechanical endurance for Circuit Breake	
21	Electrical operations of at rated current	
	a. LBS/Disconnecter b. Earth Switch	
22	Temp rise above ambient of 50 deg.	
23	Min Gas pressure in bar	
24	SF6 Gas pressure manometer with indicating bars/scale to measure the actual gas pressure (indirect method RFS etc. not accepted)	
25	Enclosure	
26	Guaranteed SF6 leakage per annum	

27	Degree of protection	
28	Internal Arc rating	
29	Internal Arc test	
30	Lightning Impulse withstand Voltage	
31	Power Frequency withstand voltage	
32	SF6 Tank design	
32.1	Tank material and grade of SS and welding	
33	Earth bus bars	
34	Material & size of earth bus bar	
35	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open	
36	Incomer Load Break switch: Shall be SF6 insulated with least maintenance. Shall have at least 3 positions, Open, Close & earth with natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock. The electrical interlock of cable charge with earth switch is preferred.	
37	Circuit Breakers: a. With VCB interrupter and SF6 insulated bus with minimum maintenance and shall have at least 2 positions i.e. Open & Close, Manual operation & fitting of motor at site shall be possible if required. b. In view of safety each VCB shall be assisted with feeder side disconnecter having 3 positions, open disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.	
38	Protection Relay-Without auxiliary power & shall include , electronic relay, low energy release & fast on test receptacle for protection testing	
39	Make of self-powered Relay & offered model	
40	Flag indication for CB Trip on fault in relay/ mechanical	

41	Testing of Cable- If doors are opened then earth switch shall be in closed position with necessary interlocks and cable test rod fixing provision in bolt head which can be fixed on terminations through boot cap/opening for testing purpose AND if doors are opened it shall not be possible to operate, Isolator, E/Switch or CB through interlocks	
42	Protection against theft	
43	Doors	
44	Voltage indicator box shall be fixed type-This device shall be in compliance with IEC 62271-206:2011 standard only	
45	Cable cleats (full circle)	
46	Cable termination and bushing suitability	
46A	Cable Termination boot /Cable boot	
46	Cable compartment suitability shall be	
47	The cable compartment	
48	Size of bimetallic washer in all compartments	
49	Height of bushing terminal from base plate	
50	Fault passage indicator	
51	Operating handle	
52	Non removable MIMIC Diagram on Front of panel	
53	Main Bus bar Material	
53.1	Bus bar Cross Section	
54	Opening & Closing times with relay	
55	Current Transformer for CB compartment	
56	Future motorization and SCADA Compatibility with FRTU	
57	Guarantee	
58	Dimension (LxWxH) (mm x mm x mm)	
59	Total weight	
60	Paint	
61	Type test of product	
62	Availability of spares	
63	VPIS auxiliary contact	
64	VPIS	
65	Breaker operation counter	
66	LBS operation counter	
67	Moisture absorption material in SF6 tank	
68	Bidder should provide the detail of the moisture absorption material.	
69	Making of earthing operations	
70	Auxiliary contacts (total numbers and spare numbers)	

71	Control cable entry provision	
72	Shunt trip coil 24V DC	
73	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	
74	RMU Cable Boot/ terminal protector	
a	Terminal protector	
b	System voltage	
c	AC High voltage	
d	Impulse withstand voltage	
e	Bushing Diameter	
f	Bushing Types	
g	Cable cross section suitability	
h	Dimensions of cable protector	
i	Material of the component	
j	Type test reports	
For motorized RMU		
1	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	
2	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	
3	Details of I/O	
4	System to prevent mal operation in case of latch command	
5	Technical Details of motors	
a	Operating Voltage	
b	Max. power rating	
c	Max current drawn	
d	Operating time	
e	Power Supply	

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

TPCODL

TPWODL

TPNODL

TPSODL

Specification No: ENG-HV-2010

**Specification Name: Specification for
11KV RMU Motorised Outdoor Type**

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

Seal of the Company:

Signature

Designation

ANNEXURE – 1
SIGNAL LIST FOR AUTOMATION

Description Type	Analog Inputs(AI)					Status(DI)		Reset Element
	Amp. Loading-R ph	Amp. Loading-Y ph	Amp. Loading-B ph	Phase Voltage	Power factor	Switch close	Switch Open	
RMU Switch *	0	0	0	0	0	1	1	
Breakers *	1	1	1	1	0	0	0	
FPI							1	1
Pressure Gauge (manometer)							1	

FRTU SIGNAL LIST

Description Type	Analog Inputs (AI)				
	Amp. Loading-R ph	Amp. Loading-Yph	Amp. Loading-B ph	Phase Voltage	Power factor
Switch *	0	0	0	0	0
Breakers *	1	1	1	1	1
Fault passage indicator *	0	0	0	0	0

Note: 0 indicate functionality not req. for that element, 1 indicate functionality required for that element

* Denotes the nos of switches/ Breaker s in RMU based on the type of RMU (3way, 4way, 5way & 7way).

Additional IOs

RMU switch Control Command
Earth Sw. 1 Status Input
Earth Sw. 2 Status Input
FPI Reset
FRTU Local/Remote Position
FRTU Door Open
FRTU Battery Charger Faulty
FRTU Battery Faulty
FRTU SwitchGear Supply Off
FRTU Aux Supply Off
FRTU Fault
Relay operation
CB OFF status
CB ON status
CB ON/OFF Command

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2013

Specification Name : Technical Specification for 11 kV AB switch (400 A & 200 A)

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1. SCOPE

This specification covers design, manufacturing, testing at manufacturer's works, inspection, packing & delivery of 11 kV Air Break Switch with accessories for out-door installation for use on transformer centers and tap line in Central Odisha. Aforesaid item(s) shall include loading and unloading at anywhere in Odisha.

It is not the intent to specify completely herein all the details of design and construction of Air Break Switches. However, AB Switches will confirm in all respects to high standards of engineering design and workmanship and shall be capable of performing in continuous Commercial operation up to the supplier's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any material, which in his judgment i.e. not in accordance with the specifications/drawings.

The AB Switches offered shall be complete with all components necessary for its effective and trouble-free operation along with associated equipment etc. such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in the specification and/or in order or not. Also similar parts particularly removable ones shall be inter-changeable.

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	Description
IS 9920 (part-I to V)	Specification for helically formed fittings for Overhead lines up to 33 kV
IS 2633 (Part 1)	Method for testing uniformity of coating on zinc coated
IEC 62231	Composite station post insulators for substations with a.c. voltages greater than 1 000 V up to 245 kV – Definitions, test methods and acceptance criteria
IEC 60168:1994+AMD1:1997+AMD2:2000 CSV	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V
IS 9530	Recommended practice for silver plating
IS 5925	Recommended practice for silver plating for general engineering purposes
BS 2816	Testing of silver plating thickness

IS 1239	GI pipe('B' class or Medium class)
IS: 5561	Electrical Power Connectors
IS 2062	Hot rolled medium and high tensile structural steel — specification

3. CLIMATIC CONDITIONS OF THE INSTALLATION

SL.NO.	CONDITONS	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	
		400 Amps AB Switch	200 Amps AB Switch
1	Rating of AB Switch	400 Amps AB Switch	200 Amps AB Switch
1.a	Reference standards (latest amend.)	IS 9920, IEC 129, IEC 62231, IS 1239	
2	Installation	Outdoor	Outdoor
3	Suitable for Mounting	Horizontal Rotating Type	
4	Type	3 Pole	3 Pole
5	Service Voltage	11 kV	11 kV
6	Rated Voltage	12 kV	12 kV
7	Rated Frequency	50 Hz	50 Hz
8	Current Carrying Capacity	400 Amps	200 Amps
9	Rated short time current	16 kA for 1sec	16 kA for 1sec
10	Rated peak withstand current	40 kA	40 kA
11	Rated main active load breaking capacity	10 Amp	10 Amp
12	Rated line charging breaking capacity	2.5A	2.5A
12.a	Rated Cable charging breaking capacity	10A	10A
13	Rated Transformer off load breaking Capacity	6.3A	6.3A
14	One minute power frequency withstand voltage Dry	35kV RMS	35kV RMS
15	One minute power frequency withstand voltage Wet	35kV RMS	35kV RMS
16	Dry flashover Voltage	55kV	55kV
17	Power Frequency puncture withstand voltage	1.3 times of actual dry flashover Voltage	
18	Visible Discharge Voltage	9kV RMS	
19	1 Minute Power Frequency withstand voltage between pole and earth	28kV RMS	28kV RMS
20	1 Minute Power frequency withstand voltage across the isolation distance	32kV RMS	32kV RMS
21	Impulse withstand voltage for positive and negative polarity (1.2 / 50) micro second wave)		
a	Across Isolating distance	85kV Peak	85kV Peak
b	To earth and between poles	75kV Peak	75kV Peak
22	No. of Post Per Pole (Polymeric, IEC 62231)	2	2
23	Total No. of post	6	6
24	Minimum Creepage Distance	320 mm	320mm

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
24.a	FRP Dia. of the Post Insulator (min.)	24mm	24mm
24.b	Dai of Weather sheds	>100mm	>100mm
24.c	Thickness of Housing (min)	3mm	3mm
25.d	Type of Sheds	Aerodynamic	Aerodynamic
25	Phase to Phase Clearance	760mm	760mm
26	Isolation Distance in switch open condition	380mm	380 mm
27	Vertical clearance from Top of Insulator cap to mounting channel	254mm (min)	254mm (min)
28	Copper contacts Temp in Air should not exceed	65Degree	65 Degree
29	Size of fixed contacts (Copper Type Electrolytic with silver plated) (coating thickness not less than 10 microns)	80mmx50mmx8mm (50x8x2 Fingers)	70mmx35mmx6mm (35x6x2 Finger)
30	Size of Moving contacts (Copper Type Electrolytic with silver plated) (coating thickness not less than 10 microns)	220mmx50mmx8mm	220mmx35mmx6mm
31	Moving Contact supporting Angle	50mmx50mmx5mm	45mmx45mmx5mm
32	Size of rods used for arcing horns	10 mm	8 mm
33	Insulation for tinned Copper braid/rope	Polyolefin, (RSFR-H) type	Polyolefin, (RSFR-H) type
34	Copper Flexible BRAIDED Tape - 320mm Long, Tined plated with Brass Nut, bolt & Washers	450gm /Mtr	450gm /Mtr
35	Minimum size*Length of Coupling Hot Dip GI Solid Pipe for Phase coupling pipe, B Class (Nominal Bore)	25mm Dia &1800 mm long	25mm Dia &1800mm long
36	Operating Down Pipe, B class (IS 1239) (Nominal bore)	32mm Dia & 7Mtr Long (one piece)	32mm Dia & 7Mtr Long (one piece)
37	Temperature Rise Limit (w.r.t ambient temp) - Tinned Copper contacts - Terminals - Metal Parts	65°C 65°C 40°C	65°C 65°C 40°C
38	Bearings	4 nos. self-lubricating bearing to be provided with grease nipple including 4 th bearing being a thrust bearing.	
39	Locking arrangement	Provision for pad locking at both 'ON' & 'OFF' Position	
40	Earth Terminal	M12 Bolts with nuts and flat washer shall be provided at base channel as earthing Terminal.	
41	'T' Connection	The T connection provided on the channel having 'moving contact' shall be G.I Nut & bolt at the bottom end to facilitate replacement of this unit only during	

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
		requirements & avoid entire change of arm.
42	'I' bolt	The I bolt shall be longer with 75 mm thread.
43	Mounting Channel HDG 100 microns	75x40x4.8 mm hot dip galvanized channel length 480 mm min. (C/C slotted hole 18x 36 mm- 250mm)
44	Connectors	Connectors shall be of hard drawn electrolytic copper or brass. The connector should be of 4 bolted type and suitable for 55- 100 sqmm AAC conductor. Or SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable for 55-100 sqmm AAC conductor.
45	Marking/Engraving (Parameters should be embossed on SS sheet of thickness 1mm with black background. It should be riveted on MS channel of AB switch)	1. Rated Voltage 2. Manufacturer Name 3. Month/Year of Manufacture 4. Serial No. 5. PO No. 6. Rated Normal Current in Amps 7. Rated One Second Short-Time Current
46	Pressure Spring	Stainless steel

5. GENERAL CONSTRUCTIONS/REQUIREMENTS

1. The Air break switch shall be outdoor type, rotating type gang operated and shall be suitable for horizontal installation having 2 no. of polymeric post insulators per phase.
2. The Rotating type operating mechanism shall be suitable for manual operation from ground level and shall be designed in such way that all the three phases shall open and close simultaneously in smooth way.
3. The air break switch shall be with the arcing horns, the sizes of the rods used for the arcing horns would be 10mm for 400 A and 8mm for 200 A AB switch of M.S. Hot dip galvanized.
4. The current carrying connectors should be two-bolt type having nuts and bolts, with spring washer and plane washer.
5. Each joint shall be provided with one plane and one spring of not less than 2mm thickness.
6. Connectors shall be of H D electrolytic copper.
7. The minimum cross section for fixed contact shall be 400 sq.mm for 400 Amp AB Switch and 200 sq.mm for 200 Amp AB Switch.
8. Tinned Copper braid/rope shall be insulated by Polyolefin (RSFR-H) type to prevent animal electrocution. It shall be 320 mm long minimum and shall weigh 450 G/M. It shall be punched at both ends.
9. All ferrous parts shall be hot dip galvanized with heavy coating after proper surface treatment as per standards. Coating thickness shall not be less than 100 micron at any point.
10. All Copper parts shall be silver plated as per relevant standards and coating thickness not less than 10 microns at any point.
11. Equipment grounding shall be provided by bidder at two points with terminals. .
12. All the nut bolt used must be Hot dip Galvanized and of size not less than M10.
13. A rigid base of galvanized steel channel of size approx.75x40x4.8 mm Length 480 mm min. (C/C slotted hole 18x 36 mm- 250mm shall be provided with clamps and bolts for Horizontal mounting firmly on steel structure.
14. Each member of the switch shall be free from Rust, sharp edges, burr and any kind of deformation.

15. The phase coupling rod, operation rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operation mechanism with 'ON' & 'OFF' positions shall be provided.
16. The operation rod shall be medium gage of 32mm diameter nominal bore G.I. pipe single length 7 meters. The phase coupling rod for gang operation shall be of medium gauge 25mm dia. & 1800 mm length nominal bore G.I. pipe.
17. Non-threaded type spindle shall be provided for connection with down pipe.
18. Provision for operating handle earth with flexible copper wire shall be provided.

Technical particulars	400 Amps AB Switch	200 Amps AB Switch
Switching Blades	It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mm x50 x 8mm for 11 KV. The switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.	It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mmX35X 6mm. The Switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.
Fixed Contacts	The fixed jaw type female contacts (80x50x8)mm for 11 KV shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by phosphorus bronze/Stainless Steel high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contacts to take the shock arising from the closing of moving contact blade without the same being transmitted to the post insulator.	The Fixed Jaw type female contacts of size (70x35x6) mm shall be made of electrolytic copper (minimum 95% copper composition) duly silver coated controlled by phosphorous bronze/Stainless steel high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of move contract blade without the same being transmitted to the post insulator.
Terminal pads	Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. of 12mm dia. brass bolts, double nuts, plain washers & spring washers should be provided along with 2 nos. solder less bimetallic sockets for each connector suitable sockets for each connector suitable up to 55- 100 mm ² AAA conductor.	Terminal connectors shall be robust in design. The size of fixed connector shall be (70 X 35 X 6 mm) and size of movable connector shall be of (70 X 35) X (70 X 35) X 6mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95% copper composition with 2 nos. of 12mm dia. holes provided with suitable brass bolts and double nuts, flat washers, spring washers & 2nos.bimetallic solder less sockets suitable up to 55-100 mm ² AAA conductor.

6. MARKING

Below parameters should be embossed on SS sheet of thickness 1mm with black background. It should be riveted on MS channel of AB switch:

1. Rated Voltage
2. Manufacturer's Name
3. Month/Year of Manufacture
4. Serial Number
5. PO no.

6. Rated normal current in Amps
7. Rated one second short-time current in Amps

7. TESTS CERTIFICATE

7.1 Type Test

The A.B. switches shall be subjected to the following type tests in accordance with clause No. 6 of IS-9920 (Part-1)/2002.

- (i) Tests to prove that the temperature rise of any parts does not exceed the values specified in part-2 of this standard.
- (ii) Tests to prove the capability of the switch to carry the rated peak withstand current and the rated short time current.
- (iii) Measurement of the resistance of the main circuit.
- (iv) Tests to prove the ability of the switch to make and break the specified currents.
- (v) Tests to verify the insulation level including withstand tests at power frequency voltages on auxiliary equipment if any. Di-electric tests include impulse withstand tests, power frequency voltage withstand tests, and power frequency voltage withstand tests.
- (vi) Tests to prove satisfactory operation and Mechanical endurance.
- (vii) Tests to prove the integrity of the external insulation under conditions of the air pollution.

Note 1: The type test certificate should not be more than 5 years old as on due date of opening of tender.

Note 2: Type test certificate of polymeric post Insulator shall be submitted and shall be issued from CPRI/ERDA or Government lab only.

7.2 Acceptance Tests

The following acceptance test should be carried out as per IS: 9920 (P4/1985) on number of samples selected from the offered lot.

- (i) Visual Inspection.
- (ii) Checking of Dimensions (of all parts as per the approved drawing).
- (iii) Power frequency voltage dry test.
- (iv) Measurement of the resistance of the main circuit.
- (v) Test to prove satisfactory operation
- (vi) Galvanizing test as per IS: 2633.
- (vii) Temperature rise test.

7.3 Routine Tests:

Supplier shall provide a control plan, which will be implemented on AB switches. Routine test reports should be submitted by the manufacturer with inspection call.

The following routine tests as outlined in clause No.4 of IS: 9920 (Part4/1985) shall be carried out by the manufacturer on each unit to check certain essential requirements.

- i) Power frequency voltage dry tests.

- ii) Measurement of the resistance of the main circuit.
- iii) Test to prove satisfactory operation.

The tenderer shall clearly indicate what testing facilities are available in the works of manufacturer & whether facilities are adequate to carry out all Acceptance & Routine Tests. These facilities should be available to TPCODL/TPNODL/TPSODL/TPWODL's representative if deputed or carry out or witness the tests in the manufacturer works.

8. TESTS

Along with the bid, the bidder must submit Type Test Reports on AB switches as per this technical specification, carried out within last five years from the date of opening of techno-commercial bid of the tender from CPRI/ERDA labs only. Otherwise the tender may be rejected.

9. PRE DISPATCH INSPECTION

Equipment 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 option of the TPCODL/TPNODL/TPSODL/TPWODL and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Supplier 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 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 TPCODL/TPNODL/TPSODL/TPWODL. Following documents shall be sent along with material

- a) Routine Test reports
- b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
- c) Invoice in duplicate
- d) Packing list
- e) Drawings
- f) Delivery Challan
- g) Installation and maintenance Manual soft copy for all components
- h) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORES/SITE

The material received at TPCODL/TPNODL/TPSODL/TPWODL Store/Site will be inspected for acceptance and shall be liable for rejection if found different from the reports

of the pre-dispatch inspection. If any deviation or anomaly observed at this stage same need to be rectified by bidder at bidders own cost at earliest.

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 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.

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. The packing should be in such manner that during storage and its components should not be damaged. No single use plastic to be used in packing material. Packing should be done with environment friendly recyclable materials

13. TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/TPNODL/TPSODL/TPWODL).

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 TPCODL/TPNODL/TPSODL/TPWODL's or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections. To ensure proper operation of Product the bidder shall provide onsite training of TPCODL/TPNODL/TPSODL/TPWODL teams as and when required. To ensure quality of installations bidder shall provide supervision support during impartation.

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 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 documents to be submitted along with the bid for evaluation:

- a) Completely filled-in clause wise compliance of this specification.
- b) Signed and stamped copy of drawing
- c) Complete Type test reports
- d) Completely filled signed and stamped copy of tender document.
- e) Any other requisite document
- f) Experience List.

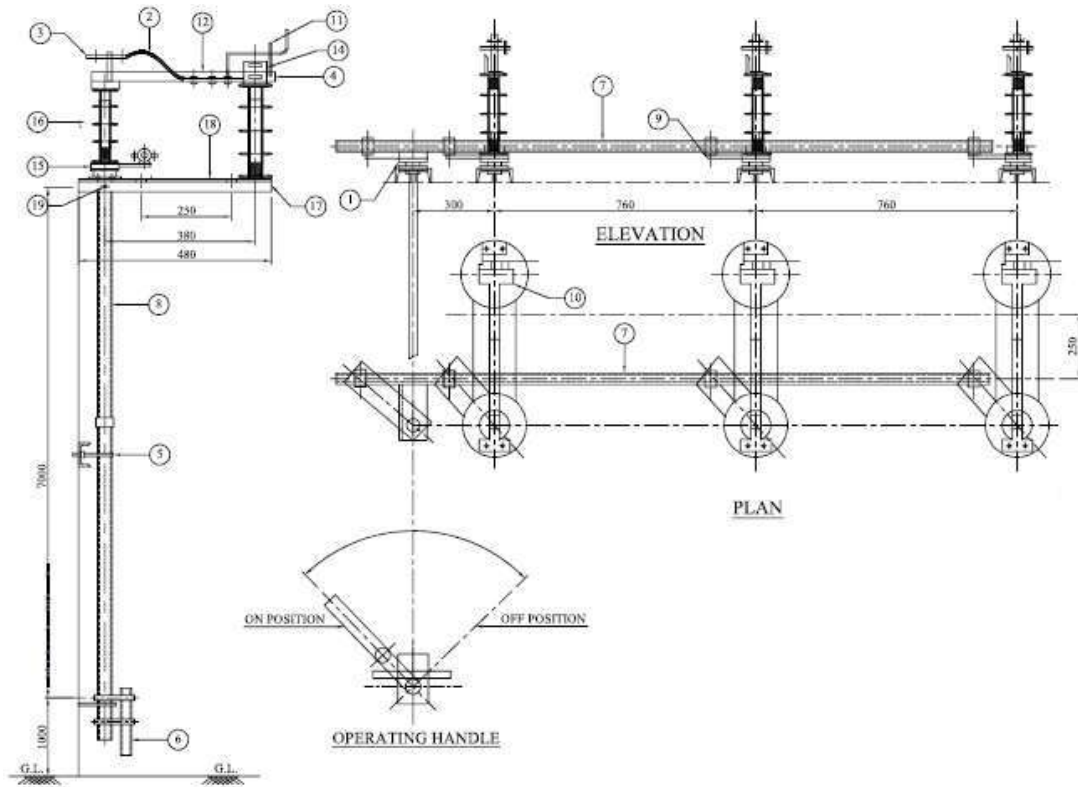
Following documents shall be submitted after award of RC/PO before manufacturing:

- a) Completely filled-in clause wise compliance of the specification.
- b) Signed and stamped copy of GA drawing
- c) Signed and stamped copy of installation drawing
- d) Compliance of all undertaking submitted during technical evaluation, if any
- e) Type test Certificates for each specified test if not submit during technical evaluation

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	Manual/Catalogues/drawings for all components.		√	
3	Technical details and test certificates.		√	√
4	Installation Instructions		√	√
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.



Indicative drawing of 11 KV 400 A and 200 A AB Switch

19. GUARANTEED TECHNICAL PARTICULARS

Completely filled-in clause wise compliance of this specification along with bid.

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:

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

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Specification No: [ENG-HV-2016](#)

Specification Name:

Technical Specification For Heat Shrinkable
Straight through Joint & Termination for 11kV
Power Cable

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Specification No: [ENG-HV-2016](#)

Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11kV Power Cable

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.	CONDITONS	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:

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)



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- c) A2XWaY- (Aluminium stranded compacted conductor, XLPE insulation, Aluminium wire screen, PVC sheath)
 - i) 3CX95 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - ii) 3CX150 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - iii) 1CX55 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - iv) 1CX95 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - v) 1CX150 sq.mm. A2XC2Y/ 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 U ₀	pC	<10
3	Impulse Peak Withstand	kV	75 kV
4	Continuous operation withstand Temperature	°C	90
	Short Circuit withstand temperature	°C	250
5	Withstand short circuit current	kA/1Sec	As per Size of Conductors
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

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/mm ² (Minimum) and (8 N/mm ² for anti-tracking)
7	Ultimate Elongation	200% (Minimum)
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 200°C Min. (For stress control tube: 30 Minutes at 250°C Min.)
9	Low Temperature Flexibility	No cracking after 4 hrs. at minus -20°C Max.
10	Volume Resistivity	1x 10 ¹⁰ 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 250°C Min.



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Sl. No.	Parameter	Specified limit
9	Low Temperature Flexibility	No cracking after 4 hrs. @ minus -20°C 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	<p><u>Compression Lugs:</u></p> <ul style="list-style-type: none"> 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. <p><u>Mechanical Lugs:</u></p> <ul style="list-style-type: none"> 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.



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S. No.	Components	Requirement																																				
		<p>d) Approved make NILLED, PFISTERER, NEXANS, TYCO (GERMANY).</p> <p>e) Dimensions shall be as annexure-I of this specification.</p>																																				
2	Lug Seal, Anti-tracking tube, weather sheds, Stress control tube	<p>a) Heat Shrinkable</p> <p>b) Fire resistant and weather resistant as per ENA TS 09-13 – for lug seals, weather sheds and Anti-tracking tubes</p> <table border="1"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <p>For lower sizes length & OD of tubes should be adjusted suitably. BOM approval is mandatory before supply.</p>	Sl. no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm	1	3C 300/400 sqmm I/D & O/D	Stress control tube	3	130	50/25	2	3C 300/400 sqmm O/D	Anti tracking tube	3	60	55/20	3	1C 630 sqmm O/D & ID	Stress control tube	1	130	65/30	4	1C 630 sqmm O/D & ID	Anti tracking tube	1	400	70/30	5	1C 630 sqmm O/D & ID	Insulating tube	3	300	35/12
Sl. no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm																																	
1	3C 300/400 sqmm I/D & O/D	Stress control tube	3	130	50/25																																	
2	3C 300/400 sqmm O/D	Anti tracking tube	3	60	55/20																																	
3	1C 630 sqmm O/D & ID	Stress control tube	1	130	65/30																																	
4	1C 630 sqmm O/D & ID	Anti tracking tube	1	400	70/30																																	
5	1C 630 sqmm O/D & ID	Insulating tube	3	300	35/12																																	
3	Mastic tape	<p>a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant.</p> <p>b) Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.</p> <p>c) Stress grading mastic should be provided for both connector portion and semicon portion.</p> <p>d) Water resistant sealing mastic shall also be provided for end sealing in straight through kit and lug sealing in termination kit.</p>																																				
4	Heat Shrink Breakout & Lug seal	<p>a) Fire resistant and weather resistant as per ENA TS 09-13.</p> <p>b) Adhesive coated Breakouts shall be provided on outer sheath of the cable to prevent water ingress.</p> <p>c) Anti tracking lug seal with adhesive coated, flame retardant.</p>																																				



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S. No.	Components	Requirement
5	Tinned coated copper braid	<p>a) Shall be completely insulated by adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug.</p> <p>b) Fire resistant and weather resistant as per ENA TS 09-13.</p> <p>c) Size and length is as follows:</p> <p>d) 25 mm² x 500 mm x 1 Run for 3C 70, 95, 120 & 150 mm² cables.</p> <p>e) 50 mm² X 600 mm X 1 Run for above 150 mm² & up to 400 mm² cables.</p> <p>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.</p> <p>For Copper screened HT ABC, continuity of armor shall be through 25 sq.mm. X 500mm insulated tinned copper braid.</p> <p>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.</p>
6	Tinned coated copper braid as a Leakage Current Collector	<p>a) Leakage current collector tinned copper braid</p> <p>b) 1R X 7 mm² X 150 mm per core shall be provided for terminations.</p>
7	Tinned copper wire mesh	<p>a) Minimum 2.5mm² tinned copper mesh shall be provided on armour circumference beneath the copper braid.</p> <p>b) For 3 core cable 1R X 0.5mtr</p> <p>c) For 1 core cable 1R X 0.7mtr</p>
8	Sub-kit components	<p>a) GI Solid Collet dia of dia as per cable OD (1no only in 3C cables),</p> <p>b) Worm drive clip/ Jubilee clip of stainless steel (2 nos),</p> <p>c) Compatible support rings (Aluminium for single core and GI for three core cables)</p> <p>d) Soldering on copper screen is not acceptable</p> <p>e) Constant pressure roll spring shall be provided for screen connections as per compatible size. For 3 core- 3nos, for 1C - 1nos.</p> <p>f) Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same</p> <p>g) Tinned copper binding wire 20 SWG, qty 50gms</p> <p>h) Nylon string OD 1mm, 2mtr</p> <p>i) Silicone grease, 30 gms</p> <p>j) Cleaning liquid</p> <p>k) Vinyl tape</p> <p>l) Al oxide cloth</p> <p>m) Other necessary items</p>



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S. No.	Components	Requirement
9	Submission of BOM and instruction sheet	<p>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.</p> <p>*Note: BOM shall be approved by TPCODL/TPWODL/TPNODL/TPSODL authorized official at the time of pre-bid.</p>

5.2 Components of Straight Through jointing kit:

S. No.	Components	Requirement																																										
1	Heat Shrinkable insulating tube/ Sleeve	<p>a) Surface of material: shall be smooth and free from protrusion, voids and nicks.</p> <p>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.</p> <p>c) Wall thickness ratio (before recovery) of all sleeves/ tubes shall not be less than 60% at any two points of measurement.</p> <table border="1"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <p>d) For lower sizes length & OD of tubes should be adjusted suitably. BOM approval is mandatory before supply.</p>	Sl no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm	1	3C 300/400 sqmm	Stress control tube	3	470	45/20	2	3C 300/400 sqmm	Red Insulating tube	3	460	55/20	3	3C 300/400 sqmm	Dual wall tube	3	450	65/21	4	1C 630 sqmm	Stress control tube	1	500	65/30	5	1C 630 sqmm	Red Insulating tube	1	490	70/30	6	1C 630 sqmm	Dual wall tube	1	480	85/30
Sl no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm																																							
1	3C 300/400 sqmm	Stress control tube	3	470	45/20																																							
2	3C 300/400 sqmm	Red Insulating tube	3	460	55/20																																							
3	3C 300/400 sqmm	Dual wall tube	3	450	65/21																																							
4	1C 630 sqmm	Stress control tube	1	500	65/30																																							
5	1C 630 sqmm	Red Insulating tube	1	490	70/30																																							
6	1C 630 sqmm	Dual wall tube	1	480	85/30																																							

S. No.	Components	Requirement
2	Compression lugs/ Mechanical Connectors	<p>a) Material : 99% Electrolytic grade Aluminium with Anti-corrosive paste</p> <p>b) Shape: As per IS 8308</p> <p>c) Dimensions as per Annexure-I of this Specification</p> <p>d) Conductivity of ferrules/mechanical connectors shall be as per IS 8309: 2003.</p> <p>e) Conductivity of Aluminium shall be min. 60% of IACS.</p> <p><u>Mechanical Lugs:</u></p> <p>a) Tinned coated Aluminium 185-400 mm²/ 630mm²/1000mm²</p> <p>b) Type Tested as per IEC 61238(part1):2003</p> <p>c) Dimensions shall be as annexure-I of this specification.</p> <p>d) Approved make NILLED, PFISTERER, NEXANS, TYCO (GERMANY).</p> <p>Dimensions shall be as annexure-I of this specification.</p>
3	Mastic Tape	<p>a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant.</p> <p>b) Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.</p> <p>c) Stress grading mastic should be provided for both conductor portion and semicon portion.</p> <p>d) Water resistant sealing mastic shall also be provided for end sealing in straight through kit and lug sealing in termination kit.</p>
4	Tinned coated copper braid for GI armour continuity / Ferrules for Aluminium armour continuity	<p>a) Shall be completely insulated with adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug at one end.</p> <p>b) Fire resistant and weather resistant as per ENA TS 09-13</p> <p>c) Size and length as per below:</p> <p>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.</p> <p>e) Uniformly tinned coated copper braid shall be provided for armor continuity</p> <p>f) Size of tinned copper braid shall be: 50 mm² x 1 Run for 150-400 sq.mm. three core cables. 25 mm² x 1 Run for below 150 sq.mm. three core cables.</p> <p>Ferrules for Aluminum armor continuity:</p> <p>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 mm² x 1 Run tinned copper braid to be provided.</p>

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: 2.5mm ² (2" X 6mtr) c) For 1C cable: 2.5mm ² (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



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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



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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



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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)



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(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



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Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11kV Power Cable

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



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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 U _o	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	



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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

SI.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	



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Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11kV Power Cable

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:

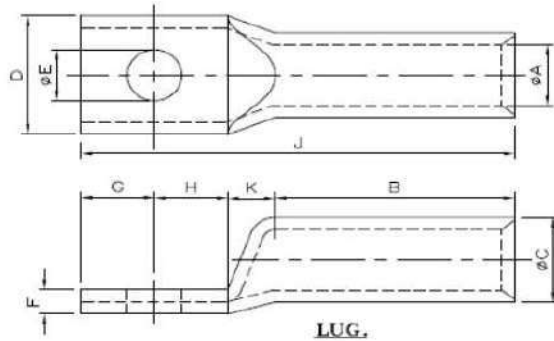
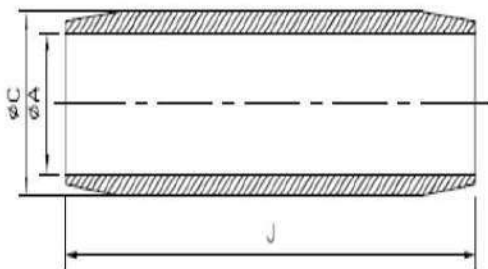
Signature

Designation

Annexure- Dimensions Ferrules & Lugs HT

Dimensional details of Aluminum ferrules for HT AL circular stranded compacted XLPE cables			
Cable Size in MM ²	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 MM ²	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

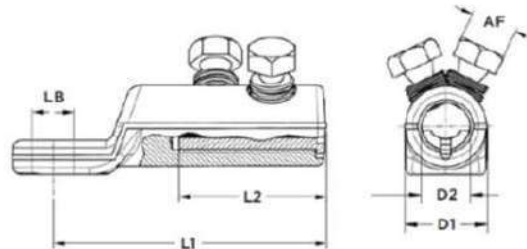
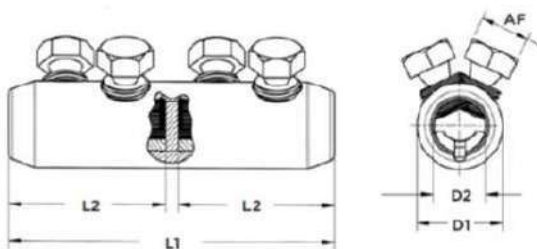


For remaining cable sizes, dimensions of Ferrules & Lugs shall be as per IS.

Annexure- Dimensions Mechanical connectors & Mechanical Lugs

Aluminium Mechanical connectors			
Cable Size in MM ²	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 MM ²	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-2021

Specification Name : Specification for 11kV 200A HG Fuse

Susavan Biswas	SATYA PRASAD NAYAK	JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPCODL	TPWODL	TPNODL	TPSODL	TPSODL
27-01-2023	01-02-2023	01-02-2023	01-02-2023	02-02-2023	02-02-2023

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21. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of 11 KV, 200 A, 3 pole HG Fuse sets for outdoor installations to be used for 33/11 KV Substations. Scope also includes transportation & unloading of poles 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 9385	High voltage fuses
IS 2062	Hot Rolled Medium and High Tensile Structural Steel
IS 209	Zinc Ingot
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
IEC 62231	Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV – Definitions, test methods and acceptance criteria.

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)

TPSODL/TPNODL/TPWODL/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. GENERAL TECHNICAL REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Name of Manufacturer	To be Specified by Bidder
2	Works Address	To be Specified by Bidder
3	Manufacturers Type	To be Specified by Bidder
4	Standard according to which the HGF are manufactured	IS 9385-1980 (Part-II) amended upto date, IEC 62231
5	Rated Voltage	12 kV
6	Rated Frequency	50 Hz
7	Lightning Impulse Withstand Voltage Positive & Negative Polarity (1.2/50 micro sec wave)	
a.	Across the Isolating distance	85 kV (Peak)
b.	To Earth & Between Poles	75 kV (Peak)
8	Dry Flashover Voltage	85 kV
9	Power frequency Puncture withstand Voltage	1.3 times of actual dry flashover voltage
10	Impulse Withstand Voltage (Switch in position)	75 kV (Peak)
11	Visible Discharge Voltage	9kV RMS
12	1 Min. Power Frequency Withstand Voltage (Dry & Wet)	
a.	Across the Isolating distance	32 kV
b.	To Earth & Between Poles	28 kV
13	Temperature Rise	Within permissible limit as per IS 9385-1980 (Part-II) amended upto date
14	Outdoor/Indoor	Outdoor
15	Type of mounting	Horizontal
16	Vertical clearance from top of insulator cap to mounting Channel	254mm (Minimum)
17	Continuous current Rating	200 Amp
18	Aluminium Strip for HG Fuse	30mmx5mmx425mm
19	11kV Polymer Post Insulator	
a.	Applicable Standard	IEC 62231 amended up to date
b.	Make of Post Insulator	To be Specified by Bidder
c.	Minimum failing load	5 kN
d.	CD of Post Insulator (min.)	320 mm
e.	Number of Insulators per Pole	2 Nos.
f.	Diameter of FRP Rod (min.)	24 mm
20	Total weight of Horn Gap Fuse	To be Specified by Bidder

21	Details of Arcing Horn	1 SWG (7.62 mm) dia. Solid copper rod silver plated provided with screwing arrangement on the fuse carrier made of copper for fixing fuse wire (Total length -635 mm). All the bolts, Nuts and washers should be made out of Brass
22	Riser Unit (150 mm height total)	The shape of connectors may be made out of straight copper Flat. Copper Riser 40 mm width x 5 mm Thick x 80mm height Copper Connector 40 mm width x 5 mm thick x 40 mm length. All Nonferrous parts shall be silver plated with coating thickness of (25 microns min.)
		b) 100 mm height G.I Riser made of 19 mm nominal bore medium gauge G.I pipe welded with 2 nos. of G.I flat of 30mmx5mm of both ends fixed with 10mm dia. bolts and nuts with flat & spring washer. All the bolts, Nuts and washers should be made out of Brass
23	Size of Base Channel	75mmx40mmx5mm Length Min. 500 mm (mounting slotted hole 18x 36 mm c/c 250 mm) a) All ferrous parts shall be hot dipped Galvanized as per IS.2633/1972 (Latest Amendment), IS 2629/1985 (1st. Revision), & all nonferrous parts should be duly electroplated with silver.
24	Connectors	SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable for 55-100 sq. mm AAAC conductor.
25	Marking/Engraving	TPSODL/TPNODL/TPWODL/TPCODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing.

5. GENERAL CONSTRUCTION:

The H.G. Fuses shall have adjustable arcing horns made of solid copper rod having 7.62 mm dia. The horns shall be fitted with screwing devices with fly nuts for fixing and tightening the fuse wire. It shall have robust terminal connector of size as per clause no.4 made of copper duly silver plated with two numbers of 12mm dia. brass bolts and double nuts with flat brass washers. The connector should be capable of connecting crimp able conductor up to 100 Sq.mm. size (AAAC) with bimetallic solder less sockets. The H.G. Fuse Set shall be suitable for horizontal mounting on Sub-station structures. All metal (ferrous) parts shall be galvanized and polished.

5.1 Insulators:

The post type insulators used for the Horn Gap Fuse Unit shall conform to IEC: 62231 (amended upto date) in all respects with regard to mechanical and electrical requirements.

The electrical characteristics of the insulators shall be as follows

1	System Voltage	11 kV
2	Lightning Impulse Withstand Voltage in kV	75
3	Power Frequency Withstand Voltage in kV (Dry)	55
4	Power Frequency Withstand Voltage in kV (Wet)	35
5	Power Frequency Flashover Voltage in kV (Dry)	85
6	Power Frequency Flashover Voltage in kV (Wet)	50
7	Creepage Distance in mm (min)	320
8	FRP Rod Dia. in mm (min)	24

Minimum failing loads for post Insulators should be 5kN for 11kV.

The type of insulation materials, metal fittings, Creepage distance, protected Creepage distance, tensile strength compression strength, torsion strength and cantilever strength shall be as provided in the guaranteed technical particulars in clause no.19.

The bidder shall furnish the type test certificate of the post insulators from their manufacturer for reference & scrutiny. For type, test reports refer cl no 7.3. Any fittings accessories or equipment which may not have been specifically mentioned in this specification but which are usually necessary in equipment shall be deemed included in the specification and shall be supplied by the Bidder without extra charge. All equipment shall be complete in all details whether such details are mentioned in the specification or not.

6. MARKING:

Below parameters should be embossed on SS sheet of thickness 1mm with black background. It should be riveted on MS channel of HG Fuse:

1. Rated Voltage
2. Manufacturer’s Name
3. Month/Year of Manufacture
4. Serial Number
5. PO no.
6. Rated normal current in Amps
7. Rated one second short-time current

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) Power frequency voltage dry test.
- ii) Tests to prove satisfactory operation.
- iii) Dimension check.
- iv) Galvanization test.

7.2 ROUTINE TESTS

- i) Power frequency voltage dry test.
- ii) Tests to prove satisfactory operation.
- iii) Dimension check.
- iv) Galvanization test.

7.3 TYPE TESTS

- i) Impulse voltage dry test
- ii) Power frequency voltage dry test
- iii) Power frequency voltage wet test
- iv) Temperature rise test.
- v) Mechanical endurance test / Mechanical strength test for the post insulator.

Type tests on Post Insulators

- i) Dry Lightning impulse withstand voltage test.
- ii) Wet power frequency test
- iii). Damage limit proof test and test of tightness of the interface between end fittings & insulator housing
- iv). Radio interference test
- v). Recovery of hydrophobicity test
- vi). Chemical composition test for silicon content
- vii). Brittle fracture resistance 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/ Other Govt. Lab** 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 TPSODL/TPNODL/TPWODL/TPCODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPSODL/TPNODL/TPWODL/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 TPSODL/TPNODL/TPWODL/TPCODL's representatives at all times when the work is in progress. Inspection by the TPSODL/TPNODL/TPWODL/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 TPSODL/TPNODL/TPWODL/TPCODL.

Following documents shall be sent along with material.

- a) Test reports
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- d) Packing list
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- f) Guarantee / Warrantee card
- g) Delivery Challan
- h) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORE:

The material received at TPSODL/TPNODL/TPWODL/TPCODL 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 12 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 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:

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

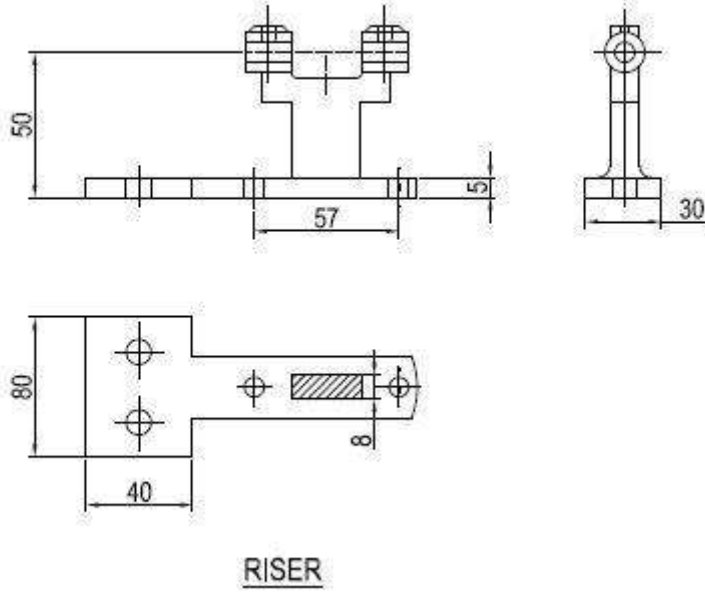
Not applicable.

18. DRAWINGS AND DOCUMENTS:

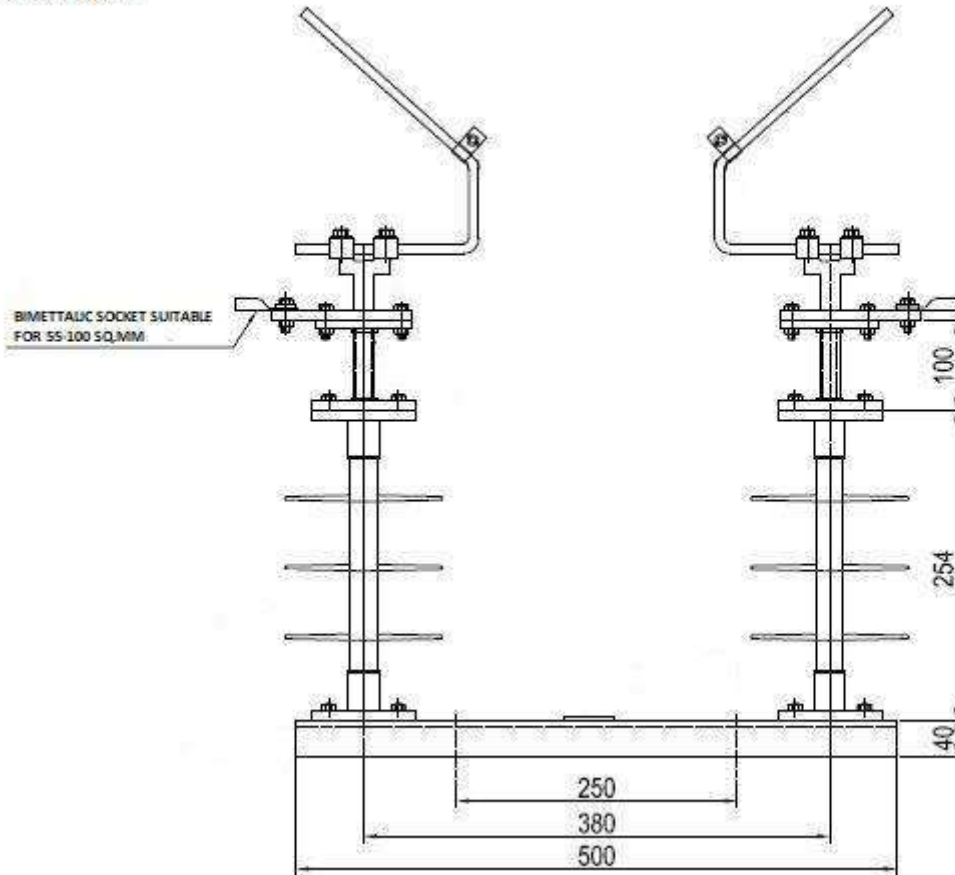
Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- a) Completely filled in Schedule "A" Guaranteed Technical Particulars.
- b) Work Experience details
- c) Type test certificates.
- d) Drawing (3 sets) of HG fuse containing complete information about manufacturing & fabrication etc.

19. Drawing (reference for tender purpose only)



REFERENCE FOR TENDER PURPOSE ONLY. FINALIZATION OF GTP WILL BE AT THE TIME OF DETAILED ENGINEERING



20. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	Desired Value
1	Name of Manufacturer	
2	Works Address	
3	Manufacturers Type	
4	Standard according to which the HGF are manufactured	
5	Rated Voltage	
6	Rated Frequency	
7	Continuous current Rating	
8	Post Insulator	
8.1	Lightning Impulse Withstand Voltage Positive & Negative Polarity (1.2/50microsecwave)	
a	Across the Isolating distance	
b	To Earth & Between Poles	
8.2	1 Minute Power Frequency Withstand Voltage (Dry)	
8.3	1 Minute Power Frequency Withstand Voltage (Wet)	
8.4	Visible Discharge Voltage	
8.5	Dry Flashover Voltage	
8.6	Power frequency puncture withstand voltage	
8.7	Impulse Withstand Voltage (Switching Position)	
9	1 Minute Power Frequency Withstand Voltage	
a	Across the Isolating distance	
b	To Earth & Between Poles	
10	Temperature Rise	
11	Outdoor/Indoor	
12	Type of mounting	
13	Vertical clearance from top of insulator cap to mounting Channel	
13B	Height of the riser for carrying the horns.	
13C	Details of Arcing Horns	
13D	Riser Unit	
14	Connectors	
15	Size of Base Channel (HDG)	
16	Aluminium Strip for HG Fuse	
17	11 kV Post Insulator	
a.	Applicable Standard	
b.	Make of Post Insulator	
c.	Minimum failing load	
d.	CD of Post Insulator (min.)	
e.	Number of supporting Insulators per Pole	
18	Total weight of Horn Gap Fuse	
19	Marking/Engraving	



Specification No: ENG-HV-2021

Specification Name: Specification for 11kV 200A HG Fuse

21. 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-2023

Specification Name : Technical Specification For HT stay (Guy) insulator

SAYANTANI DAS	MILAN MAITY	SANTOSH KUMAR PATRA	Susavan Biswas	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
24-01-2023	25-01-2023	25-01-2023	27-01-2023	30-01-2023	31-01-2023

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TPWODL*

TPCODL

TPWODL

TPNODL

TPSODL

Specification No: ENG-HV-2023

Specification Name: Technical Specification of
HT Stay (Guy) Insulator

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1. SCOPE
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17. SPARES, ACCESSORIES AND TOOLS
18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of porcelain HT Guy Strain Insulators for use in Distribution system. 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:

Ref IS	Description
IS 5300	Porcelain Guy Strain Insulators

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 Speed	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/ TPWODL/ 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	DESIRED VALUE
1	Manufacturer's Name	To be specified by Bidder
2	Type of insulator	Designation C
3	Standard Specification to which the material shall confirm	As per IS: 5300
4	ELECTRICAL CHARACTERISTICS	
(a)	Dry one minute power frequency Flashover voltage	32 kV
(b)	Wet one minute power frequency Flashover voltage	15 kV
(c)	Dry one minute power frequency Withstand voltage	27 kV
(d)	Wet one minute power frequency Withstand voltage	13 kV
5	Minimum Failing Load	88 KN
6	DIMENSIONS	
(a)	Length	140 mm
(b)	Width	85 mm
(c)	Cable Hole Dia	25 mm (+/- 1.5 mm)
7	Creepage Distance	57 mm
8	Type of Glaze	Brown / Dark Brown
9	Weight per piece	1.1 Kg approx.

5. GENERAL CONSTRUCTION:

- a) The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed.
- b) The design of the insulators shall be such that the stresses due to expansion and contraction in any part of the insulator shall not lead to its deterioration.
- c) The glaze shall be brown in color for insulators. The glaze shall cover the entire porcelain surface parts except those areas that serve as supports during firing.
- d) The standard guy strain insulators shall be of designation, 'C' as per IS: 5300 or its latest revision. The recommended type of guy strain insulators for use on guy wires of HT overhead line is Type-C.

6. MARKING:

Following distinct non-erasable embossing is to be made on each Insulator to be supplied to TPCODL/ TPNODL/ TPWODL/ TPSODL under this Tender.

- a) "TPCODL/ TPNODL/ TPWODL/ TPSODL"
- b) Failing Load in KN
- c) Manufacturer Name/ Trade Mark
- d) Year of manufacturing, Country 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) Verification of Dimensions.
- ii) Temperature cycle test
- iii) Mechanical strength test
- iv) Porosity test

7.2 ROUTINE TESTS

- i) Visual examination

7.3 TYPE TESTS

- i) Visual examination
- ii) Verification of dimensions
- iii) Temperature cycle test
- iv) Dry one-minute power frequency withstand test
- v) Wet one-minute power frequency withstand test
- vi) Mechanical strength test
- vii) Porosity 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 tests shall be conducted at **CPRI / ERDA / Other Government 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/ 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) TPCODL/ TPNODL/ TPWODL/ 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/ 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 54 months from the date of commissioning or 60 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 materials are to be packed in crates or boxes for rough handling. Packing shall be marked with the strength and voltage ratings. 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.

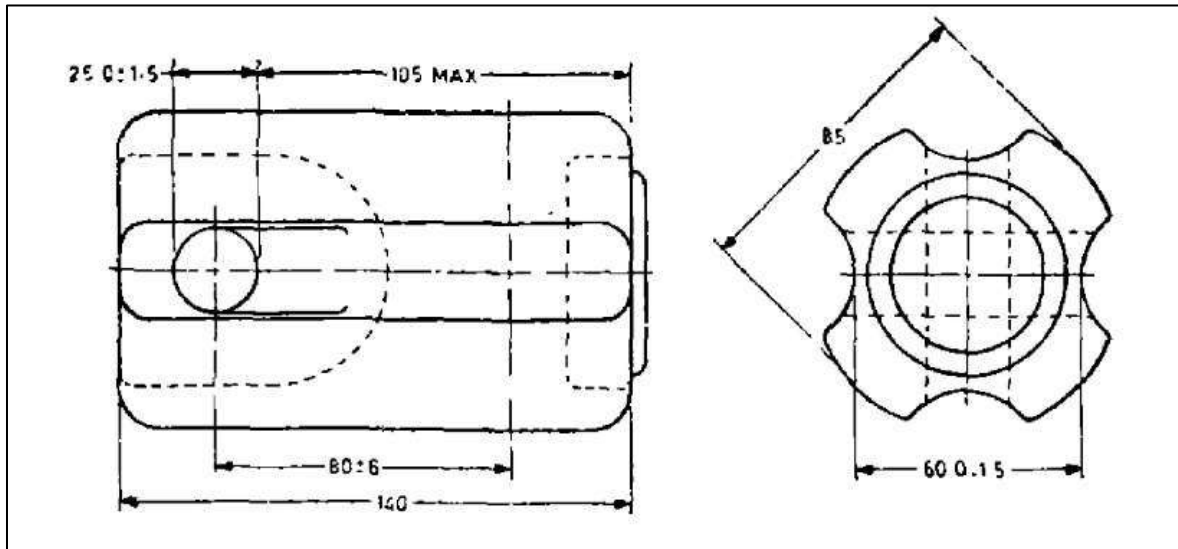
17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

The following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- a) Completely filled in Schedule "A" Guaranteed Technical Particulars.
- b) Work Experience details
- c) Type test certificates.
- d) Drawing (3 sets) of Guy Insulator containing complete information about manufacturing & fabrication etc.



Note: -All Dimensions are in mm unless noted otherwise specified. This is an indicative drawing of Guy Insulator used for tender purpose only.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	To be furnished by Bidder
1	Manufacturer's Name	
2	Type of insulator	
3	Standard Specification to which the material shall confirm	
4	ELECTRICAL CHARACTERISTICS	
(a)	Dry one minute power frequency Flashover voltage	
(b)	Wet one minute power frequency Flashover voltage	
(c)	Dry one minute power frequency Withstand voltage	
(d)	Wet one minute power frequency Withstand voltage	
5	Minimum Failing Load	
6	Power Frequency Punctured withstand voltage	
7	DIMENSIONS	
(a)	Length	
(b)	Width	
(c)	Cable Hole Dia	
8	Creepage Distance	
9	Type of Glaze	
10	Weight per piece	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

TPCODL**TPWODL****TPNODL****TPSODL****Specification No:** ENG-HV-2023**Specification Name:** Technical Specification of
HT Stay (Guy) Insulator

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-2024

Specification Name : Technical Specification For HT Stay set including Clamp

SAYANTANI DAS	MILAN MAITY	SANTOSH KUMAR PATRA	Susavan Biswas	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
16-02-2023	16-02-2023	21-02-2023	21-02-2023	22-02-2023	23-02-2023

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TPWODL*

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8. TYPE TEST CERTIFICATES
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16. MANUFACTURING ACTIVITIES
17. SPARES, ACCESSORIES AND TOOLS
18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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 HT Stay Set.

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	Description
IS 4759	Hot Dip Galvanizing For Fabrication
IS 1852	Tolerance For Raw Material
IS 2062	Manufactured from raw material as per IS 2062 grade E-250 quality 'A'

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 PARTICULARS	DESIRED VALUE
1	Manufacturer Name & Address	To be specified by Bidder
2	Referred IS	IS: 2062, IS: 2633, IS: 2629
3	Dimensions	
4	Anchor Rod (20mm Dia): 1 No.	
a)	Dia of Rod	20mm (+ 5%, - 3%)
b)	Overall length of Anchor rod	1800mm (+ 0.5%)
c)	Inside Dia of Rounded Eye	40mm (+ 3%)
d)	Length of threaded portion	40mm (+ 11%, - 5%)
e)	Size of MS Nut & Bolt, Square MS Washers confirming to IS 1387 (1967) and IS 1363 (1967)	20mm Sq. Washer 50X 50 X 1.6mm (2No.s)
5	Anchor Plate: 1 No.	
a)	Size of the MS Anchor plate	300x300x8 mm
b)	Dia of the hole made at the centre of the plate	22mm
6.	Turn Buckle	
(A)		
(i)	Dia of the eye bolt	20mm (+ 3%, - 2%)
(ii)	Length of the eye bolt	450mm
(iii)	Length of the threaded portion of the bolt	300mm
(vi)	Inner dia of the circular eye made at other end of the bolt.	40mm
(B)	Bow with welded Channel	
(i)	Dia of the MS Rod used for bow	20mm dia
(ii)	Overall length and height of the bow	995mm 450mm
(iii)	Magnitude of the angle in radians by which bow is bended at the top	10 R
(iv)	Length and size of the GI Channel welded at the order end of the bow	200mm & 100x50x5 mm Channel
(v)	Number of holes made in the GI Channel	3
(vi)	Dia of the holes	22mm (3Nos.)
7	Thimble: 1 No.	
a)	Thickness of the MS Sheet used for thimble	1.5mm
b)	Size of thimble	75x22x40mm

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
8	Minimum strength of the welding provides on various components of Guy/Stay Sets (IS:823/1964)	4900Kg.
9	Average weight of finished stay set	14.523 kg (min) / 15.569 kg (Max)
10	Surface Finish of stay set	Hot Dip Galvanized
11	All Tolerance of the dimensions/weight	± 5%
12	Hot-Dip Galvanized, Flat (50X8) GI Flat for Stay Clamp	
1	Relevant Standard	IS: 2062, IS: 2633, IS: 2629
2	Grade of Steel	E 250 A
3	Minimum Tensile Strength	410 N/mm ²
4	Yield Stress	250 N/mm ²
5	Percentage Elongation (Min.) at Gauge Length	23%
6	Bend Test (Internal Dia)	Min-2t
7	Mass of Zinc Coating	705 gm/m ²
8	Zinc Coating Thickness	100 micron (6 Dip)
9	Chemical composition	Grade: E 250 (As per IS: 2062)
10	Markings/Embossing	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's trademark.

5. GENERAL CONSTRUCTION:

5.1 ANCHOR ROD WITH MS CHANNEL

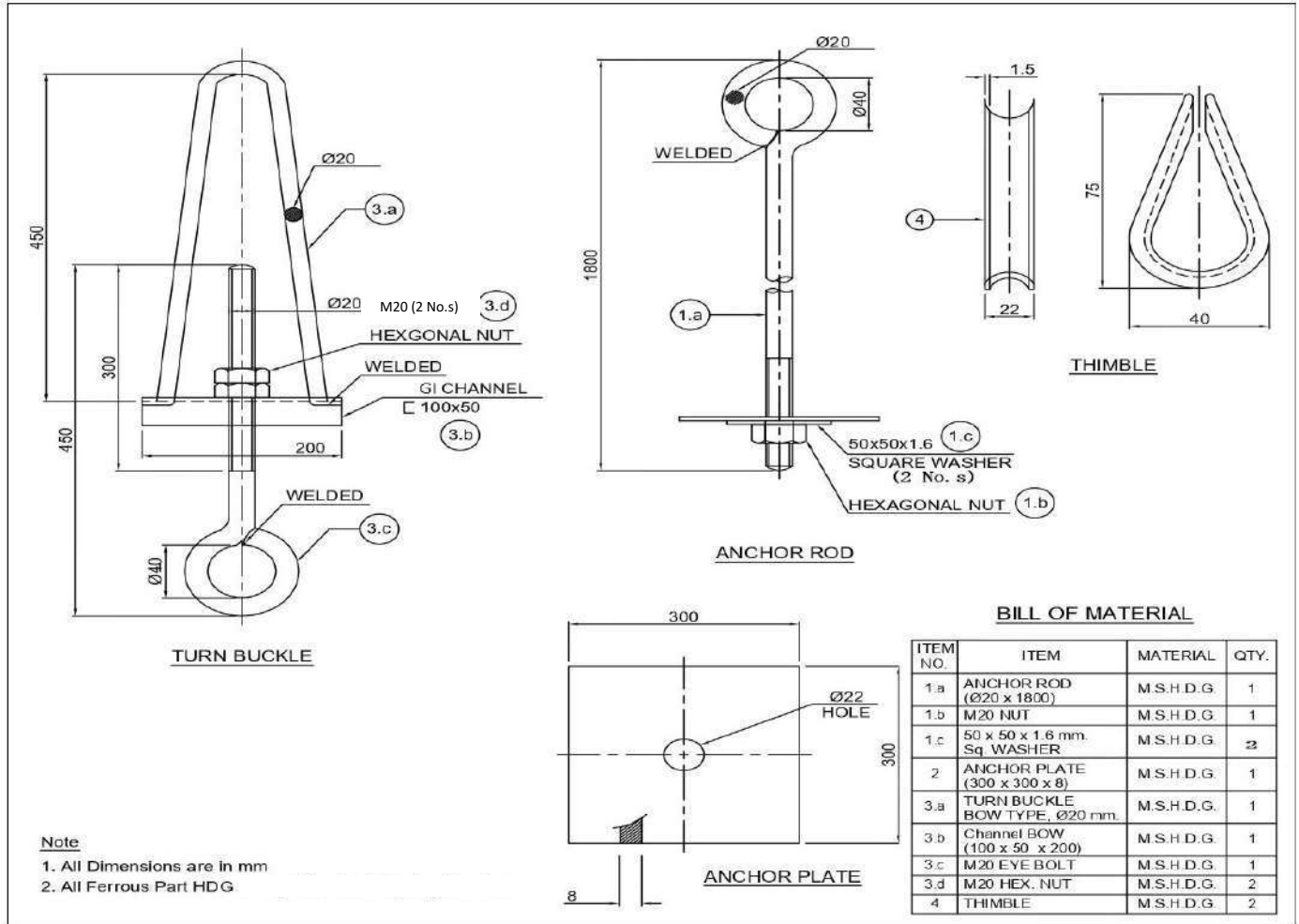
Overall length of rod should be 1800 mm made out of 20 mm diameter MS rod. One end of rod to be made into a round eye having an inner diameter of 40 mm. Other end fitted with MS channel 100 x 50 x 5 mm; 200 mm long. Hot Dip galvanized as per IS 4759-1996.

5.2 EYE BOLT

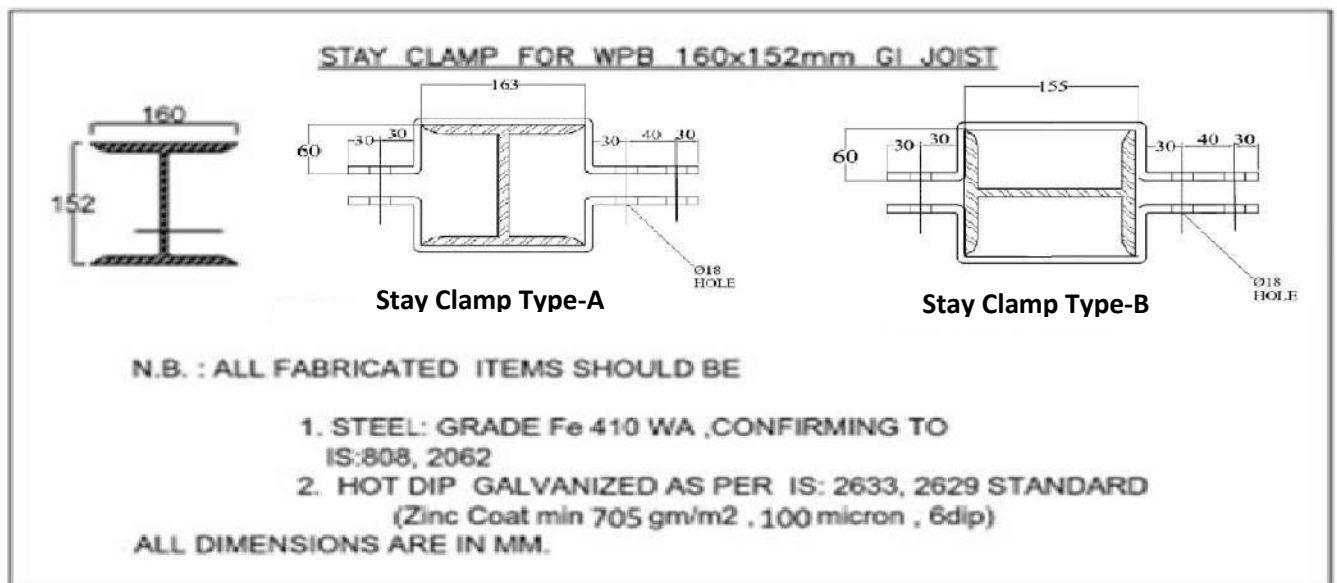
Eye bolt to be made of 20 mm dia MS Rod having an overall length of 450 mm. One end of the rod to be threaded up to 300 mm length. The other end of the rod shall be rounded into a circular eye of 40 mm inner dia with proper and good quality welding. Eye Bolt being a threaded fastener be hot dip galvanized as per relevant IS : 1367 (part 13) – 1983.

DRAWINGS

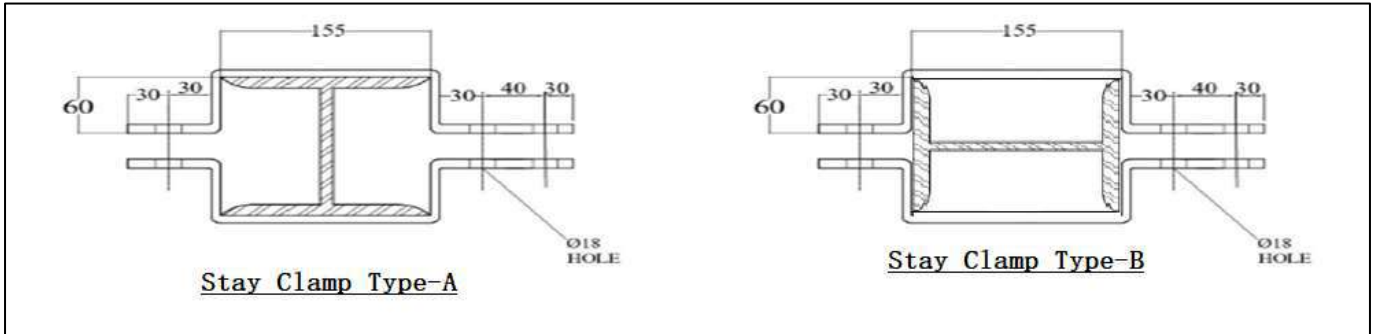
HT Stay Set :



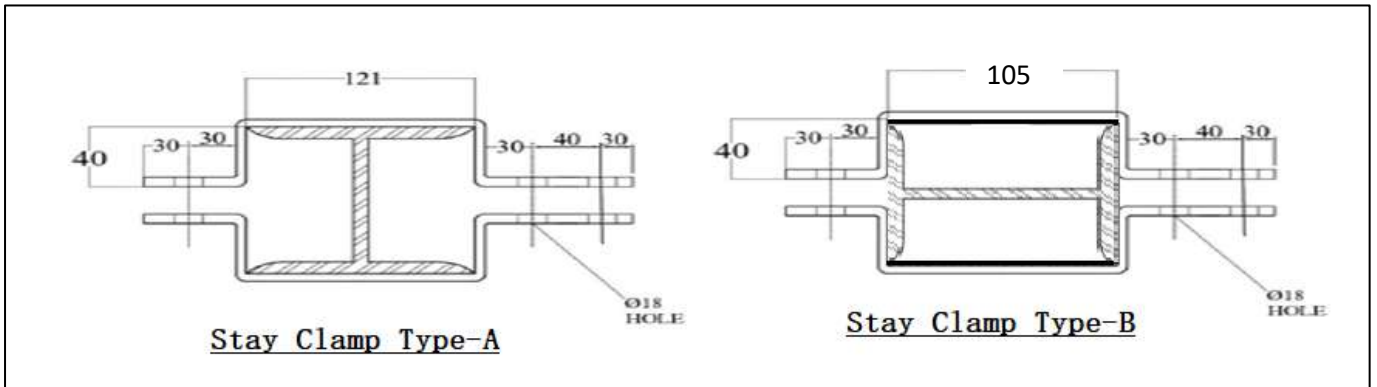
HT Stay Clamp for WPB Pole (50x8 mm):



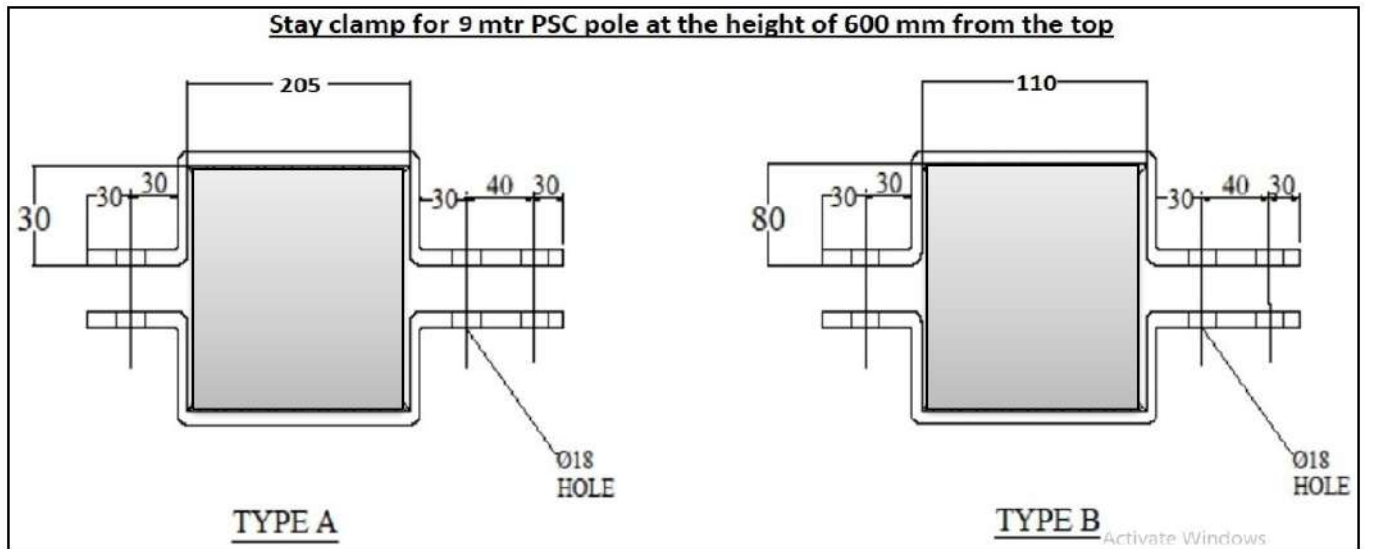
HT Stay Clamp for 150x150 RSJ Pole (50x8 mm):

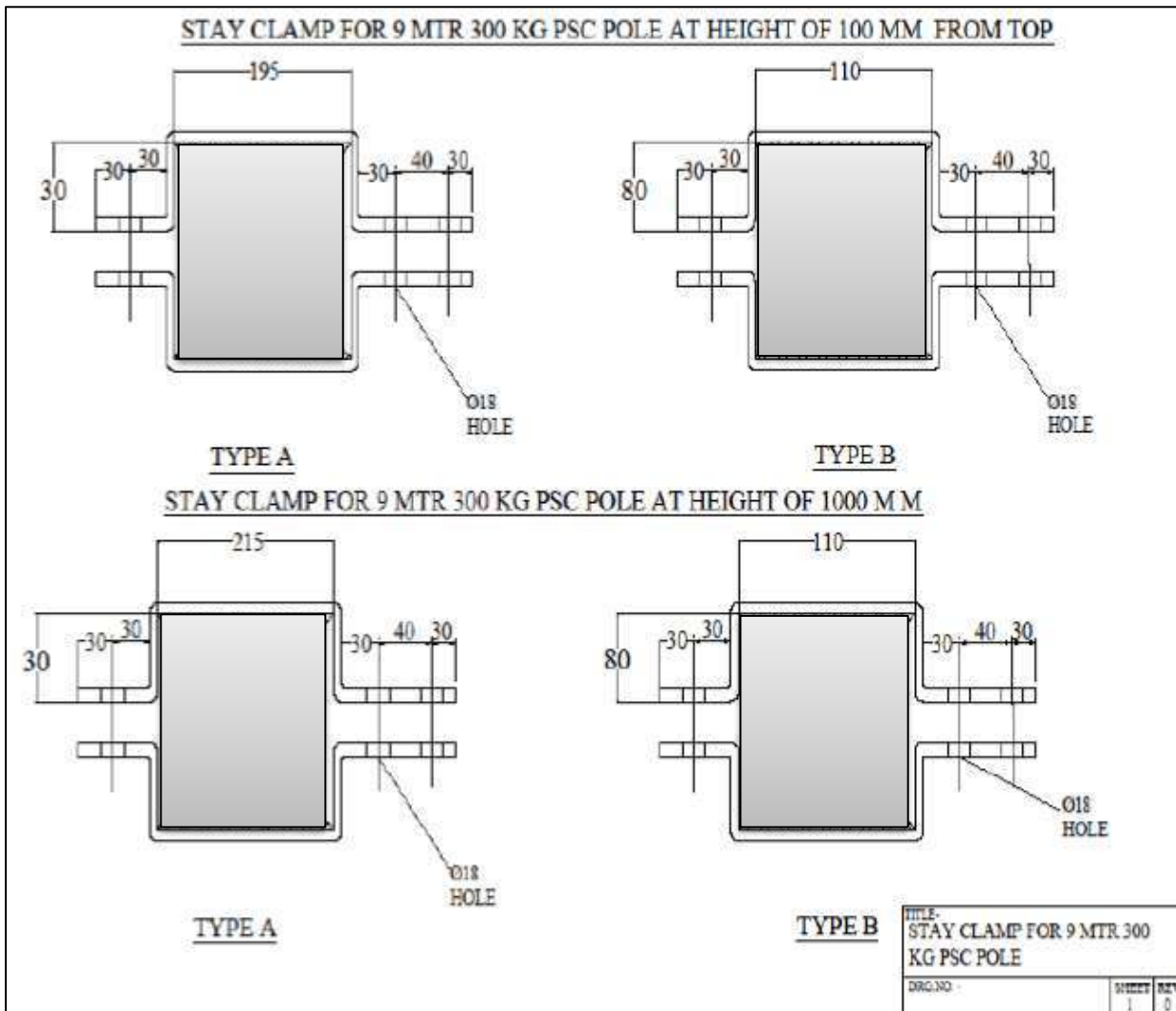


HT Stay Clamp for 116x100 RSJ Pole (50x8 mm):



HT Stay Clamp for 9 mtr PSC Pole (50x8 mm):





Specific requirements as per Tender, are to be fulfilled at the time of detailed engineering.

6. MARKING:

Following distinct non-erasable embossing to be made on each HT Stay Set and clamp Supplied to TPCODL/ TPNODL/ TPSODL/ TPWODL under this Tender.

- a) Manufacturer Name/ Trade Mark
- b) Engraved Marking (Punching before galvanization)
- c) "TPCODL/ TPNODL/ TPSODL/ TPWODL"
- d) Year of manufacturing, Country 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 examination, Verification of dimension and marking test.
- ii) Tensile Strength.
- iii) Galvanization (Uniformity) test.

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS

- i) Chemical Composition
- ii) Mechanical Properties
- iii) Test in respect of Hot Dip Galvanization i.e. thickness of zinc coating in microns

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 Labs** as per relevant IS. Type tests should have been conducted in certified 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 12 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.

Galvanization Guarantee- Quality of Hot Dip Galvanization should be guaranteed for any type of damage due to harsh climatic condition for 5 Years.

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.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY THE BIDDER
1	Manufacturer Name & Address	
2	Referred IS	
3	Dimensions	
4	Anchor Rod (20mm Dia): 1 No.	
a)	Dia of Rod	
b)	Overall length of Anchor rod	
c)	Inside Dia of Rounded Eye	
d)	Length of threaded portion	
e)	Size of MS Nut & Bolt, Square MS Washers confirming to IS 1387 (1967) and IS 1363 (1967)	
5	Anchor Plate: 1 No.	
a)	Size of the MS Anchor plate	

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY THE BIDDER
b)	Dia of the hole made at the centre of the plate	
6. (A)	Turn Buckle	
(i)	Dia of the eye bolt	
(ii)	Length of the eye bolt	
(iii)	Length of the threaded portion of the bolt	
(vi)	Inner dia of the circular eye made at other end of the bolt.	
(B)	Bow with welded Channel	
(i)	Dia of the MS Rod used for bow	
(ii)	Overall length and height of the bow	
(iii)	Magnitude of the angle in radians by which bow is bended at the top	
(iv)	Length and size of the GI channel welded at the order end of the bow	
(v)	Number of holes made in the GI Channel	
(vi)	Dia of the holes	
7	Thimble: 1 No.	
a)	Thickness of the MS Sheet used for thimble	
b)	Size of thimble	
8	Minimum strength of the welding provides on various components of Guy/Stay Sets (IS:823/1964)	
9	Average weight of finished stay set	
10	Surface Finish of stay set	
11	All Tolerance of the dimensions/weight	
12	Hot-Dip Galvanized, Flat (50X8) GI Flat for Stay Clamp	
1	Relevant Standard	
2	Grade of Steel	
3	Minimum Tensile Strength	
4	Yield Stress	
5	Percentage Elongation (Min.) at Gauge Length	
6	Bend Test (Internal Dia)	
7	Mass of Zinc Coating	
8	Zinc Coating Thickness	



Specification No: ENG-HV-2024

Specification Name: Technical Specification of HT Stay Set including Clamps

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY THE BIDDER
9	Chemical composition	
10	Markings/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-LV-3001

**Specification Name : ENG-ELC-034- TECHNICAL SPECIFICATION FOR 1.1 KV
POWER CABLES- R1**

JYOTIPRAKASH MOHANTY	Ranjan Kumar Sahoo	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	VARUN BHATNAGAR	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPSODL	TPNODL	TPCODL	TPWODL	TPWODL
16-01-2023	16-01-2023	16-01-2023	17-01-2023	17-01-2023	17-01-2023



Specification No: [ENG-LV-3001](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 1.1 kV XLPE
POWER CABLE

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1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's work, packing, forwarding, supply and unloading at site/store of 1.1 kV LT XLPE Power Cable for trouble free and efficient operation.

Applicable for 1.1 kV LT XLPE insulated Power Cable of following sizes:

Four Core Cables	Two Core Cables	Single Core Cable
4C X 300 sq.mm.	2C X 50 sq. mm.	1C X 630 sq. mm.
4C X 240 sq. mm.	2C X 25 sq. mm.	1C X 300 sq. mm.
4C X 150 sq.mm.	2C X 16 sq. mm.	1C X 185 sq. mm.
4C X 95 sq.mm.	2C X 10 sq. mm.	1C X 150 sq. mm.
4C X 50 sq.mm.	2C X 6 Sq. mm.	1C X 95 sq. mm.
4C X 35 sq.mm.	2C X 4 Sq. mm.	1C X 25 sq. mm.
4C X 25 sq.mm.		1C X16 sq. mm.
4C X 16 sq.mm.		1C X 4 sq. mm.
4C X 10 Sq.mm.		1C X 2.5 sq. mm.

2. APPLICABLE STANDARDS:

LT 1.1 kV Cable covered by this specification shall unless otherwise stated, be designed, manufactured, and tested in accordance with latest revisions of relevant Indian Standards/ IEC/ International Standards and shall conform to the regulations of local statutory authorities.

Standards	Title
IS-7098 (Part-I)	Specifications for Cross Linked Polyethylene PVC Sheathed Cables: Part 1-For Working Voltages up to and including 1100 Volts
IS-8130	Conductor for insulated electric cables & flexible cords.
IS-5831	PVC insulation and sheath of electric cables.
IEC-60228/3-	Conductor of insulated cables
IS 10810	Methods of tests for Cables
IEC-60502-1	Specification for power cables with extruded solid insulation with a rated voltage rating between 1 kV and 3 kV
IS-3975	Low carbon galvanized steel wires, formed wires & tapes for armouring of cables
IS 10418	Specification for Drums of Electric cables
IS 3961 Part 6	Recommended Current Ratings for Cables – XLPE insulated PVC sheathed cables
IS 4826	Hot-dipped galvanized coatings on round steel wires
IS 1554 (Part-1)	PVC insulated (heavy duty) electric cables
IEC 332-1	Test on electric cables on fire conditions
IS 10462-1	Fictitious calculation method for determination of dimensions of protective coverings of cables
ICEA T-31-610	Test method for conducting longitudinal water penetration resistance tests on blocked conductors
ASTM 2863	Oxygen Index Test
IEC 60754	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content

**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:

SL.NO.	CONDITONS	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 atmospheres.

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 as mentioned in above table.

4. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Parameter	Requirement		
1	Voltage level	1.1 kV (Earthed System)		
2	Nominal System voltage	415 V- 433V		
3	Supply frequency	50 Hz		
4	Variation in supply frequency	± 5%		
5	Types of Cables	4 core (3 phase + 100% neutral), 2 core (1 phase + 100% neutral), 1 core (1 phase)		
6	Cable components	4 CORE CABLE	2 CORE CABLE	1 CORE CABLE
	Conductor	Less than 150 sq.mm.		Stranded Aluminium
		150 sq.mm. and above		Watertight Stranded Aluminum
	Insulation	XLPE		
	Core identificationn strip	As per Clause No. 5. III of ENG-LV-3001	NA	
	Inner sheath	Extruded PVC ST-2 type	NA	
	Armour	Annealed low carbon heavily coated galvanized steel round wires	NA	
Outer sheath	PVC FRLSH ST-2 type			

5. GENERAL CONSTRUCTION:

The cross-linked polyethylene insulated (XLPE) 1.1 kV cable (Sioplas/ self-cured) shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – 1)/ relevant IEC/International standards and their latest amendments. All material used in the manufacturing of cables shall be virgin 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 for different laying configuration of cables shall be provided by the bidder

I. CONDUCTOR:

S. No.	Parameter	Requirement			
1	Material	Plain Aluminium, grade H2/H4 as per IS 8130			
2	Class	Class II			
3	Shape	No. of Cores		Size of cable	Shape
		Single Core Cable		2.5 sq.mm. 4 sq.mm.	Stranded Non-Compacted Circular
				16 sq.mm. and above	Stranded Compacted Circular
		Two Core Cable		10 sq.mm.	Stranded Non-Compacted Circular
				16 sq.mm. and above	Stranded Compacted Shaped
		Four Core Cable		10 sq.mm.	Stranded Non-Compacted Circular
16 sq.mm. and above	Stranded Compacted Shaped				
4	No. of strands & electrical parameters	Nominal size of conductor mm ²	Min. number of strands	Max. DC resistance @ 20 deg C (Ohm/km)	Conductor Short circuit current rating for 1 second(kA)
		2.5	3	12.1	0.235
		4	3	7.41	0.376
		6	3	4.61	0.564
		10	7	3.08	0.94
		16	6	1.91	1.50
		25	6	1.20	2.35
		35	6	0.868	3.31
		50	6	0.641	4.70
		95	15	0.320	8.93
		150	15	0.206	14.2
		185	30	0.164	17.39
		240	30	0.125	22.6

		300	30	0.10	28.20
		630	53	0.0469	59.22
6	Longitudinal water sealing of conductor (For 150 sq.mm.and above only)	<p>a) Non-conductive water swellable yarn/tape/ combination of both shall be provided in between interstices of the conductor.</p> <p>b) 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.</p> <p>c) It shall not affect the electrical conductivity of the conductor.</p>			
7	Cleanliness and uniformity	<p>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.</p> <p>b) Stranded Conductor shall be free from oil traces & aluminum dust. Conductor (after stranding) shall be super cleaned.</p> <p>c) Traces of aluminum dust on conductor shall not be acceptable.</p>			
8	Raw material supplier	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta only.			
9	Diameter of conductor (For single core cable only)	To be specified by bidder			
10	Weight of conductor/km (approx.)	Nominal size of conductor		Min. weight of conductor	
		mm ²		(kg/km/core)	
		2.5		6.5	
		4		10.4	
		6		15.6	
		10		26	
		16		42	
		25		65	
		35		91	
		50		130	
		95		247	
150		390			
185		482			

		240	625
		300	780
		630	1640

II. INSULATION:

S. No.	Parameter	Requirement
1	Material and extrusion process	XLPE insulation shall be applied through extrusion process.
2	Curing process	Curing shall be done by Sioplas/ self-curing method.
3	Min. thickness of Insulation	As per Table no. 3 of IS 7098 part 1. Tolerance on thickness shall be as per Clause no. 9.3 of IS 7098—Part 1
4	Raw material supplier	(i) XLPE compound shall be super cleaned and procured from reputed raw material suppliers viz., Dow, Borealis, Hanwa Kalpana, KLJ only. (ii) XLPE compound from cable manufacturer may be considered only after evaluation of the compound manufacturing process.
5	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.
6	Insulation fitting to the conductor	(i) Insulation shall fit tightly to the conductor and shall be applied concentrically about the conductor in thickness consistent with the voltage classification. (ii) The insulation shall be so applied that it shall be possible to remove it without damaging the conductor.
7	Weight of core	To be specified by bidder

III. CORE IDENTIFICATION

4C Cable	Core color: 'red' for R phase, 'blue' for B phase, 'yellow' for Y phase & 'Black' for Neutral.
2C Cable	Core color: 'red' for phase, & 'Black' for Neutral.
1C Cable	For single core cable, XLPE insulation shall be black in colour.

IV. LAYING UP OF CORES

Laying up	(i) Cores shall be laid up together as per table-4 of Clause 11.2 of IS 7098, Part-1. (ii) Where necessary, the interstices shall be filled with non-hygroscopic material.
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V. INNER SHEATH (For Multi core cables only)

S. No.	Parameter	Requirement
1	Material	Black coloured Polyvinyl chloride (PVC) type ST-2 compound.
2	Thickness	(i) The sheath shall have adequate thickness, mechanical strength and elasticity, as per IS 5831. (ii) Min. thickness of inner sheath shall be as per Table no.5 of IS 7098 part 1. (iii) For 2 Core: Inner sheath shall be applied by pressure extrusion method. For 4 Core: Inner sheath shall be applied by normal extrusion process.
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 may be considered only after evaluation of the compound manufacturing process.

VI. ARMOUR (For Multi core cables only)

S. No.	Parameter	Requirement	
1	Material	Annealed (soft) low carbon hot dipped heavily coated galvanized round steel wires.	
2	Compliance to Standard	It shall comply with the requirements of IS 3975 along with the latest amendments. Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires. Zinc coating shall be heavily coated as per IS 4826:1979.	
4	Approx. Armour Short circuit rating of armour for 1 sec (kA)	Area of Conductor (sq.mm.)	Short circuit rating of Armour for 1 sec (kA)
		4	1.37
		6	1.53
		10	1.88
		16	2.54
		25	3.17

		35	4.30
		50	5.22
		95	6.97
		150	10.98
		240	13.92
		300	16.18
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	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 Kg/km	To be furnished by Bidder	
9	Raw material supplier	Armour steel shall be procured from reputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL, Bansal (BWIL)	

VII. Outer Sheath

S. No.	Parameter	Requirement
1	Material	Polyvinyl chloride (PVC) ST-2 FRLSH type compound (as per IS 5831) with ' lead naphthenate ' additive.
2	Configuration	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with ' lead naphthenate ' additive as 'termite & rodent repellent' shall be applied by extrusion process. The outer sheath shall have adequate thickness, mechanical strength and elasticity, as per IS 5831. Thickness of outer sheath shall be as per Table no. 8 of IS 7098 part 1.
3	Colour	Blue, colour code: 103 as per IS 5:2007.
4	Surface uniformity	(i) The outer sheath shall be ultraviolet protected for operation in direct sunlight. (ii) Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.

5	Raw material supplier	PVC compound shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam
		PVC compound from cable manufacturer may be considered only after compound manufacturing process evaluation.
6	Weight of outer sheath kg/km	To be provided by bidder
7	Weight of complete cable Kg/km	To be provided by bidder
8	Overall diameter of cable	To be provided by bidder

VIII. Other Requirements

Parameter	Requirement
End seal	Adhesive coated polyolefin heat shrinkable end caps shall be provided on both ends of cable.

6. MARKING:

Wooden drums shall be free from sharp edges and visual defects.

Cable length on one drum shall be:

- (a) 4 Core Cable – 95 sq.mm. to 300 sq.mm. – 500 meters with + 5% tolerance
- (b) 4 Core Cable – 16 sq.mm. to 50 sq.mm. – 1000 meters with + 5% tolerance
- (c) 2 Core & 1 Core Cables – 1000 meters with + 5% tolerance (as per PO terms and conditions)

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 (as per PO terms)
- 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. The following details shall be **embossed** on the **outer PVC sheath**.

Embossing shall be clearly visible. **At interval of every 1 meter, following details to be embossed:**

- a) Sequential meter marking (**shall be marked through printing**)
- b) Property of TPCODL/TPNODL/TPSODL/TPWODL
- c) Manufacturer name
- d) Month & Year of Manufacture
- e) Voltage grade
- f) Size of the cable
- g) Purchase Order no.
- h) Cable code

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 TPCODL/TPNODL/TPSODL/TPWODL's authorized representative. All the components should also be type tested as per the relevant standards. The following tests shall be necessarily conducted on the 1.1 kV cables in addition to others specified in IS/IEC standards.

7.1 ACCEPTANCE TESTS

All acceptance tests mentioned below shall be witnessed by TPCODL/TPNODL/TPSODL/TPWODL's representative during the inspection stage.

S.No.	Test name	Specific value		Test method	
		ClauseNo.	Reference Standard	Clause No.	Reference Standard
(I) Test on Conductor					
1	Conductor resistance test	ClauseNo. 5(A.4)	ENG-LV-3001	10	IS 10810-part 5
2	Test for non-conductivity of water swellable tape/yarn of conductor (For conductor size: 150 sq.mm. and above)	ClauseNo. 5(A.6)	ENG-LV-3001	Through multimeter	
3	Visual inspection for conductor cleanliness	ClauseNo. 5(A.7)	ENG-LV-3001	Check for presence of any Aluminium dust	

4	Tensile test (non-compacted conductor only)	Clause No.3.1	IS 8130	8	IS 10810-part 2
5	Wrapping test (non-compacted conductor only)	Clause No.6.2.2	IS 8130	8	IS 10810-part 3
6	Conductor water penetration test	ICEA T-31-610			
(II) Test on Insulation					
7	Tensile strength & Elongation at break (before ageing)	Table 1	IS 7098 parts 1	8	IS 10810-part 7
8	Insulation thickness	Table 3	IS 7098 parts 1	8	IS 10810-part 6
9	Depth of embedded, extruded colourline (For multi-core cable only)	Max depth 50% of insulation thickness	ENG-LV-3001	Through profile projector/ magnifying optical scale	
10	Brightness of embedded, extruded colourline (For multi-core cable only)	Clause No. 5.C	ENG-LV-3001	Visual check from a distance of 1 meter	
11	Hot set test	Table 1	IS 7098-part 1	8	IS 10810-part 30
12	Surface smoothness of insulation	Clause No. 5(B.7)	ENG-LV-3001	To be checked by inspector	
(V) Test on Inner sheath					
13	PVC thickness	Table 5	IS 7098 parts 1	8	IS 10810-part 6
14	Colour of inner sheath	Clause No. 5 (D.1)	ENG-LV-3001	To be checked by inspector	

(VI) Test on Armour (for multicore cables only)

15	Tensile test	8	IS 3975	IS 1608
16	Mass of zinc coating	Table 1 Heavily coated soft wire	IS 4826	IS 6745
17	Uniformity of zinc coating	9	IS 3975	IS 2633
18	Adhesion test	9	IS 3975	IS 3975
19	Diameter	Table 6	IS 7098 parts 1	Value to be measured by inspector
20	No. of wires & Coverage %	ClauseNo. 5(E.6)	ENG-LV-3001	Value to be measured by inspector

(VII) Test on PVC Outer Sheath

21	Thickness		IS 7098 parts 1	IS 10810 Part 6
22	Tensile strength and Elongation at break (before ageing)	Table 2	IS 5831	8 IS 10810 part 7
23	Colour of outer sheath	ClauseNo. 5 (F.3)	ENG-LV-3001	To be checked by inspector
24	Surface uniformity of outer sheath (onfull drum)/ shall befree from any damage-void, nick, cavity.	ClauseNo. 5 (F.4)	ENG-LV-3001	Through rewinding of drum (As per TPCODL/TPNODL/TPSODL /TPWODL specification)
25	Anti-termite and rodent property test in PVC outersheath	Chemicaltest	As per manufacturer Process/ Method	To be checked by inspector

26	Flammability test	IS 10810-part 61		
27	Oxygen index	IS 10810-part 58		
28	Temperature Index test	IS 10810-part 64		
29	Acid gas generation	IS 10810-part 59		
30	Smoke density	IS 10810-part 63		
(VIII) Tests for complete cable				
31	High voltage test	7.2 kVfor 5 minutes As per Clauseno. 16.2.1	IS 7098 parts 1	8 IS 10810 part 45
(IX) Additional tests				
32	Raw material consumption	Clause No. A.8, B.4, D.3, E.9, F.5	Document verification as proof to be submitted	
		Invoice to be shown from procurement to consumption		
33	Sequential marking check	Clause no. 6.ii	ENG-LV-3001	To be checked by inspector
34	Cable drumlength verification	Clause no. 6	ENG-LV-3001	To be checked by inspector
35	Packaging of cable-on-cabledrum	By recyclable PVC sheet- As per Clauseno.12	ENG-LV-3001	To be checked by inspector
36	End caps	Clause No. G	ENG-LV-3001	To be checked by inspector

37	Weight of conductor Kg/km	To be checked by inspector
38	Weight of core Kg/km	To be checked by inspector
39	Weight of armour Kg/km	To be checked by inspector
40	Weight of complete cable Kg/km	To be checked by inspector
41	Overall approx. diameter of complete cable	To be checked by inspector

7.2 ROUTINE TESTS

Test	Clause No.	Reference Standard
Conductor resistance test	15.3	IS 7098-part 1
High voltage test with power frequency	15.3	IS 7098-part 1

7.3 TYPE TESTS

S.No.	Test	Specific value		Test method	
		Clause No.	Reference Standard	Clause No.	Reference Standard
Tests on Conductor					
1	Conductor resistance test	Table 2	IS 8130	10	IS 10810 part 5

2	Conductor water penetration test (For conductor size - 150 sq.mm. and above)	ICEA T-31-610	ICEA T-31-610	4	ICEA T-31-610
3	Tensile strength (For non-compacted conductor)	6.2.1	IS 8130	8	IS 10810 part 2
4	Wrapping test (For non-compacted conductor)	6.2.2	IS 8130	8	IS 10810 part 3
Tests on Insulation					
5	Tensile strength & Elongation at break (Before ageing)	Table 1	IS 7098 part 1	8	IS 10810 part 7
6	Ageing in air oven	Table 1	IS 7098 part 1	8	IS 10810 part 11
7	Tensile strength & Elongation at break (After ageing)	Table 1	IS 7098 part 1	8	IS 10810 part 7
8	Tests for thickness of insulation	Table 3	IS 7098 part 1	8	IS 10810 part 6
9	Hot set test	Table 1	IS 7098- part 1	8	IS 10810 Part 30
10	Shrinkage test	Table 1	IS 7098 part 1	8	IS 10810 part 12
11	Gravimetric test (Water absorption)	Table 1	IS 7098 part 1	8	IS 10810 part 33
12	Volume resistivity/ Insulation Resistance	Table 1	IS 7098 part 1	8	IS 10810 part 43
Tests on Inner Sheath					

13	PVC thickness	Table 5	IS 7098 part 1	8	IS 10810 part 6
Tests on Outer Sheath (PVC)					
14	Flammability test for outer sheath	Clause No. 16.3	IS 7098 Part 1	As per IEC 332-part 1	
15	Tensile strength and Elongation at break (Before ageing)	Table 2	IS 5831	8	IS 10810 part 7
16	Tensile strength and Elongation at break (After ageing)	Table 2	IS 5831	8	IS 10810 part 7
17	Variation due to ageing	Table 2	IS 5831	8	IS 10810 part 7
18	Loss of mass test	Table 2	IS 5831	8	IS 10810 part 10
19	Shrinkage test	Table 2	IS 5831	8	IS 10810 part 12
20	Hot deformation test	Table 2	IS 5831	8	IS 10810 part 15
21	Heat shock test	Table 2	IS 5831	8	IS 10810 part 14
22	Thermal stability test	Table 2	IS 5831	Append ix B	IS 5831:1984
23	Oxygen index	As per ASTM 2863			
24	Temperature index	ASTM 2863			
25	Acid gas generation	IEC 60754			
26	Smoke density	ASTM 2843			
Tests on Armour for multi-core Cable					

27	Tensile test	8	IS 3975	6	IS 1608
28	Torsion test	8	IS 3975	7	IS 1717
29	Wrapping test	8	IS 3975	5	IS 1755
30	Resistance test	8	IS 3975	8	IS 10810 Part 42
31	Mass of zinc coating	Table 1	IS 4826	6	IS 6745
32	Uniformity of zinc coating	9	IS 3975	4	IS 2633
33	Adhesion test	9	IS 3975	9.3	IS 3975
Tests on complete cable					
34	High voltage test	7.2 kV for 5 minutes As per Clause no. 16.2	IS 7098 part 1	8	IS 10810 Part 45

8. TYPE TEST CERTIFICATES:

The bidder shall furnish the type test report of **1.1 kV** cable for the tests as mentioned in Clause no. 7 of this specification and as per reference standards.

Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA/ Approved labs by TATA ODISHA DISCOMs only. Type test report shall be submitted for the type, size and rating of the cable mentioned in the bid/ OR for any size higher (than required) of similar type and similar voltage grade. Conductor Water penetration test as per ICEA T 31-610 shall be conducted at CPRI/ERDA Approved labs by TATA ODISHA DISCOMs only.

Type test should have been conducted in certified test laboratories during the period not exceeding from the date of 10 years from the date of opening of 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 type tests, if any) not carried out, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL.

In case the type test certificates are dated beyond 5 years and up to 10 years, though the basic component design of cable is same, then acceptance for '*no change in design*' shall be submitted by bidder on their organization's letter head.

TPCODL/TPNODL/TPSODL/TPWODL will have the rights to accept/reject these type test reports.



Specification No: [ENG-LV-3001](#)

Specification Name:

TECHNICAL SPECIFICATION FOR 1.1 kV XLPE
POWER CABLE

9. PRE-DISPATCH INSPECTION:

Inspection shall be carried out by duly authorized representative of TPCODL/ TPNODL/ TPSODL/ TPWODL.

The 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 may be made at any stage of manufacturing at the discretion of TPCODL/TPNODL/TPSODL/TPWODL and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection.

Inspection by TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specification.

Dispatch of material: 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 the supplied material:

- a) Test reports
- b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
- c) Invoice in duplicate
- d) Packing list
- e) Delivery Challan

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.

11. GUARANTEE:

The bidder shall confirm for guarantee towards design, material, workmanship & quality of process / manufacturing for integrated product delivered under the contract.

In the event any defect is found by TPCODL/TPNODL/TPSODL/TPWODL, up to a period of at least 60 months from the date of commissioning or 72 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 their own costs, within mutually agreed time frame, and to the entire satisfaction of TPCODL/TPNODL/TPSODL/TPWODL, failing which TPCODL/TPNODL/TPSODL/TPWODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPCODL/TPNODL/TPSODL/TPWODL's own charges (@ 20% of expenses incurred), from the Bidder or from 'Security cum Performance Deposit' as the case may be.

Free replacement: 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 TPCODL/TPNODL/TPSODL/TPWODL.

12. PACKING AND TRANSPORT:

- a) **Standard length of Cable:** The cable shall be supplied in continuous **standard length** as per Clause no.6 of this specification.
- b) **Filling condition:** Drum shall not be overfilled.
- c) **Cable drum:** The cable shall be wound on non-returnable drums without any extra cost to TPCODL/TPNODL/TPSODL/TPWODL 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.
- 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.
- Material preservation shall be applied to the entire drum.
- f) The bottom end of cable should be clamped on drum by jute or nylon rope.
- g) **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. The drums shall withstand normal handling and transport.
- h) **Packaging shall be as per climate change perspective.**

The cable wound on cable drum shall be covered by recyclable PVC sheet for dustproof.

TPCODL/TPNODL/TPSODL/TPWODL encourages the use of environmentally friendly packaging.

13. TENDER SAMPLE:

Not Applicable

14. QUALITY CONTROL:

The bidder shall submit a 'Quality Assurance Plan' followed by him in respect of bought out items, items manufactured by him, Raw materials in process, Final inspection Packaging & Marking. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPCODL/TPNODL/TPSODL/TPWODL reserves the sole rights for the type test of 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.

TPCODL/TPNODL/TPSODL/TPWODL's nominated representative shall have free access to the bidder'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 International / Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder will have to submit (after placement of RC) technical compliance document and drawing of cable as per RC line items for getting approval before mass manufacturing. Bidder shall start manufacturing of mass quantity only after getting CAT-A approved drawings and technical compliances or as per intimation from TPCODL/TPNODL/TPSODL/TPWODL.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following documents shall be submitted along with the bid for approval after award of RC/PO:

- a) Completely filled-in clause wise compliance of this specification
- b) Type test Certificates for each specified test
- c) Cross sectional drawing of the cable
- d) Rating factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and different laying configuration of cables.

Following documents shall be submitted after award of contract for approval before manufacturing:

- a) Completely filled-in clause wise compliance of this specification
- b) Cross sectional drawing of the cable

All the Documents and Drawings shall be in English Language.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder to submit clause wise compliance.



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TECHNICAL SPECIFICATION FOR 1.1 kV XLPE
POWER CABLE

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-3002

**Specification Name : TECHNICAL SPECIFICATION FOR LT AB cable- 3 cores /
Insulated messenger / Street Light**

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



Specification No: [ENG-LV-3002](#)

Specification Name:
Specification for LT AB cable - 3
Cores/ insulated messenger/ street
light

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20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at store/site and performance of LT ABC cable for trouble free and efficient operation. The specific requirements are covered in the enclosed technical data sheet.

The sizes specified in the specifications are tabulated below:

SI.No	Phase Conductor (No. of Cores x Size in sqmm)	Insulated Messenger (No. of Cores x Size in sqmm)	Streetlight (No. of Cores x Size in sqmm)
1	3C x 95	1C x 70	1C x 16
2	3C x 70	1C x 50	1C x 16
3	3C x 50	1C x 35	1C x 16
4	3C x 35	1C x 25	1C x 16
5	1C x 35	1C x 25	—
6	3C x 50	1C x 35	—
7	3C x 35	1C x 25	—

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-398 (Part IV)	Aluminum conductor for overhead transmission purposes- Part IV Aluminum alloy stranded conductor
IS-5216	Guide for safety procedures and practices in electric works
IS-7098 (part-I)	Specification for Cross-linked_ polyethylene insulated PVC sheathed cables- Part I for working voltage up to and including 1100 volts.
IS-8130	Specification for Conductor for insulated electric cables & flexible cords.
IS-10418	Specification for drums for electric cables
BS-5468	Cross-linked polyethylene insulation of electric cables
IEC-540	Test methods for insulations and sheaths of electric cables and cords
IEC-60228/3	Conductor for insulated cables
IEC-60502-1	Power cables with extruded insulation and their accessories for rated voltages from 1kV (Um=1.2kV), up-to 30kV(Um=36kV)-Part 1:Cables for rated voltages of 1 kV /Um=1,2kV) and 3kV/Um=3.6kV)
ASTM G-53/DIN 56687	UV testing of XLPE insulation
SANS 1713	South African Standard for Aerial Bunched conductor
IS14255	Aerial Bunched conductors for working voltages up to and including 1100 volts

3. CLIMATIC CONDITIONS:

SL.NO.	CONDITIONS	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 as mentioned above.





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4. GENERAL TECHNICAL REQUIREMENTS:





SL NO	DESCRIPTION	UNITS	3C×95 mm ² (P)+1C×70mm ² (M)+1CX16 mm ² (StreetLight)	3C X 70 mm ² (P)+ 1C X 50 mm ² (M) +1C x 16 mm (Street Light)	3C×50 mm ² (P)+1C×35mm ² (M)+1CX 16mm ² (Street Light)	3C X 35 mm ² (P) + 1C X 25(M)+ 1C x 16 mm ² (StreetLight)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase and streetlighting core twisted around the insulated neutral cum messenger wire			
2	Size of Aerial Bunched cable		3C×95 mm ² (P)+1C×70 mm ² (M)+1CX 16 mm ² (Street Light)	3C X 70 mm ² (P)+ 1C X 50 mm ² (M) +1C x 16 mm (Street Light)	3C×50 mm ² (P)+1C×35 mm ² (M)+1C X16 mm ² (Street Light)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)+ 1C x16 mm ² (Street Light)
3	Rated Voltage	kv	1.1	1.1	1.1	1.1
4	System Voltage	kv	0.415- 0.433	0.415 - 0.433	0.415 - 0.433	0.415 - 0.433
5	Nominal Area of Phase Conductor	mm ²	95	70	50	35
6	Nominal Area of Messenger	mm ²	70	50	35	25
7	Phase Core		Stranded compacted circular aluminum conductor, Extruded XLPEinsulated			
8	Neutral core & MessengerWire		Stranded compacted circular aluminum alloy conductor, Extruded XLPEinsulated			
9	Maximum conductor temperature during continuous operation	Deg C	90	90	90	90
10	Maximum conductor temperature during short circuit	Deg C	250	250	250	250
11	Phase Core RYB insulated					
a)	Conductor					
(i)	Material		EC Grade Aluminum of H4Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4Grade to IS: 8130:1984	EC Grade Aluminum of H4Grade to IS: 8130:1984

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(ii)	No. of Cores & Nominal Size	mm ²	3Cx95	3Cx70	3Cx50	3Cx35
(iii)	Minimum number of strand wires		15	12	6	6
(iv)	Diameter		Shall be suitably selected to meet conductor DC resistance as per IS 8130			
(v)	Max. DC Resistance of phase conductor at 20 deg.C	Ω/km	0.32	0.443	0.641	0.868
(vi)	Shape of Conductor		Stranded Compacted Circular			
(vii)	Short Circuit current rating of conductor for 1 sec	kA	8.93	6.58	4.7	3.29
(viii)	Continuous current rating in air at 40Deg. C	A	230	200	149	125
b)	Insulation					
i)	Material		XLPE Insulation as per IS 14255:1995			
ii)	Nominal Thickness	mm	1.5	1.5	1.5	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255			
12	Street light core					
a)	Conductor					
i)	Material		EC grade aluminum of H4 grade to IS: 8130:1984			
ii)	Nominal size	mm ²	16	16	16	16
iii)	Nominal no. of wire		7	7	7	7
iv)	Max DC resistance at 20 deg. C	Ohm/km	1.91(As per IS 8130:1984)	1.91(As per IS 8130:1984)		
v)	Shape of conductor		Stranded compacted circular			
b)	Insulation					
i)	Material		As per IS: 14255:1995			
ii)	Nominal thickness	mm	1.2	1.2	1.2	1.2
iii)	Tolerance in Insulation Thickness		XLPE Insulation as per IS 14255:1995			
13	Neutral Cum Messenger Wire					
a)	Messenger wire					
i)	Material		Aluminum Alloy Wire			
ii)	Nominal size	mm ²	70	50	35	25

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iii)	No. and Nominal Dia. of each strand	No./m m	7/3.57	7/3.02	7/2.54	7/2.14
iv)	Calculated Maximum resistance at 20 deg C	ohm/k m	0.492	0.689	0.986	1.38
v)	Shape of conductor		Stranded circular-compacted			
vi)	Short circuit rating for 1 sec	kA	6.58	4.7	3.29	2.35
vii)	Material of insulation		XLPE Insulation as per IS 14255			
viii)	Thickness of insulation	mm	1.5	1.5	1.2	1.2
ix)	Min Breaking load of messenger wire	KN	19.7	14	9.8	7
14	Core Identification		RIDGES for Phase identification: 1 ridge for R phase 2 ridges for Y phase 3 ridges for B phase For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.			
15	Formation of cable		3 phase cores & 1 street lighting core xlpe insulated are laid up over insulated messenger with R-H direction of Lay			
17	Maximum conductor temperature during continuous operation (RYBN)	Deg C	90	90	90	90
18	Maximum conductor temperature during Short circuit (RYBN)	Deg C	250	250	250	250
19	Standard Drum Length	Mtr	500	500	500	500
20	Tolerance in Drum length	%	+/-5%	+/-5%	+/-5%	+/-5%
21	Reference Standard		IS 14255			
22	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100V, size of cable, ISI, month & year of manufacturing, Property of TPCODL/TPNODL/TPWODL/TPSODL, PO number & date.			

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SL NO	DESCRIPTION	UNITS	1C X 35 mm ² (P) + 1C X 25 mm ² (M)	3C×50 mm ² (P)+1C×35 mm ² (M)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase core twisted around the insulated neutral earth cum messenger wire		
2	Size of Aerial Bunched cable		1C X 35 mm ² (P) + 1C X 25 mm ² (M)	3C×50 mm ² (P)+1C×35 mm ² (M)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)
3	Rated Voltage	kV	1.1	1.1	1.1
4	System Voltage	kV	0.415-0.433	0.415-0.433	0.415-0.433
5	Nominal Area of Phase Conductor	mm ²	35	50	35
6	Nominal Area of Messenger	mm ²	25	35	25
7	Phase Core		Stranded compacted circular Aluminum Conductor, Extruded XLPE Insulated		
8	Neutral core & Messenger Wire		Stranded compacted circular aluminum alloy conductor, Extruded XLPE insulated		
9	Maximum conductor temperature during continuous operation	Deg C	90	90	90
10	Maximum conductor temperature during shortcircuit	Deg C	250	250	250
11	Phase Core RYB insulated				
a)	Conductor				
(i)	Material		EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984
(ii)	No. of Cores & Nominal Size	mm ²	1C*35	3C*50	3C*35
(iii)	Minimum number of Strand wires		6	6	6
(iv)	Diameter		Shall be suitably selected to meet conductor DC resistance as per IS 8130		

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(v)	Max. DC Resistance of phase conductor at 20 deg. C	Ω/km	0.868	0.641	0.868
(vi)	Shape of Conductor		Stranded Compacted Circular		
(vii)	Short Circuit current rating of conductor for 1 sec	kA	3.29	4.7	3.29
(viii)	Continuous current rating in air at 40Deg.C	A	125	149	125
b)	Insulation				
i)	Material		XLPE Insulation as per IS 14255:1995		
ii)	Nominal Thickness	mm	1.2	1.5	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255:1995		
c)	Messenger wire				
i)	Material		Aluminum Alloy Wire	Aluminum Alloy Wire	Aluminum Alloy Wire
ii)	Nominal size	mm ²	25	35	25
iii)	No. and Nominal Dia. of each strand	No./m m	7/2.14	7/2.54	7/2.14
iv)	Calculated Maximum resistance at 20 degC	ohm/k m	1.38	0.986	1.38
v)	Shape of conductor		Stranded circular-compacted	Stranded circular-compacted	Stranded circular-compacted
vi)	Short circuit rating for 1sec	kA	2.35	3.29	2.35
vii)	Material of insulation		XLPE Insulation as per IS 14255	XLPE Insulation as per IS 14255	XLPE Insulation as per IS 14255
viii)	Thickness of insulation	mm	1.2	1.2	1.2
ix)	Min Breaking load of messenger wire	KN	7	9.8	7

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12	Core Identification		RIDGES for Phase identification: 1 ridge for R phase 2 ridges for Y phase 3 ridges for B phase. For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.		
13	Formation of cable		1 phase core XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay
14	Continuous current rating in air at 40DegC of phase conductor	A	125	149	125
15	Maximum conductor temperature during continuous operation (RYBN)	Deg C	90	90	90
16	Maximum conductor temperature during short circuit (RYBN)	Deg C	250	250	250
17	Standard Drum Length	Mtr	500	500	500
18	Tolerance in Drum length	%	+/-5%	+/-5%	+/-5%
19	Reference Standard		IS 14255		
20	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100V, size of cable, ISI, month & year of manufacturing, Property of TPCODL/ TPNODL/ TPWODL/ TPSODL, PO number & date.		

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5. GENERAL CONSTRUCTION

5.1 Conductors:


- 5.1.1 All conductors shall be Class 2, Stranded, compared circular, High electrical conductivity, Aluminum, Grade H2/H4 as per IS 8130:1984.
- 5.1.2 Before stranding, the conductor shall be circular in cross section, uniform in quality, solid, smooth and free from scale, sharp edges and other defects.
- 5.1.3 Conductor shall conform to the standards for permissible number of joints in any one of the single wires forming every complete length of conductor, for location of joints in same layer of conductors and for method of making such joints. No joint shall be made in any conductor after it is stranded.
- 5.1.4 All conductors shall be of high electrical conductivity Aluminum as specified, conforming to requirement of relevant standards.

5.2 INSULATION

- 5.2.1 The insulating material shall be Cross Linked Polyethylene (XLPE) applied by extrusion as per latest IS:14255 and its latest amendments.
- 5.2.2 The insulation shall be both heat and moisture resistant and shall be suitable for continuous operation at conductor temperature of 90 Degree Centigrade, rising momentarily to 250 Degree Centigrade under short circuit conditions.
- 5.2.3 It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. The XLPE insulation shall be ultraviolet protected for operation in direct sunlight.
- 5.2.4 It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. Average thickness of the insulation shall not be less than nominal value specified in latest IS:14255 with latest amendments. The tolerance on the thickness shall be as specified in latest IS:14255.
- 5.2.5 The insulating material shall have excellent electrical properties with regard to resistivity, dielectric constant and loss factor and shall have high tensile strength and resistance to abrasion. This shall not deteriorate at elevated temperatures or when immersed in water. The insulation shall be preferably fire resistant and resistant to chemicals like acids, alkalis, oils and ozone.

5.3 MESSENGER WIRE

The insulated messenger wire shall be made of aluminum alloy, generally conforming to latest IS:14255. The conductor shall be of heated aluminum-magnesium-silicon alloy wires containing approximate 0.5% magnesium and approximately 0.5% silicon conforming to IS 398(Part 4). Insulation shall be as per IS 14255.

	<p>Specification No: ENG-LV-3002</p> <p>Specification Name: Specification for LT AB cable 3 Cores insulated messenger street light</p>
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5.4 CORE IDENTIFICATION

The following shall be embossed on the one side of the core:

RIDGES REQUIRED for Phase identification:

- 1 ridge for R phase
- 2 ridges for Y phase
- 3 ridges for B phase

For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.

5.5 LAYING OF CORES

Cores shall be laid up with a right-hand lay, and shall have a lay length not exceeding $28(d1+d2)$, where;

d1 is the core diameter, including sheath, in mm.

d2 is the diameter of the messenger, including the outer protective covering where applicable, in mm.

5.6 STRANDING

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfy all the relevant requirements of IS 398(Part-IV): 1994. The lay ratio of the different layers shall be within the limits given in IS 398(Part-IV): 1994. The successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded. The lay ratio of any layer shall not be greater than the lay ratio of layer immediately beneath it.


5.7 CABLE DRUM

Cables shall be furnished in the specified reels or coil lengths of 500 meters. Drums shall be of non-returnable wooden drums as per IS 10418:1982 and the drums should be free from defects such as through cracks, knots, warps and split. The ends of the cables shall be suitably sealed by means of non-hygroscopic sealing. The tolerance on the Drum length shall be +/- 5% / as per PO terms.

6. MARKING:

The cable shall carry the following information either stenciled on the drum or contained in a label attached to it:

- a) Reference to the Standards.
- b) Manufacturer's name.
- c) Type of cable.
- d) Voltage grade.
- e) Number of cores.
- f) Nominal cross-section area of the conductor.
- g) Length of the cable on the drum.
- h) Length of the cable perm.

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- i) Marking of PO
- j) Direction of rotation of the drum.
- k) Gross mass.
- l) Country of manufacture.
- m) Year of manufacture.
- n) ISI Certification mark.

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 shall also be type tested_ as per the relevant standards. Following tests shall be necessarily conducted on the LT ABC cables in additions to others specified in the IS/IEC/SANS Standards.

7.1 ACCEPTANCE TESTS

- i) Tensile test (for phase/street light conductor)
- ii) Wrapping Test (for phase/street light conductor)
- iii) Breaking load test for messenger conductor
- iv) Elongation test for messenger conductor
- v) Conductor Resistance test for messenger and phase conductor.
- vi) Test for thickness of insulation
- vii) Hot set test for XLPE insulation
- viii) Tensile strength and elongation test at break for test of insulation
- ix) High voltage test.
- x) Insulation resistance (volume resistivity test).
- xi) UV test for XLPE insulation (black carbon content and dispersion test).


7.2 ROUTINE TESTS

- i) Conductor resistance test
- ii) High voltage test

7.3 TYPE TESTS

- i) Tests on phase/street light Conductor
 - a) Tensile test
 - b) Wrapping test
 - c) Resistance test
- ii) Tests on messenger Conductor
 - a) Breaking load test
 - b) Elongation test.
 - c) Resistance test.

iii) Physical Test for XLPE Insulation:

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- a) Tensile strength and elongation at break
- b) Ageing in air oven
- c) Hot test
- d) Shrinkage test
- e) Water absorption (gravimetric)
- f) Carbon black:
 - 1) Content
 - 2) Dispersion.
- g) Insulation resistance (Volume resistivity) test.
- iv) Test for thickness insulation.
- v) High voltage test.

7.4 OPTIONAL TESTS

- i) Bending Test

8. TYPE TEST CERTIFICATES:


The Bidder shall furnish the type test certificates of the cable for the tests as mentioned as 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 in certified Test laboratories 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, or any/all type tests (including additional 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 manufacturing 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

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- 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 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 30 months from the date of commissioning or 36 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 30/36 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.

The 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:

The cable shall be wound on wooden drums and packed in line with requirements of IS 10418-1982. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.

Bidder shall ensure that all 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. TENDER SAMPLE:

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/ TPNODL/ TPSODL/ TPWODL).

14. QUALITY CONTROL:

The bidder shall submit Quality Assurance Plan (QAP) indicating the various stages of inspection,

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TPSODL

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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.

17. SPARES, ACCESSORIES AND TOOLS

The bidder shall provide a list of complete set of accessories and tools required for erection and maintenance of LT ABC along with the installation procedure.





18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on TPCODL/ TPNODL/ TPSODL/ TPWODL 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 brochure.

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.

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SL.No	Description	For Approval	For Review information	Final Submission
1	Technical Particulars	✓		✓
2	Manual/Catalogues/drawings for all components		✓	
3	Technical details and test certificates of XLPE compound		✓	✓
4	Cross sectional area of the cable		✓	✓
5	Installation instructions		✓	✓
6	Instructions for use		✓	✓
7	Transport/shipping dimension drawing		✓	✓
8	QA & QC Plan	✓	✓	✓
9	Routine, Acceptance and type test certificates	✓	✓	✓
10	Fault level calculation for armor and manual	✓	✓	✓

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.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS: (To be furnished by bidder)

All clauses and points in the specification to be complied as per **Clause Number 4.0(GENERAL TECHNICAL PARAMETERS) & Clause Number 5.0 (GENERAL CONSTRUCTION)**

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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-3003

Specification Name : Accessories of LT AB cables (Insulated Messenger)

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
13-01-2023	13-01-2023	16-01-2023	16-01-2023	17-01-2023	17-01-2023

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TPWODL*



Specification No: [ENG-LV-3003](#)

Specification Name:
Specification for Accessories of LT AB cables
(Insulated Messenger)

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1. SCOPE

The Specification covers the design, manufacture, supply, testing preferably at manufacturer's works before supply and delivery of Accessories for anchoring, suspending & making connections to Aerial Bunched Cables with insulated neutral cum messenger rated 1100 volts. Aforesaid items shall include loading and unloading at anywhere in Odisha.

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	Description
NFC 330-020	Insulating piercing connector
NFC 330-021	Junction Sleeve
NFC 33-209 IS 14255	LV Aerial Bunched Cables
NFC 20-540	Environment Testing for Outdoor
NFC 33-004	Electrical Ageing Test
NFC 33-040	Suspension Equipment
NFC 33-041	Anchoring Devices
NFC 33-042	Service Clamps

3. CLIMATIC CONDITIONS OF THE INSTALLATION

SL.NO.	CONDITIONS	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. Cm/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.

TPCODL/ TPNODL/ TPSODL/ TPWODL service area has heavy saline conditions the coast and high cyclonic intensity winds with speed up to 300km/h. 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

4.1 CABLE DATA

The Accessories of LT XLPE Insulated Aerial Bunched Cables (ABC) with insulated messenger are specified below:

- a. Since ABC accessories are to be used with **insulated messenger**, their design should incorporate specific features to prevent damage to the insulation which meeting the required electrical, mechanical & thermal requirements.
- b. All mechanical, electrical & thermal ratings should meet or exceed 90% of the corresponding ratings of the cable, or the values specified herein, whichever are more stringent.
- c. The accessories should provide "Double Insulation" so that a single point failure of insulation will not result in the system tripping.

The ABC Accessories shall consist of the following:

1	Insulation Piercing Connectors	For making tap-off/branch connectors/service (IPC) connector to an ABC line.
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2	Anchoring Assembly (AA)	For fitting onto a pole for anchoring the end of a length of ABC, or for a major change in direction.
3	Suspension Assembly (SA)	For supporting a length of ABC at an intermediate pole in a length, with small angle of deviation
4	Service clamp (SC)	For anchor Insulated service lines (armored or unarmored)
5	Junction Sleeves	For Phases, messengers & Street lighting conductor.
6	Eye Hook/ Eye Bolt with necessary clamp fittings and nuts & bolts	For fixing of cable accessories

4.2 INSULATION PIERCING CONNECTORS (IPC)

IPCs are designed to make a connection between the uncut main conductor and a branch cable conductor without having to strip either cable to expose the conductor instead the tightening action of the IPC will first pierce the Insulation, then make good electrical contact between the main end and branch conductor while simultaneously insulating and sealing the connection.

SL. NO.	DESCRIPTION	DESIRED VALUE		
		Main Size	Branch Size	Current Rating
1	IPC Type A	Bidder to specify	Bidder to specify	350 A
2	IPC Type B	Bidder to specify	Bidder to specify	200 A
3	IPC Type C	Bidder to specify	Bidder to specify	100 A
4	IPC Type D	Bidder to specify	Bidder to specify	100 A
5	Rated Voltage	0.415 kV - 0.433 kV		
6	System Frequency	50 Hz		
8	Maximum Tightening Torque (Nm)	Not exceeding 20 Nm for conductor cross-sections up to 95 sq.mm. & 30 Nm for conductor cross-section over 95 sq.mm. and up to 150 sq.mm.		
9	Insulation body	Weather, heat & UV resistant, flame retardant glass fiber reinforced black thermoplastic.		
10	Contact Plates	Tinned copper		
11	No. of contact bridges	Minimum 4 nos.		
12	Coating on contact plates	Tinning on copper		
13	Bolt	Material: Hot dip galvanized steel, minimum 8.8 grade Shape: Hex/semi-circular head square/round neck compatible with body design		
14	Shear off nut	Material: non-corrosive metallic Shape: shear off portion of nut shall have hexagonal shape. Rest of the portion of long nut shall have circular shape. Circlip or ring shall be provided beneath the shear off nut to rest the tightening tool.		

SL. NO.	DESCRIPTION	DESIRED VALUE
15	Compression Plate/ Belleville spring washer	Material: Anti-corrosive metal Shape: Square/ Rectangular compression plate or Belleville spring washer compatible to upper body shall be provided beneath the nut
16	Seals and End caps	Material: Elastomer seals and end cap shall be provided. The IPC shall be free from grease / gel for water protection. Elastomer seals shall be Blue colors.
17	Voltage withstand with Water emersion in kV	6kV in 1 Min

4.3 ANCHORING ASSEMBLY

- a. The clamps should be designed to Anchor LT AB cable with insulated messenger. The clamp should consist of an Aluminum alloy corrosion resistant castled body, bail of stainless steel and self-adjusting plastic wedges which shall anchor/hold the messenger.
- b. No losable part in the process of clamping arrangement.
- c. The clamp should conform to the standard NFC 33041 and 33042 or equivalent I.S. if any.
- d. The clamp body should be made of corrosion resistant Aluminum alloy, bail should be of stainless steel and wedges should be weather and UV resistant polymer.
- e. Ultimate tensile strength of the clamp should not be less than 12 KN for 25-35 Sq.mm, 15 KN for 50-70 Sq.mm and shall not be less than 20 KN for 70-95 sq.mm sized insulated AB cable respectively.
- f. Slip load of the clamp should not be less than 80% of Ultimate tensile strength (UTS) of relevant messenger wire.

	TECHNICAL PARTICULARS	DESIRED VALUE		
		(25-35 mm ² Insulated Messenger Wire)	(50-70 mm ² Insulated Messenger Wire)	(70-95 mm ² Insulated Messenger Wire)
1	Name & Address of the Manufacturer	To be furnished by Bidder		
2	Standard	NFC 33-041		
3	Range of messenger size	25-35 mm ² Insulated Messenger Wire	50-70mm ² Insulated Messenger Wire	70-95mm ² Insulated Messenger Wire
4	Type of design	wedge type		
5	Material of Clamp	Aluminium alloy corrosion resistant castled body, bail of stainless steel and self-adjusting plastic wedges		
6	Dimensions (mm)	GA To be Provided		
7	Approximate weight (Kg)	To be furnished by Bidder		
8	Ultimate Tensile Strength (KN)	12	15	20

SL.NO	TECHNICAL PARTICULARS	DESIRED VALUE		
		(25-35 mm ² Insulated Messenger Wire)	(50-70 mm ² Insulated Messenger Wire)	(70-95 mm ² Insulated Messenger Wire)
9	Slip	80% of UTS of relevant messenger cable		
10	Galvanization	All ferrous Part shall be Hot dip Galvanized as per IS 2633/2629		
11	Tolerance	+/-5%		
12	Marking	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's name or trademark, Year of Manufacturing.		

4.4 SUSPENSION CLAMP FOR INSULATED MESSENGER

- a. The clamp should be designed to hang LT AB cable with insulated messengers. The messengers should be fixed by an adjustable grip device. A movable link should allow longitudinal and transversal. The movement of the clamp body can accommodate small angle deviation of 30°.
- b. No losable part in the process of clamping arrangement.
- c. The clamp should conform to the standard NFC 33040 or equivalent I.S, if any.
- d. The clamp and the link made of Polymer should provide an additional insulation between the cable and the pole.
- e. The clamps and movable links should be made of weather and UV resistant glass fiber reinforced polymer.
- f. Clamps should be fixed with pole by eye hook / bracket/ eye bolt. Bracket should be made of corrosion resistant aluminum alloy.
- g. Ultimate tensile strength of the clamp should not be less than 16 KN for 70/95 Sq.mm & 50/70 Sq.mm and shall not be less than 12 KN for 25/50 sq.mm insulated neutral cum messenger respectively.

SL.NO	TECHNICAL PARTICULARS	DESIRED VALUE
1	Name & Address of the Manufacturer	To be furnished by Bidder
2	Standard	NFC 33-040
3	Range of conductor size	25-50 mm ² Insulated Messenger Wire 50-70 mm ² Insulated Messenger Wire 70-95 mm ² Insulated Messenger Wire
4	Type of design	Bolt less
5	Material for clamp Body	Made of weather UV resistant glass fiber reinforced polymer
6	Colour of Non-metallic parts	Black
7	Ultimate tensile strength	Ultimate tensile strength of the clamp should not be less than 16 KN for 70/95 Sq.mm & 50/70 Sq.mm and shall not be less than 12 KN for 25/50 sq.mm insulated neutral cum messenger respectively.
8	Slip	There should not be any slippage up to 300 N
9	Tolerance	+/-5%
10	Marking	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's name or trademark, Year of Manufacturing.

4.5 SERVICE CLAMPS

- a. The clamps should be designed to anchor insulated service lines (armored or unarmored) with 2/4 conductors.
- b. The clamps should be made of weather and UV resistant polymer.
- c. No losable part in the process of clamping arrangement
- d. The clamp should conform to the standard NFC 33042 or equivalent I.S., if any.
- e. Breaking load of the clamp should not be less than 3 KN.

4.6 JUNCTION SLEEVE

- a. The sleeves should be pre-Insulated for phases, messengers and street lighting conductors.
- b. Sleeve should be made of Aluminum, insulated with an Anti-UV black thermoplastic tube hermetically sealed two ends with 2 flexible rings.
- c. Dia. reference, size and strip length are indicated on the sleeve itself.
- d. Sizes needed: 16 sq.mm to 150 sq.mm for Aluminum XLPE insulated cable.
- e. Reference standard: NFC 33021 or equivalent I.S. if any.

4.7 EYE HOOKS/ EYE BOLTS

- a. Eye hooks/ Eye Bolts should be designed as to hold suspension clamps and dead-end clamps and to be installed with the pole clamp.
- b. Eyehooks should be made up of forged Galvanized steel.
- c. The clamps corrosion resistance should conform to the standards I.S. 2629 & I.S.2633.
- d. Bolts and nuts should be made of hot dip Galvanized steel according to VDE 0210 and VDE 0212.
- e. Ultimate Tensile strength (UTs) of the clamp be 20 KN or higher.

SL.NO	TECHNICAL PARTICULARS	DESIRED VALUE
1	Name & Address of the Manufacturer	To be furnished by Bidder
2	Application	To hold suspension clamp and Dead-End clamp with pole
3	Material	Mild Steel Grade E250 A, IS 2062
4	Finish Material	Hot dip galvanized Steel (As per IS 2633 with latest amendment,
5	Type of Hook	Flat Eye Hook
6	Type of Design	Forged Eye Hook
7	Dimension	As per GA Drawing
8	Ultimate Tensile Strength, Min	20 KN
9	General Tolerance	+/-5 %
10	Type of packing	40 Pcs in Gunny Bags
11	Marking	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's name or trademark, Year of Manufacturing.

5. GENERAL CONSTRUCTIONS/REQUIREMENTS

5.1 INSULATION PIERCING CONNECTORS (IPC)

- a. The housing shall be made entirely of mechanical and weather resistant plastic insulation material and no metallic part outside the housing is acceptable except for the tightening bolt.
- b. Any metallic part that is exposed must not be capable of carrying a potential during or after connector installation.
- c. Screws or nuts assigned for fitting with IPC (Insulating Piercing connector), must be fitted with torque limiting shear heads to prevent over tightening or under tightening (min & max torque values to be specified by Manufacturer).
- d. The IPC must perform piercing and connection on Main and Branch cable simultaneously.
- e. The IPCs shall be waterproof and the water tightness shall be ensured by appropriate elastomer materials and not by grease, gel or paste alone.
- f. Design of IPC should be such as to not cause damage to insulation of adjacent conductors due to vibration and relative movement during service.
- g. The connector shall have a rigid removable end cap which can be slide fitted onto the main connector body on either right or left by the installer (depending on site requirement) for sealing the cut end of the branch cable. Once the connector is fitted, it should not be possible to remove the cap without removing the connector.
- h. All the metallic parts of the connector should be corrosion resistant and there should not be any appreciable change in contact resistance & temperature after overloads & load cycling.
- i. The contact plates should be made of tinned copper.
- j. Elastomer seals and end cap shall be provided. The IPC shall be free from grease / gel for water protection. Elastomer seals shall be Blue colors.
- k. The Insulation material should be made of weather & UV resistant reinforced polymer.
- l. The outer metallic part should have potential free tightening bolts to allow safe installation on live lines.

The insulation piercing connectors shall be of the following type(s) depending on the applications.

Type	Description	Application
A	Insulation piercing multiple port (4 way) connector.	For providing service connection from ABC
B	Insulation Piercing Connector for networking	For main-to-main networking or branching of ABC to another ABC
C	Insulation Piercing Connector for Street Lighting	For street lighting/earthing connection from AB Cable
D	Bare Connector for Earthing/Neutral Connections	For Earthing connection from AB Cable

Standard size ranges for Type A multiple tap insulation piercing connector for service connector shall be as follows:

Type	Application	Method of Branch Connection	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
A	For service connections from Smaller size and Capacity AB Cable	dis-connectable	25 - 95	4 x (2.5) 6 – 35
	For service connections from Smaller size and Capacity AB Cable	dis-connectable	50 - 150	4 x (2.5) 6 – 35

Standard size ranges for Type B insulation piercing connectors for main to main networking or branching of ABC shall be as follows:

Type	Application	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
B	For Main-to-Main network connections from smaller size and Capacity AB Cable	16 - 95	16 - 95
	For Main-to-Main network connections from smaller size and Capacity AB Cable	25 - 150	25 - 150
	For Main-to-Main network connections from smaller size and Capacity AB Cable / Charging of Distribution Box	16 - 150	4 - 50
	For Main-to-Main network connections connections from smaller size and Capacity AB Cable / Charging of Distribution Box	16 – 95	4-35
	For Main-to-Main network connections connections from smaller size and Capacity AB Cable / Charging of Distribution Box	10 – 95	1.5 – 10 (16)

Standard size range for Type C, insulation piercing connector for street lighting

Type	Application	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
C	For Street Lighting connections	10 - 95	1.5 – 10

Standard size range for Type D, Bare connector for Earthing

Type	Application	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
D	For Earthing/Neutral Connections	10 - 95	1.5 – 10

5.2 ANCHORING ASSEMBLY

Each Anchoring Assembly shall include.

a. One number tension bracket.:

The tension bracket shall be made from a single piece of Aluminum alloy suitable for attachment to a pole either by 20mm galvanized eye hook (s) or two stainless Steel straps of 20 x 0.7 mmx 0.75 m.

The tension bracket should be designed to ensure the Flexible rope cannot slip out at any angle.

b. One number wedge type tension clamp

Wedge type clamps shall be used for clamping the messenger. The clamp shall be capable of clamping an uncut messenger so that it can continue without break to the connecting point or next span. The clamp shall be fully insulating type of mechanical and weather resisting thermoplastic. No bolts or loose parts are allowed as part of the Clamping system. No tools shall be needed for fitting the messenger into the clamp. The clamp shall be self-tightening.

c. Flexible Rope for fixing tension clamp to bracket

The Anchoring assembly shall be supplied with a stainless-steel flexible rope to connect the Tension Clamp to the Tension Bracket. The rope should have sufficient flexibility to ease the torsional movement of the AB Cable System. The Rope should be pre-fitted with compression type end fittings to secure the tension clamp. A wear resistant moveable saddle should be loosely fitted on the Rope to prevent abrasion at the point of fitting into the tension bracket. The Rope should have sufficient mechanical strength to withstand the mechanical test for the complete assembly tests in this specification.

5.3 SUSPENSION CLAMP FOR INSULATED MESSENGER

Suspension Assemblies shall be supplied in sets to ensure compatibility of the materials against corrosion or wear of rotating/moving parts. Each Suspension Assembly shall consist of:

a. One number Suspension Bracket

The Suspension bracket shall be made from a single piece of Aluminium alloy suitable for attachment to a pole either by 20 mm galvanized steel bolt (s) or two stainless Steel straps of 20 x 0.7 mmx0.75m The Suspension Bracket shall be provided with an upper bulge to prevent the clamp from turning over on the Bracket for more than 45 mm from the horizontal or to within less than 60 mm from the pole / fixing structure. The Suspension Bracket should be so designed to ensure that the articulated link cannot slip out of it.



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b. One number moveable (articulated) connecting link

Movable Links are used between the Suspension Bracket and Suspension Clamp to allow a degree of movement and flexibility between the two. The Movable link should be unlosable fitted to the Bracket and the Clamp.

c. One number Suspension Clamp

Suspension Clamps are used for locking the messenger of the ABC bundle and allowing the messenger to become dismounted from the fitting. The Suspension Clamp shall accommodate messenger wires from 16 sq.mm to 150 sq. mm. The Suspension Clamp shall be made fully of insulating type of mechanically strong and weather resistant Plastic. Bolts should not be used for clamping / locking the messenger in the clamp.

5.4 Stainless steel strap and buckles

The stainless-steel strap shall consist of

- a) Stainless steel strap of size 20mm \pm 0.2 x 0.7mm \pm 0.05 mm x 750 M and shall have tensile strength of 7.5KN min., elongation 30% Min, finish 2B, and the stainless-steel material shall be of high mechanical strength, corrosion and wear resistant as per ASTM SS 202.
- b) Tensile strength of strap is to be min 7.5KN to be tested on a loop with buckle. Minimum 2 Number of loops for mounting the bracket on pole to be allocated as per load requirement for dead-end and suspension clamp specified in this specification.
- c) Min two loops of 0.75 meter each with one buckle to be considered for attaching the brackets to the poles. For dead-end or suspension pole bracket a total of 1.5 meter of SS Strap and two buckle are required.
- d) The SS Strap should be engraved with the name of the Manufacturer, month and year of manufacturing and length at a distance of approx. 250 mm for traceability.
- e) The SS buckle to suit above strap shall be used to tension & fix it. It should have a slot width of not less than 20.5 mm x 1.5 mm
- f) The Buckle should be made from ASTM SS 304 of thickness not less than 1.2 mm.
- g) SS Strap must be supplied in 50-meter roll in plastic dispenser casing with indication of remaining length.
- h) Buckles should be supplied in plastic bags containing 100 pcs per bag.

6. MARKING

Each product shall be clearly identified with manufacturer name or trade mark, reference and capacity of the item and batch no. and suitable identification marking of the property "TPCODL/ TPNODL/ TPSODL/ TPWODL".

The marking should be engraved/embossed.

7. TESTS

Along with the bid, the bidder must submit Type Test Reports on same fittings carried out within last 7 years from the date of opening of techno-commercial bid of the tender CPRI/ERDA/Any Govt Lab that is NABL accredited.

8. TYPE TESTS CERTIFICATE

8.1 Type Test

The following shall constitute Type Tests for IPC:

- a. Electrical Ageing Test
- b. Dielectric and Water Tightness Test.
- c. Mechanical Tightening Test
- d. Effect of Tightening on main Core
- e. Effect of Tightening on Branch core
- f. Over-current Test (if applicable)

The following shall be Type Test for Suspension Assembly (SA)

- a. Mechanical Test
- b. Voltage Test
- c. Climatic Aging Test
- d. Corrosion Test

The following shall be Type Tests for Anchoring Assemblies (AA)

- a. Mechanical Test
- b. Voltage Test
- c. Dynamic Test
- d. Climatic Aging Test
- e. Corrosion Test

8.2 Acceptance Tests

The following shall constitute Acceptance Tests for Insulation Piercing Connectors (IPC)

- a. Visual *
- b. Dimensional (as per SCD and overall dimensions submitted with Tender Offer) *
- c. Dielectric and Water Tightness Test. **
- d. Mechanical Tightening Test **
- e. Effect of Tightening on Main Core **
- f. Effect of Tightening on Branch Core **

The above tests are to be carried out as per sampling plan below. However, the electrical ageing test on IPC (market***) is to be done on only one connector of each type and size.

In case of random failure/defect, double the sample lot is to be drawn and there should be no failure/defect exceeding half the permissible defects (rounded down) shown in the chart.

Lot Size	For tests marked*		For tests marked**	
	Sample Size	Maximum Permissible defects	Sample Size	Maximum Permissible defects
Up to 100	2	nil	2	nil
101 to 1000	6	nil	4	nil
>1001	0.01% subject to min. 6 pieces	0.1% of pieces checked	4	nil

The following shall constitute acceptance tests for Anchor Assemblies:

- a. Visual *
- b. Dimensional (as per SCD and overall dimensions submitted with Tender Offer) *
- c. Mechanical Test on Bracket**
- d. Mechanical Test on Clamp **
- e. Voltage Test *

The following shall constitute acceptance tests for Suspension Assemblies:

- a. Visual *
- b. Dimensional (as per SCD and overall dimensions submitted with Tender Offer) *
- c. Mechanical Test on Bracket**
- d. Mechanical Test on Clamp **
- e. Voltage Test *

The above tests (for AA & SA) are to be carried out as per sampling plan below. In case of random failure/defect, double the sample lot is to be drawn and there should be no failure/defect exceeding half the permissible defects (rounded down) shown in the chart.

Lot Size	For tests marked*		For tests marked**	
	Sample Size	Maximum Permissible defects	Sample Size	Maximum Permissible defects
Up to 100	2	nil	1	nil
101 to 1000	5	1	2	nil
501-2500	10	2	2	nil
2501 and above	10+ 0.2%	2+ 10% pf addl. Sample quantity	4	1

8.3 Routine Tests:

Supplier shall provide a control plan, which will be implemented on each item. Routine test reports should be submitted by the manufacturer with inspection call.

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 always grant free access to the places of manufacture to TPCODL/ TPNODL/ TPSODL/ TPWODL's representatives 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. 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/ 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 24 months from the date of commissioning or 36 months from the date of last supplies made under the contract whichever is later, (the time scale of 24/36 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 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.

Guarantee clause is applicable for all the items covered under this specification.

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.

The packings of the fittings should carry the following information: -

- a. Manufacturer's name and trade-mark
- b. Name of the purchaser
- c. Batch No., date, month and year of manufacture
- d. Any other markings agreed to between the manufacturer and the Purchaser.
- e. Installation instruction should be included in packaging.

13. TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/TPNODL/TPSODL/TPWODL).

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. All bidders should preferably be ISO-9001 certified. The ABC accessories should be of proven design with minimum 2 years record of satisfactory operation with a major utility. Order copies and Performance Certificates should be enclosed with the offer.**

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 AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS

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:

- a. Completely filled in Technical Particulars.
- b. General description of the equipment and all components including brochures.
- c. Type test Certificates
- d. Experience List.

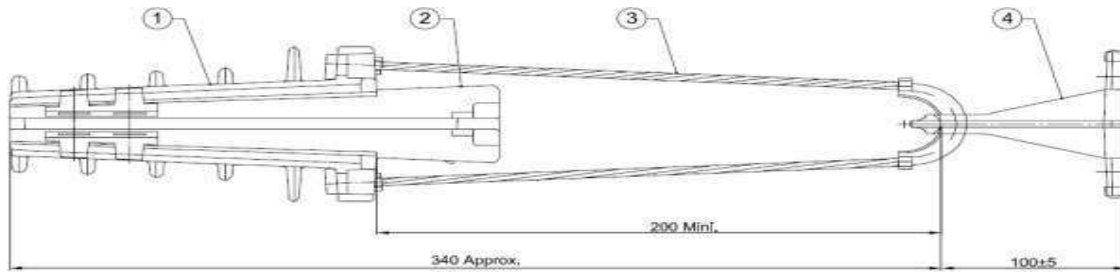
After the approval of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch 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	Manual/Catalogues/drawings for all components.		√	
3	Technical details and test certificates.		√	√
4	Installation Instructions		√	√
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.

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.

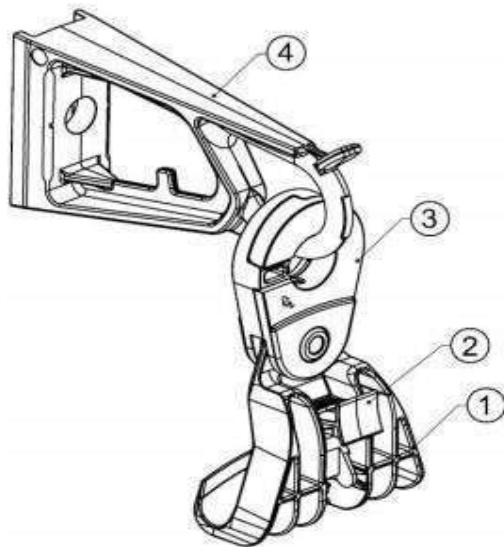


DETAILED DRAWING TO BE PROVIDED

Sl.no	Description	Qty	UoM
1	Body	1	Nos
2	wedge	1	Nos
3	Assembly	1	Nos
4	Bracket	1	Nos

FIG.1: - ANCHOR CLAMP ASSEMBLY

DETAILED DRAWING TO BE PROVIDED



Sl.no	Description	Qty	UoM
1	Clamp Body	1	Nos
2	Closing lever	1	Nos
3	Mobile Link	1	Set
4	Bracket	1	Nos

FIG.2: -SUSPENSION CLAMP ASSEMBLY

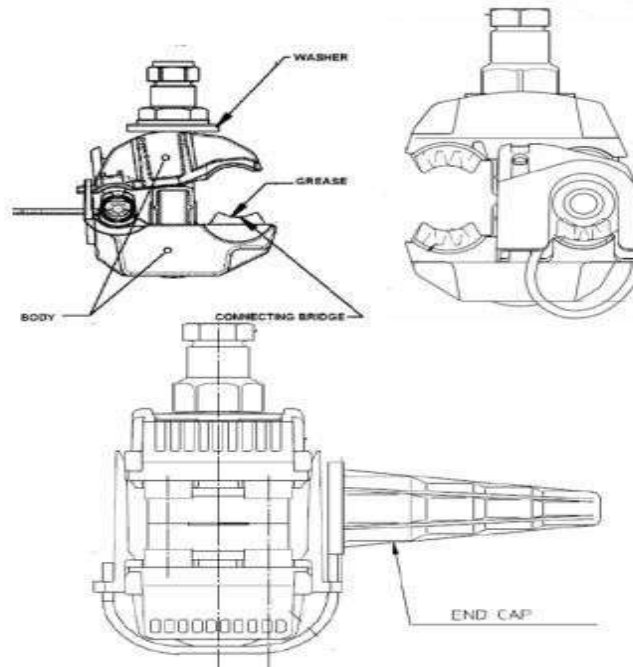
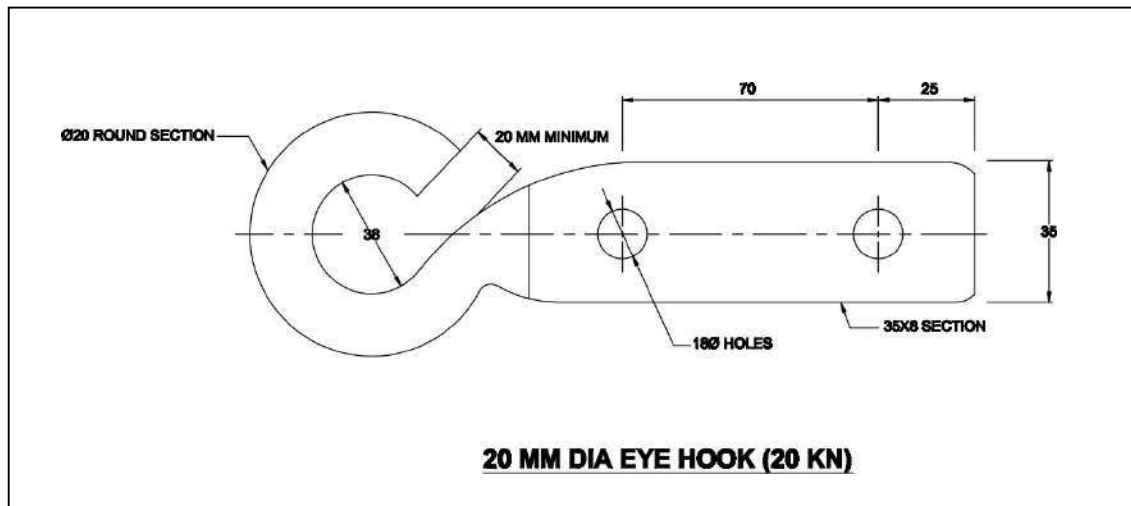


FIG.3: - INSULATING PIERCING CONNECTOR



20 MM DIA EYE HOOK (20 KN)

FIG.4: -EYE HOOK WITH POLE FIXING CLAMP

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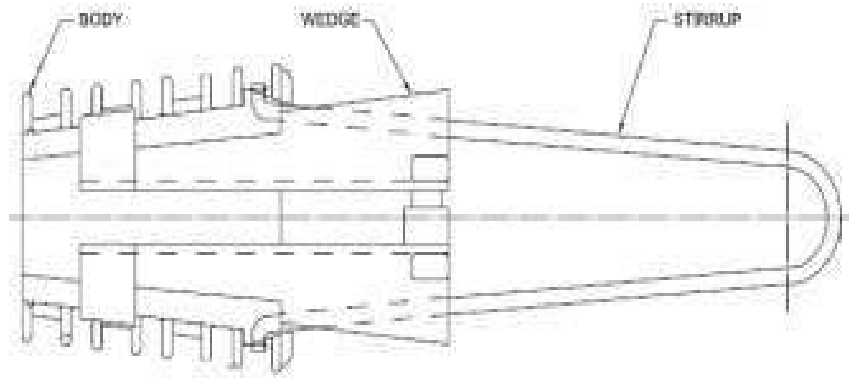


FIG.5: -SERVICE CLAMPS

19. GUARANTEED TECHNICAL PARTICULARS

The GTP is to be furnished by the Bidder as mentioned in clause 4 & clause 5.



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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:

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



Specification No: [ENG-LV-3004](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

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16. MANUFACTURING ACTIVITIES
17. SPARES, ACCESSORIES AND TOOLS
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19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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.	CONDITONS	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 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



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TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

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	°C	85	85	85	85
11	Allowable conductor temperature during short circuit	°C	160	160	160	160
12	Max. DC resistance at 20°C – 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 27°C	%	29	29	29	29
15	Guaranteed value of min. temp. index	°C	250	250	250	250
16	Smoke Density Rating		Max. average 60 SDR	Max. average 60 SDR	Max. average 60 SDR	Max. average 60 SDR



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TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

5. GENERAL CONSTRUCTION:

i) The PVC Insulated Cable shall be manufactured and tested strictly in accordance with the Indian Standard 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 best available 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, galvanized round 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 wires shall comply with the requirements of IS: 3975 with latest amendments

5.2 OUTER SHEATH:

The Outer Sheath shall be of polyvinyl chloride (PVC) compound conforming 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.

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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



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- 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.



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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 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



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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 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:

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:

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	°C				



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Sr. No	General Technical Particulars	UNITS	To Be Furnished by the Bidder			
11	Allowable conductor temperature during short circuit	°C				
12	Max. DC resistance at 20°C – Main	Ohm/km				
13	Max. AC resistance at max. Operating temp.	Ohm/km				
14	Guaranteed value of min oxygen index at 27°C	%				
15	Guaranteed value of min. temp. index at 21 oxygen index	°C				
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 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-3008

Specification Name : Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV 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

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TPWODL*



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Specification Name:

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Straight through Joint & Termination for 1.1KV
Cable

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Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV Cable

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 1.1 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: 2011(Part-1)	Cable Accessories for extruded power cables, for working voltages for 1.1 kV up to and including 3.3 kV – test methods and test requirements
2	IS 7098- 2003 (Part1)	Cross linked polyethylene insulated PVC sheathed cables up to and including 1.1 kV Cable.
3	IS 14255	LT Aerial Bunched cable working up to 1.1 kV
4	ENA TS 09-13	High voltage heat shrinkable material components for use up to and including 36 kV
5	IEC 61238-1: 2003	Compression and Mechanical Connectors for Power Cables
6	IS 8308 : 2003	Compression type tubular inline connector for Aluminium conductors of insulated cables
7	IS 8309 : 2003	Compression type tubular terminal ends for Aluminium conductors of insulated cables
8	IS 2633	Methods for testing uniformity of coating of zinc coated articles
9	IS 4826	Hot dipped galvanized coatings on round steel wires
10	IS 12444	Continuous Cast and Rolled electrolytic copper wire rods for electrical conductors
11	IS 191	Copper Specification
12	IS 10810	Methods of test for cables



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SL. No.	IEC/IS	Description
13	EN 50393	European Cable Jointing Standard
14	ASTM D-2303	Standard Test Methods for Liquid-Contaminant, Inclined-Plane Tracking and Erosion of Insulating Materials
15	ASTM G 154-12a	Exposure to UV radiation
16	IS 10810 (Pt.7): 1984	Tensile strength and elongation before & after UV exposure

3. CLIMATIC CONDITIONS:

SL.NO.	CONDITONS	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.



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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. Four Core Cables, 1.1KV A2XWY (Aluminium conductor stranded sector shaped, XLPE insulation, PVC inner sheath, GI round wire armour, PVC outer sheath) & A2XFY

- i) 4CX400 sq.mm.
- ii) 4C X 300 sq.mm.
- iii) 4CX240 sq.mm.
- iv) 4C X 185 sq.mm
- v) 4C X 150 sq.mm.
- vi) 4C X 95 sq.mm.
- vii) 4C X 50 sq.mm.
- viii) 4C X 35 sq.mm.
- ix) 4C X 25 sq.mm.

B. Three & half core cables

- i) 3.5C x 95 sq. mm.
- ii) 3.5C x 150 sq. mm.
- iii) 3.5C x 240 sq. mm.
- iv) 3.5C x 300 sq. mm.
- v) 3.5C x 400 sq. mm.



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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
4C & 3.5C Cables – all sizes	Straight through joints/ Indoor/ Outdoor termination

4.3 General requirement for Heat Shrinkable Jointing and Termination kit:

- 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 and IS 13573 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):
- Insulating tube for outdoor termination should be of black colour & type tested for UV rays protection.

S. No.	Parameter	Units	Requirement
1	Max. Withstand System Voltage	kV	1.1
2	Continuous operation withstand Temperature	°C	90
	Short Circuit withstand temperature	°C	250
3	Withstand short circuit current	kA/1Sec	As per Size of Conductors
4	Storage Temperature Range	°C	-10°C to + 45°C
5	Shelf life of kit components excluding mastic and solution	Years	Min. 5
6	Shelf life of mastic and solution	Years	Min. 2

4.4 General Technical Particulars for Heat Shrinkable Insulation Tubing/ Sleeves/ Wrap around Sleeve:



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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.
5	Dielectric Strength	10 KV /mm (Minimum)
6	Tensile Strength	10 N/mm ² (Minimum) and (8 N/mm ² for anti-tracking)
7	Ultimate Elongation	200% (Minimum)
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 200°C Min. (For stress control tube: 30 Minutes at 250°C Min.)
9	Low Temperature Flexibility	No cracking after 4 hrs. at minus -20°C Max.
10	Volume Resistivity	1x 10 ¹⁰ Ohm- meter (Minimum) (For stress control, tube VR: 1x 10 ⁷ Ohm-meter min.)
11	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)



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Sl. No.	Parameter	Specified limit
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 250°C Min.
9	Low Temperature Flexibility	No cracking after 4 hrs. @ minus -20°C 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.

5. GENERAL CONSTRUCTION:

5.1 Components of Indoor/ Outdoor Termination Kit:

S. No.	Components	Requirement
1	Compression Lugs/ Tinned coated Mechanical Lugs	<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.
2	Lug Seal	a) Fire resistant and weather resistant as per ENA TS 09-13
3	Heat Shrinkable insulating tube/ Sleeve	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% at any two points of measurement. c) For outdoor kits all 4 tubes should be of black colour with UV radiation protective coating. d) Length of insulating tube: Outdoor- 600mm, Indoor- 400mm
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.
5	Heat Shrink Breakout	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.
6	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 mm ² x 500 mm x 1 Run for below 300 mm ² cables. e) 50 mm ² x 500 mm x 1 Run for above 300 mm ² cables f) Compatible Supporting ring with SS jubilee clips shall be provided to connect tinned copper braids



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S. No.	Components	Requirement
7	Tinned copper wire mesh	a) Minimum 2.5mm ² x 500 mm shall be provided for wrapping over armor circumference beneath the copper braid
8	Sub-kit components	a) Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and other necessary items.
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:

S. No.	Components	Requirement
1	Heat Shrinkable insulating tube/ Sleeve	a) Surface of material: shall be smooth and free from protrusion, voids and nicks. b) Recovered thickness: Recovered thickness of insulation tubes over ferrule circumference shall not be less than 2.5 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.
2	Ferrule	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 Aluminium shall be min. 60% of IACS.
3	Mastic Tape	a) Mastic tape or sealant 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.
4	Tinned coated copper braid	a) Uniformly tinned coated copper braid shall be provided for armor continuity b) Size of tinned copper braid shall be: 50 mm ² x 1 Run for 4CX 400 sq.mm, 4CX 300 sq.mm. & 4CX 240 sq.mm. cable. 25 mm ² x 1 Run for 4CX 150 sq.mm. and 4C X 95 sq.mm. cable 10 mm ² x 1 Run for 50 sq.mm. cable and below sizes. c) Length of tinned copper braid shall be as per approved BOM



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S. No.	Components	Requirement
5	Tinned copper wire mesh	a) Minimum 2.5 mm ² X 1000 mm for 4CX400 mm ² , 4CX300mm ² , 4CX240 mm ² and 4C X 150 mm ² . b) 2.5 mm ² X 300 mm – 95 sq.mm. and below sizes c) shall be provided for wrapping over armour circumference beneath the copper braid
6	GI wire mesh	a) Mechanical protection shall be provided in GI armored cables by means of heavily zinc coated GI mesh as per IS 4826.
7	Breakouts	a) Adhesive coated Breakouts shall be provided on outer sheath at both sides on the cable to prevent water ingress.
8	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. g) Additionally, adhesive coated sleeve approx. 300 mm length shall be provided at ferrule joint area beneath the wrap around sleeve.
9	Sub-kit Components	a) Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and 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 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.



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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



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Test	Clause No.	Reference Standard
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 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
AC Voltage withstand Test (Air)	8.6	IS 13573(Part-1)
AC Voltage withstand test (Immersed)	8.6	IS 13573(Part-1)
Impulse voltage withstand at ambient Temp.	8.2	IS 13573(Part-1)
Heat Cycle test (in air and water)	8.3	IS 13573(Part-1)
Insulation Resistance (in air)	8.4	IS 13573(Part-1)
Insulation Resistance (immersed)	8.4	IS 13573(Part-1)
Visual Examination	8.8	IS 13573(Part-1)



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(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 and Compression Ferrules

Test	Clause No.	Reference Standard
Conductivity test	8.3	as per IS 8309/ 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



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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 joiner 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



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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.



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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) BOM
- 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	Continuous operation withstand Temperature	°C	
	Short Circuit withstand temperature	°C	
3	Withstand short circuit current	KA/1Sec	
4	Storage Temperature Range	°C	
5	Shelf life of kit components excluding mastic and solution	Years	
6	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	
3	Internal diameter of tube after full recovery	
4	Longitudinal change	



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Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV Cable

S.No.	Parameter	To be Furnished by Bidder
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

SI.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	
11	Flame Retardant (For anti-tracking moulded components)	



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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



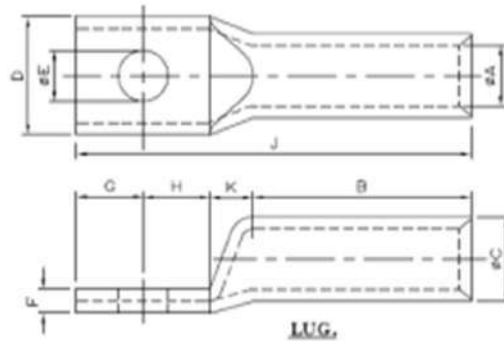
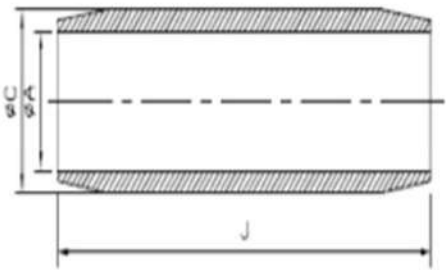
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Cable Size in MM ²	φA (mm) +/-0.3mm	φC (mm) +/-0.3 mm	J (mm)
16	5.4	8.3	65-75
25	7.2	9.7	65-75
50	10	13.5	80-90
95	12.9	17.3	100-110
150	16.3	21.5	120-130
300	23.6	31	140-150

Cable Size in MM ²	φE (mm) ±0.1mm in centre of palm	φA (mm) ±0.3mm	φC (mm) +0.5 mm	D (mm) ±1.5mm	F (mm) -0mm	B±3.0mm	J (mm) ±5mm
300	17	23.9	31	45	7	89	157



For remaining cable sizes, dimensions of Ferrules & Lugs shall be as per IS.

Annexure- II

Inspection Test Plan for HS Jointing kit components

S. No.	Name of test	Specified value(Range)	Reference documents	Test Result	Pass/Fail
1	Visual inspection	Free from pin holes, cracks, nicks, protrusion and other visible defects.	ENA-TS-09-13 Clause No. 3.15 & TPCODL/ TPWODL/ TPNODL/ TPSODL/ specification		
2	Physical verification of kit contents and dimensions	Dimensions as per TPCODL/ TPWODL/ TPNODL/ TPSODL approved BOM			
3	Electric Strength test	10 KV /mm (Minimum)	ENA-TS-09-13		



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S. No.	Name of test	Specified value(Range)	Reference documents	Test Result	Pass/Fail
			Clause No. 3.4		
4	Ultimate Elongation tests	200% (Minimum)	ENA-TS-09-13 Clause No. 3.12		
5	Tensile Strength	10 N/mm ² (Minimum) For anti-track tube-8 N/mm ²	ENA-TS-09-13 Clause No. 3.12		
6	Tracking resistance test(Anti-tracking Tube)	NO Tracing erosion to top surface /flash failure after 1 hr 2.5 KV 1hr 2.75KV 20 min 3.5 KV	ENA-TS-09-13 Clause No. 3.14		
7	Volume Resistivity	1x10 ¹⁰ Ohm- meter (Minimum)	ENA-TS-09-13 Clause No. 3.16		
8	Wall thickness ratio	0.6 or 60% (Minimum at any two points of measurements)	ENA-TS-09-13 Clause No. 3.3		
9	Expanded and recovered diameters	As per TPCODL/ TPWODL/ TPNODL/ TPSODL approved BOM	ENA-TS-09-13 Clause No. 3.3(i)		
10	Longitudinal change after recovery	10% max	ENA-TS-09-13 Clause No. 3.3(ii)		
11	Heat shock test	No splitting, cracking, dripping or flowing after 30 min @200°C min	ENA-TS-09-13 Clause No. 3.7.1/ 3.7.2		
12	Low temperature flexibility	No cracking after 4 Hrs @ Minus 20°C max	ENA-TS-09-13 Clause No. 4.5		
13	Insulation build up thickness after shrink on Ferrule as per IS 10810 -6	Not less than as specified in specification	as per IS 10810 -6 Clause No. 8.1		
14	Flame retardant test	After one min burn: burnt or charred length 250 mm max.	ENA-TS-09-13 Clause No. 3.5.1/ 3.5.2		



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Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV Cable

S. No.	Name of test	Specified value(Range)	Reference documents	Test Result	Pass/Fail
15	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			
16	Ferrules/ connectors/ lugs dimension and conductivity test	As per annexure-I in this specification	as per IS 8309 Clause 8.3		
17	Uniformity of zinc coating on GI mesh as per IS 2633	No reddish color after one dip for ½ minute in CuSO4 solution	as per IS 2633 Clause 4.1		

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-LV-3009

**Specification Name : Technical Specification For LT Distribution Box-RING
SYSTEM**

SATYA PRASAD NAYAK	SHANTAPRIYA JENA	JYOTIPRAKASH MOHANTY	Jyoti Ranjan Sahu	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	19-01-2023	21-01-2023	30-01-2023	22-02-2023	23-02-2023

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TPWODL*

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1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of LT Distribution Box Complete with accessories and other miscellaneous equipment specified in this specification, which are necessary or usual for their efficient performance and trouble free 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	Description
IS: 6875/1973	Control switches, push buttons and related Part I & II control switches
IS: 13947/1993	Specification for Low-voltage Switchgear and Control gear
IS: 13607/1992	Ready mixed paint, Finishing, General purpose, Synthetic
IS 2633	Methods for testing uniformity of coating of zinc coated articles
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: 5-1994	Colour of ready mixed paints and enamels

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/TPWODL/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	Desired Values	
		For I/C 630 Amp	For I/C 400 Amp
1	Rated Voltage	415 V \pm 10%	
2	Rated Frequency	50 HZ	
3	Continuous Current Rating	630 A	400 A
4	Type	Out door	
5	Mounting	On concrete foundation	
6	Suitable for	3 Ph 4 wire with earthed Neutral	
7	Maximum system Voltage	1.1kV	
8	Rated short Circuit Level	35kA	
9	Enclosure Details		
a)	Overall dimension	Suitable design and size without exceeding temperature rise limit @ full load & necessary clearances to be met	
b)	Sheet Thickness	3mm (Body) 2mm (Doors)	
c)	Degree of Protection	IP 55	
10	MCCB (Incoming)		
a)	Make	Siemens/ABB/Schneider/L&T/Havells	
b)	Current Rating (A)	630 A	400 A
c)	Breaking Capacity	35kA	
d)	Pole (Nos)	3	
e)	Impulse withstand voltage(kV)	8	
f)	Rated Insulation Voltage	600 V	
g)	Utilization Category	A	
h)	Ambient Temperature	50 deg	
i)	Storage Temperature	0 to 70 deg	

j)	Release	Microprocessor based protection (O/C,S/C & E/F)	
11	MCCB (Outgoing)		
a)	Current Rating (A)	100 A	
b)	Breaking Capacity	35kA	
c)	Pole (Nos)	3	
d)	Impulse withstand voltage(kV)	8	
e)	Rated Insulation Voltage	600 V	
f)	Utilization Category	A	
g)	Release	Microprocessor based protection (O/C,S/C & E/F)	
12	MCB		
a)	Make	Siemens/ABB/Schneider/L&T/Havells	
b)	Rating (A)	63 A	
c)	Pole (Nos)	2	
d)	Tripping Characteristics	C	
e)	Breaking Capacity	20kA	
f)	Voltage Rating	415	
g)	Mechanical life time (cycle)	100000	
h)	Electrical life time (cycle)	100000	
13	Current Transformer on Both Incomers		
a)	Applicable Standards	IS 2705	
b)	CT ratio (Amps)	630/5A	
c)	Accuracy Class	0.5	
d)	Burden (VA)	10	
e)	System Voltage	415	
f)	Insulation Level	3kV for 1 min	
g)	Frequency	50 Hz	
h)	Rated Continuous Thermal Current	1.2 times Rated Current	
i)	Insulation Class	E	
j)	CT Type	Resin Cast	
k)	Internal Diameter	To be furnished by Bidder	
l)	Outer Diameter	To be furnished by Bidder	
14	Busbar		
a)	Material	Aluminium	
b)	Grade	EC Grade	
c)	Size	80x08-PH 80x08-N	40x10-PH 40x10-N
d)	Earthing Bolt	M8x25 mm	
e)	Current Density	1 Amp/ Sq.mm	
15	Wire		
a)	Material	PVC Multi strand Copper wire	

b)	Size	35 mm ² for 100A Triple Pole MCCB 16 mm ² for 63A DP MCB 2.5 mm ² for CT 1.5 mm ² for phase indication & Meter Power wire
----	------	--

5. GENERAL CONSTRUCTIONS:

- a) LT Distribution Box shall be suitable for the purpose for which they are intended to be used.
- b) Each box shall be complete with following accessories for 630 Amps:
 - i) 630 Amps MCCBs for both incoming L.T. UG cable
 - ii) Sph-63 Amps MCBs for single phase consumers:- 18 nos.
 - iii) 3-Ph, 100 Amps MCCBs for 3-Ph consumers:- 6 nos.
 - iv) Provision for Electronic TV Energy meters (on both incomers) suitable for recording energy
 - v) Lock & key
 - vi) Interlocking arrangement with MCCB between two incomers supply
 - vii) Incoming/Outgoing Circuit stickers shall be fixed inside the box for indicative purposes.
 - viii) Laminated SLD of the connections diagram shall be fixed on the inside door.
- c) Each box shall be complete with following accessories for 400 Amps:
 - i) 400 Amps MCCBs for incoming L.T. UG cable
 - ii) 1-Ph-63 Amps MCBs for single phase consumers:- 9 nos.
 - iii) 3-Ph ,100 Amps MCCBs for 3-Ph consumers:- 3 nos.
 - iv) Provision for Electronic TV Energy meters (on both incomers) suitable for recording energy
 - v) Lock & key
 - vi) Interlocking arrangement with MCCB between two incomers supply. Castle Key Arrangement
- d) LT Distribution Box shall have access for sufficient ventilation and heat dissipation.
- e) The LT Distribution Boxes shall be made of Galvanized steel sheet of 3 mm thickness to with stand in the weather.
- f)The LT Distribution Box shall be suitable to mount on brick concrete foundation. Necessary provision for foundation bolt in the pillar shall be made for 4 Nos GI foundation bolts of size 12mm. Nuts, Bolts and 2 Nos. of Washers. Base channels shall be provided for mounting LT distribution box on concrete foundation.
- g) The box shall be provided with suitable rain shed and all bolt and washers used shall be galvanized mild steel.
- h) A danger board as shown in the sketch shall be provided in the front of the box.
- i) The box shall be provided with two Nos. of earthing points internally connected with accessible position on the sides. The earthing point shall be provided by 50x6 mm GI flat

with galvanized bolts and nuts and marked with \perp symbol.

- j) LT Distribution Box shall be provided with PVC insulated sleeved bus bar to with stand 1.1 kV. The bus bar sizes shall be 2 layers of required dimension made up of aluminum with Red, Yellow and Blue colour for three phases and black for neutral.
- k) The bus bar shall be made out of E.C. Grade Alluminium flats. The bus bar shall be suitably supported on an insulating base rigidly fitted to the metal box.
- l) The connection to the neutral bus bar is by means of socket. Necessary holes may be drilled on the bus bar for mounting the bus bar.
- m) MCCBs shall be suitable to work on 415 V, 630 Amps/400 Amps, three pole 50Hz, heavy duty, front operated type, with replaceable silver plate contacts conforming to IS 4064/1978, superior type arc chambers with necessary insulating barriers and enclosed in a compact insulating cover. The switch shall be designed break the current of 630A/400A and able to withstand breaking stresses with quick and reliable spring loaded operating handle with microprocessor based protection O/C,E/F and S/C.
- n) The location of operating handle shall be so as to facilitate convenient operation. The position of ON & OFF must be clearly indicated.

6. MARKING:

The LT Distribution Box shall be provided with transparent label or card of removable type and the following information are to be recorded.

- a) Title
- b) Cable Size of both incomers
- c) Current Rating of both I/C
- d) Current Rating of both O/G
- e) Current Rating of MCBs and MCCBs
- f) No. of Outgoing service mains with their code numbers

The label or card shall be fitted on the side of the door and circuit numbering means shall be indicated by symbol or diagram relating to the service mains.

The Circuit plate with following engraved information has to be riveted to the inside of the door of the Distribution Box in an accessible position for easy reading

Incoming Line from :

Incoming Line to :

Outgoing Line ___Amps to : (--- nos.) S-Ph, (--- nos.) 3-Ph.

7. TESTS:

A type test shall be performed on Distribution Box. The bidder shall be required to submit

complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

- i) Overall Dimensions Checking
- ii) Insulation Resistance Tests
- iii) High Voltage Test at 2500 V, 50 Hz AC for one minute.
- iv) Operation Test on MCCB
- v) Thermal overloading Test for MCCB
- vi) Contact Resistance Test
- vii) Temperature rise test

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) Operation Test on MCCB
- v) Thermal overloading Test for MCCB
- vi) Contact Resistance Test

7.3 TYPE TESTS

On Complete Box

- i) Temperature rise test
- ii) High voltage test
- iii) Short Time Withstand Current Test
- iv) Degree of protection on complete box
- v) Time /current characteristic test on MCCBs
- vi) Type tests on MCCB as per IS-13947 amended upto date shall be carried out

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA/Other Govt. Labs** as per the relevant IS/IEC. 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:

<Property of TPCODL/TPNODL/TPWODL/TPSODL -Not to be reproduced without permission of
TPCODL/TPNODL/TPWODL/TPSODL >

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).

PROTOTYPE AND STAGE INSPECTION:- Successful Bidders also need to prepare a prototype design & get the same inspected & cleared by E&Q department of the TPCODL/TPNODL/TPWODL/TPSODL before starting mass production of these LTDBs.

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 54 months from the date of commissioning or 60 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. 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 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.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

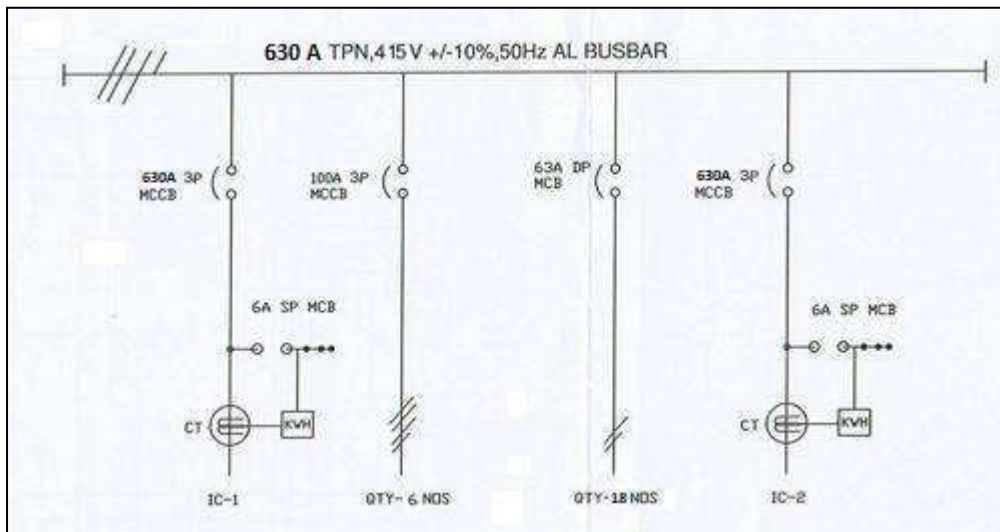
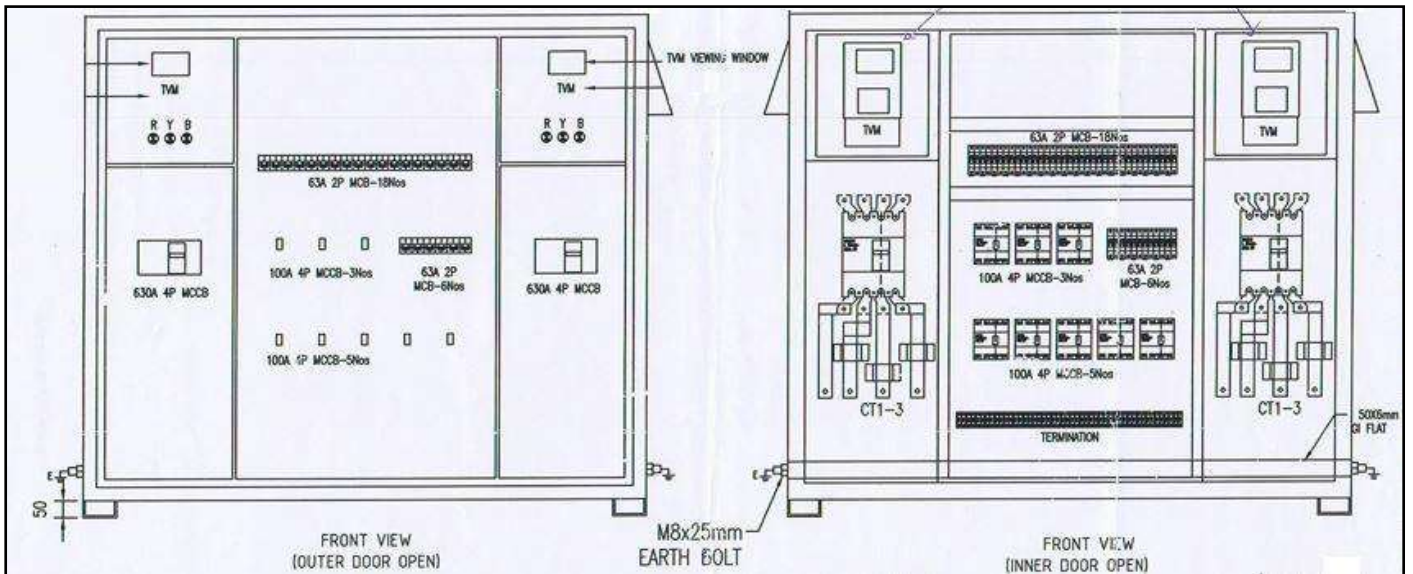
18. DRAWINGS AND DOCUMENTS

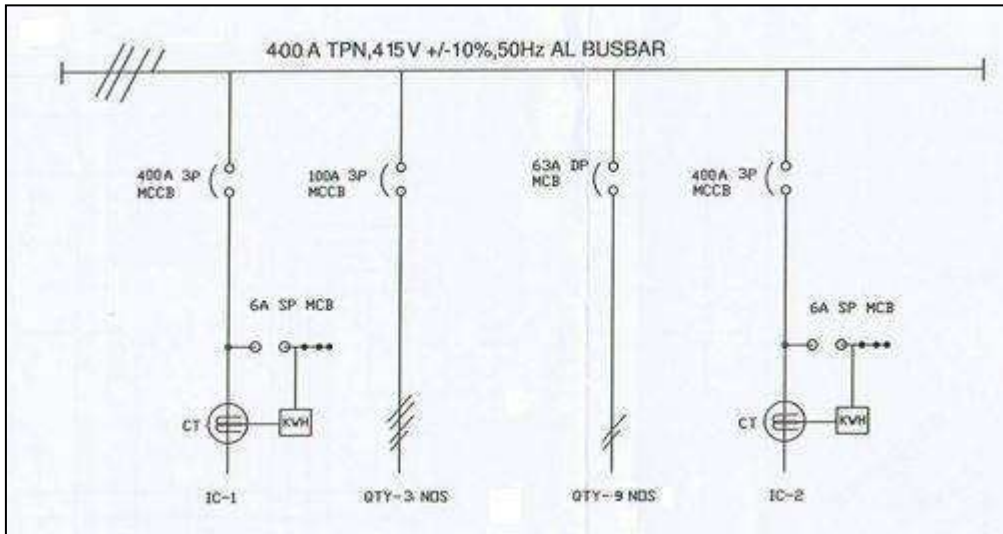
Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- 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:- Indicative drawings for tender purpose only.
Ratings shall vary during detailed engineering stage**

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

SL. No.	Technical Particulars	Desired Values	
		For I/C 630 Amp	For I/C 400 Amp
1	Rated Voltage		
2	Rated Frequency		
3	Continuous Current Rating		
4	Type		
5	Mounting		
6	Suitable for		
7	Maximum system Voltage		
8	Rated short Circuit Level		
9	Enclosure Details		
a)	Overall dimension		
b)	Sheet Thickness		
c)	Degree of Protection		
10	MCCB (Incoming)		
a)	Make		
b)	Current Rating (A)		
c)	Breaking Capacity		
d)	Pole (Nos)		
e)	Impulse withstand voltage(kV)		
f)	Rated Insulation Voltage		
g)	Utilization Category		
h)	Ambient Temperature		
i)	Storage Temperature		
j)	Release		
11	MCCB (Outgoing)		
a)	Current Rating (A)		

b)	Breaking Capacity	
c)	Pole (Nos)	
d)	Impulse withstand voltage(kV)	
e)	Rated Insulation Voltage	
f)	Utilization Category	
g)	Release	
12	MCB	
a)	Make	
b)	Rating (A)	
c)	Pole (Nos)	
d)	Tripping Characteristics	
e)	Breaking Capacity	
f)	Voltage Rating	
g)	Mechanical life time (cycle)	
h)	Electrical life time (cycle)	
13	Current Transformer on Both Incomers	
a)	Applicable Standards	
b)	CT ratio (Amps)	
c)	Accuracy Class	
d)	Burden (VA)	
e)	System Voltage	
f)	Insulation Level	
g)	Frequency	
h)	Rated Continuous Thermal Current	
i)	Insulation Class	
j)	CT Type	
k)	Internal Diameter	
l)	Outer Diameter	
14	Busbar	
a)	Material	
b)	Grade	
c)	Size	
d)	Earthing Bolt	
e)	Current Density	
15	Wire	
a)	Material	
b)	Size	

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-2010

Specification Name : Specification for 11KV RMU Motorised Outdoor Type

Vijender Goyal	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	JYOTIPRAKASH MOHANTY	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPNODL	TPCODL	TPWODL	TPSODL	TPSODL
09-12-2022	09-12-2022	09-12-2022	09-12-2022	09-12-2022	09-12-2022

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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 motorized Ring Main Units with all accessories 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 editions of the following IEC/IS Standards and shall conform to the regulations of local statutory authorities.

IEC 62271-200	HV switchgear and control gear-AC Metal Enclosed switchgear and control gear for voltages above 1 kV and upto and including 52kV .
IEC 62271-1	Common specifications for high voltage switchgear and control gear standards
IEC 62271-102	HV switchgear and control gear-Alternating current disconnectors and earthing switches
IEC 62271-103	High voltage switches — Part 1: Switches for rated voltages above 1 kV and less than 52 kV
IEC 60529.	Degrees of protection provided by enclosures (1P Code)
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts (IK Code)
IEC 60060	High-voltage test techniques
IEC 60947 /IS 13947	Low voltage switchgear and control gear
IEC 60439-1	Low-voltage switchgear and control gear assemblies- Type tested and partially type tested assemblies
IEC 60255-151	Electrical relays - Part 3: Single input energizing quantity measuring relays with dependent or independent time.
IEC 60044-1 / IS 2705	Current Transformers
IEC 60044-2 / IS 3156	Voltage Transformers
IEC 60376	Specification of technical grade sulfur hexafluoride (SF6) for use in electrical equipment
IEC 61958	High-voltage prefabricated switchgear and control gear assemblies - Voltage presence indicating system

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	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.

Note: Climatic Condition will be considered as per respective Discoms TPCODL/TPNODL/TPSODL/TPWODL.

4. GENERAL TECHNICAL REQUIREMENTS

Sl. No	Descriptions	As Specified By TPCODL/TPNODL/TPSODL/TPWODL
1	RMU Category	3Way Motorised (1CB + 2 LBS/ 2CB + 1LBS) 4Way Motorised (2CB + 2 LBS / 3CB + 1LBS) <i>(will be decided by user at the time of issuance of tender as per site requirement)</i>
2	RMU application	Outdoor.
3	Offered Model nos. and OEM type	a. 3 Way Non Extensible b. 4 Way Non Extensible
4	Dielectric medium	SF6
5	Interrupting medium	Vacuum- for CB SF6 for LBS and earth switch
6	System Frequency	50 Hz
7	Rated Voltage	12 KV
8	Service Voltage	11 KV
9	Rated current -Line Switches	630 A
10	Rated Current-CB and LBS	630 A for all type
11	Rated Short time current withstand (3 sec)	21 KA
12	Rated Short time Making capacity	50 KA
13	Rated cable charging interrupting current of incomer load break switch	10 A
14	Rated load interrupting line current	630 A
15	Rated cable charging breaking current of breaker	25 A
16	No. of operations at rated short circuit current on line switches, earthing switches should be E2	LBS- 5 close ES- 5 close The ES in line with CB

17	Opening time of breaker (max.) Without relay time	2.5 cycle
18	Closing time of breaker (max.)	3 cycle
19	Breaker Duty Cycle	O – 3min - CO - 3min – CO
20	i. Mechanical endurance for Isolator & Earth Switch	Min 1000 Operations
	ii. Mechanical endurance for Circuit Breaker	Min 2000 Operations
21	Electrical operations of at rated current	To be provided by bidder
	a. LBS/Disconnecter b. Earth Switch	
22	Temp rise above ambient of 50 deg.	50 Deg C. (Type Tested as per IEC and complying to requirements)
23	Min Gas pressure in bar	To be provided by bidder based on type tested design
24	SF6 Gas pressure manometer with indicating bars/scale to measure the actual gas pressure (indirect method RFS etc. not accepted)	1. Dial type Manometer to be provided for gas pressure indication 2. Contacts to be provided and wires up on the TB for SCADA communication of gas status.
25	Enclosure	The RMU metal parts shall be 2mm thickness high tensile steel/CRCA. The overall paint thickness shall be 70 to 125 microns. (will be decided by user at the time of issuance of tender as per site requirement)
26	Guaranteed SF6 leakage per annum	Less than 0.1% from main tank
27	Degree of protection	a. IP 67 for the tank and b. IP2X for the front cover / mimic board and c. IP 54 (Main door closed) for Outdoor RMUs. d. IP 54 for cable compartment
28	Internal Arc rating	IAC AFL or better
29	Internal Arc test	20kA for 1 Sec.
30	Lightning Impulse withstand Voltage	75 kVp
31	Power Frequency withstand voltage	28 kVrms.
32	SF6 Tank design	Hermetically/robotically sealed unpainted stainless steel enclosure with SF6 Gas. Sealed pressure system by Laser welding / TIG & MIG welding so that no refilling of gas is required for 30 years. No gas work at site. Complete body shall be tamperproof to prevent access to live parts. No gaskets shall be used. No bolts shall be provided.

32.1	Tank material and grade of SS and welding	Should be of SS and non-corrosive, offered grade of SS to be mentioned. The welding shall be such that there shall be corrosion of welding for useful life of equipment.
33	Earth bus bars	In enclosure to prevent tampering.
34	Material & size of earth bus bar	To be provided by the bidder
35	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open	To be provided by the bidder
36	Incomer Load Break switch: Shall be SF6 insulated with least maintenance. Shall have at least 3 positions, Open, Close & earth with natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock. The electrical interlock for preventing manual closing of earth switch under cable charged condition to be provided.	To be provided by the bidder
37	Circuit Breakers: a. With VCB interrupter and SF6 insulated bus with minimum maintenance and shall have at least 2 positions i.e. Open & Close, Manual operation & fitting of motor at site shall be possible if required. b. In view of safety each VCB shall be assisted with feeder side disconnecter having 3 positions, open disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.	To be provided by bidder as per specs.
38	Protection Relay-Without auxiliary power & shall include , electronic relay, low energy release & fast on test receptacle for protection testing	To be provided by bidder as per specs.
39	Make of self-powered Relay & offered model	a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA – ABB, Ashida, Schneider, Siemens
40	Flag indication for CB Trip on fault in relay/ mechanical or Electrical	To be provided by bidder
41	Testing of Cable- If doors are opened then earth switch shall be in closed position with necessary interlocks and cable test rod fixing provision in bolt head which can be fixed on terminations through boot cap/opening for testing purpose AND if doors are opened it shall not be possible to operate, Isolator, E/Switch or CB through interlocks	To be confirmed. If separate test bushing are provided, it shall be covered with suitable antitheft covers with anti vandal screws

42	Protection against theft	Design of RMU shall be tamper & arc proof. Anti vandal screws shall be provided. Cable covers shall be pad lockable. All live parts and internal parts etc. shall be covered with antitheft covers.
43	Doors	Outer enclosure should be hinged main door with padlock provision. Cable chamber door should not be hinged type. It should be arc proof with bolted arrangement.
44	Voltage indicator box shall be fixed type-This device shall be in compliance with IEC 62271-206:2011 standard only	Capacitive dividers type which will supply low voltage to power the lamps and 3 inlets can be used to check phase sequence or presence of voltage in cable
45	Cable cleats (full circle)	HDPE/Nylon (Fire Retardant)
46	Cable termination and bushing suitability	Heat/ Cold shrink terminations
46A	Cable Termination boot /Cable boot	Cable Termination Kit & Termination Boot in scope of Supplier.(Raychem/3M Make only) Cable Size in detailed Engineering Stage
46	Cable compartment suitability shall be	Suitable for cable sizes a. 11kV 3CX400 sq.mm having dia of 92mm in all compartment and b. For three way with two CB the LBS shall be suitable for 11kV 1CX630 sq.mm cable having diameter of 51mm in incomer LBS- the necessary cleat and nonmagnetic base plate cable entry arrangement and 15mm longer bolt than other compartment shall be provided.
47	The cable compartment	All cable compartment shall be bottom entry and front opening type only
48	Size of bimetallic washer in all compartments	Must be suitable for M16 for TPCODL/TPNODL/TPSODL/TPWODL, ODISHA) bolt and bushing sizes with min. 2mm thick.
49	Height of bushing terminal from base plate	Minimum 800mm for proper termination space.
50	Fault passage indicator	FPI on each LBS as a part of each RMU with specified default setting. FPI should be communicable type with remote resettable functionality.
51	Operating handle	To be provided by bidder as a part of RMU with each RMU and to be placed on front or on door

52	Non removable MIMIC Diagram on Front of panel	To be provided by bidder with detailed descriptions as mentioned in specs. And earth switch marking background shall be yellow for TPCODL/TPNODL/TPSODL/TPWODL-ODISHA As per annexure-2
53	Main Bus bar Material	Copper
53.1	Bus bar Cross Section	To be specified by bidder as per current density
54	Opening & Closing times with relay	125 ms maximum
55	Current Transformer for CB compartment	Shall be epoxy resin casted and mounted on cables. The CTs around the cables shall be supported on the sheet steel bracket and should be fixed with bolts. The mounting frame should be moveable up and down or to and fro but shall be fixed at coaxial position with base plat holes and bushing terminal bolts. a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA The CT settings shall be adjustable & Primary & Secondary Current and range to be decided by user at the time of issuance of tender as per site requirement Burden is 2.5 VA, Class - 5P20.
56	Future motorization and SCADA Compatibility	To be provided
57	Guarantee	As per specification
58	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder
59	Total weight	To be provided by bidder
60	Paint	Light Gray shade RAL 7032
61	Type test of product	To be provided by bidder as per specification
62	Availability of spares	Assurance by bidder for 25 years,list of spares as mentioned in specification to be provide along with RMU lot
63	VPIS auxiliary contact	The VPIS shall have auxiliary contact such that it can be configured with SCADA for remote status indication of cable charged. The auxiliary contact to be wired up in TB.
64	VPIS	In all compartments
65	Breaker operation counter	To be provided by bidder
66	LBS operation counter	To be provided by bidder
67	Moisture absorption material in SF6 tank	Bidder should provide the detail of the moisture absorption material.

68	Making of earthing operations	a. For TPCODL/TPNODL/TPSODL/TPWODL, ODISHA All earth operation to be marked with Yellow back ground and permanent in nature.
69	Auxiliary contacts (and spare numbers to be provided)	LBS (4NO+4NC) Earth Switch (2NO+2NC) CB (4NO+4NC) CB Disconnecter (2NO+2NC) CB earth switch (2NO+2NC)
70	Control cable entry provision	To be provided
71	Shunt trip coil 24V DC	To be provided
72	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	To be provided
73	RMU Cable Boot/ terminal protector	
a	Terminal protector	Insulating Boots
b	System voltage	12 kV
c	AC High voltage	28kV For 1 min
d	Impulse withstand voltage	75kV
e	Bushing Diameter	To be provided by bidder
f	Bushing Types	To be mentioned by bidder
g	Cable cross section suitability	Bidder to provide complying to specs.
h	Bushing Material & Class	Epoxy bushing-F class
h	Dimensions of cable protector	Suitable for cables & bushing in specs (offered size to be provided by bidder)
i	Material of the component	To be specified by bidder
j	Type test reports	Bidders to provide detailed list of tests conducted at lab name, conducted dates, report number along with full reports.
For motorized RMU		
1	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	To be provided
2	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	To be provided
3	Details of I/O	As per Annexure-IO list of this specs
4	System to prevent mal operation in case of latch command	Bidder to provide inbuilt system to prevent any mal operation in case of latch command at RMU in case of any fuse failure or DC fail situation

5	Technical Details of motors	
a	Operating Voltage	24 V DC
b	Max. power rating	240 Watts
c	Max current drawn	9 Amp (±10%)
d	Operating time	4-8 seconds
e	Power Supply	24VDC from Battery Charger and 230 VAC from Aux PT in scope of Supplier (Aux PT is optional and to be Quoted Separately)

Type of Ring Main Units shall be as under:

3 Way/4 Way Non Extensible Type (For Outdoor application):

3Way Motorised (1CB + 2 LBS/ 2CB + 1LBS) with Self powered O/C & E/F Relay and 1 FPI

4Way Motorised (2CB + 2 LBS / 3CB + 1LBS) with Self powered O/C & E/F Relay and 1 FPI

(will be decided by user at the time of issuance of tender as per site requirement)

5. GENERAL CONSTRUCTIONS

5 GENERAL CONSTRUCTION FOR RMU

5.1.1 The switchgear and bus bar shall be contained in a stainless steel tank filled with SF6 gas and the outer body shall be made of minimum CRCA of 2mm or GI high tensile steel 2mm thick with thick gland plates of 3mm. The sheet steel shall have surface treatment of 7 tank process With powder coating of minimum 70 microns. The tank shall have SS sheet of minimum 2mm thickness with internal Arc Type tested and meet the "sealed pressure system" criteria in accordance with the IEC 62271-200. This is a system for which no handling / refilling of gas shall be required throughout the expected operating life, i.e. 30 years. Sealed pressure systems are completely assembled, filled and tested in the factory. The maximum leakage rate of SF6 gas shall be lower than 0.1 % of the total initial mass of SF6 gas per annum. The filling pressure for the switchgear shall be just above the atmospheric pressure so as to reduce the tendency to leak. SF6 gas used for the filling of the RMU shall be in accordance with .IEC 376. It is preferable to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption. The degree of protection for RMU tank (Indoor/Outdoor) shall be IP 67. The mimic board shall be provided with IP2X /IP3X degree of protection for Indoor RMUs and protection for Outdoor RMUs shall be minimum IP 54

The RMU shall be suitable for mounting on plinth with provision for cabling through gland plate in the base and trench below, The RMU shall be designed so that the position of the different devices is visible to the operator on the front and operations are also visible. The RMU shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics. The RMU shall be designed to be tamper proof so as to prevent access to all live parts during operation without the use of tools.

5.1.2 The RMU shall be completed with all connection and electrolytic copper bus bar with continuous current carrying capacity of 630A at 50 Deg C ambient. The bus bar shall be fully encapsulated by SF6 gas inside the steel tank. There shall be continuity between the metallic

parts of the RMU and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The earth bus bar shall be preferably enclosed in an enclosure to prevent theft/tampering.

5.1.3. All parts of main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This does not apply to removable parts which become accessible after being separated from the switchgear and control gear. The cables shall be earthed by an earth switch with short-circuit making capacity in compliance with IEC 62271-102. Circuit breaker shall not be closed in case Earth Switch is closed. The earth switch shall be fitted with its own operating mechanism and manual closing shall be driven, by a fast-acting mechanism, independent of operator action. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when cable is charged.

5.1.4 Any accidental over pressure inside the sealed chamber shall be limited by the opening of a pressure limiting device provided in the rear part of the tank. Gas shall be released to the rear of the RMU away from the operator. Bidder shall provide type test report to prove compliance to the 'Internal fault IAC AFLR as per IEC 62271-200. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch-or earth switch. All manual operations shall be carried out on the front of the RMU. The instrument transformers (CT/PT) shall be required and to be incorporated in the drawing for discussion at the final stage.

5.1.5 Circuit Breaker for Transformer Local Feeder Control

The circuit breakers shall be of the maintenance free. The position of the power and earthing contacts shall be clearly visible on the front of the RMU. The circuit breakers shall have at least 2 positions: Open-disconnected and closed and shall be constructed in such a way that natural interlocks prevent all unauthorized operations. They shall be fully mounted and inspected in the factory. Breaker operation counter should be provided

An operating mechanism can be used to manually close the circuit breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping by, an integrated push button. There will be no automatic re-closing. The operating mechanism shall be compatible for remote/SCADA operation. The circuit breaker shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include three toroid transformers incorporated in the transformer tee-off bushings, an electronic self powered relay, a low energy release, and a "fast-on" test receptacle for protection testing (with or without CB tripping). The protection system shall ensure circuit breaker tripping as of a minimum operating. current which is the rated current of the underground network to be protected. The CT settings shall be adjustable & Primary & Secondary Current and range to be decided by user at the time of issuance of tender as per site requirement . Protection core CT complete details should be furnished (Burden, class, ALF).

The circuit breaker shall be provided with Phase protection of Definite time/ IDMT element for .overcurrent and earth fault with minimum PSM-0.05,Tsm-0.01 having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The Earth Fault Protection shall be provided of. Definite time/ IDMT element having standard characteristics of Standard Inverse, Very inverse, Extremely Inverse as per IEC 60255-3 standard. The "Time Multiplier" with minimum set point of 0.05 TMS shall be available. The breaker shall have the provision of flag Relay for indication of Trip on Fault. High set (DT) for overcurrent and earth fault-min .current setting-0.5 In, minimum Time Delay-20 millisecond. The relays shall be suitable numerical relay with necessary elements or any other relay as per the Purchaser's approval.

There' shall be provision for testing of cable without opening the front door by suitable arrangements. In case cables are to be tested with front door open, doors shall have interlocks such that doors can be opened only with earth switch in closed position. Termination boots as approved by the Purchaser's should have a proper opening to facilitate the testing. The opening shall be covered by means of removable protection cap

In case of front door opened, it shall not be possible to operate the breaker. All panel covers shall be provided with anti vandal screw bolts so that opening of panel covers is only possible with special tools, which shall be provided by the Bidder. This is required to prevent pilferage. The cable cover door shall be pad lockable and shall be Tamper and Arc proof. There shall be provision of hinged doors in the RMU. The circuit breaker and earth switch shall be lockable in the open or closed positions by 1 to 3 padlocks. Breaker shall have mechanical life of at least 2000 operations. The circuit breaker shall be compatible for remote operation and can close (ON) and open (OFF) by remote operation.

5.1.6 Incomer Load Break Switches :

The Load break switches shall have positions, open-disconnected closed, and earthed, and will be constructed in such a way that natural interlocking prevents unauthorized operations

The position indicator shall provide positive contact indication in accordance with IEC 265-1 standard. In addition, manufacturer shall prove reliability of indication in accordance with IEC 129.

The switches shall be fully mounted and inspected in the factory. Manual opening and closing will be driven by a fast-acting mechanism, independent of operator action.

Mechanical Interlock should be provided for Earth switch, If cable is back charged Earth switch should not be closed.

Each switch can be fitted with an electrical operating mechanism in a specially reserved location, without any modification of the operating mechanism and without de-energizing the RMU.

Load break Switch should be operated manually & motorized.

5.1.7 Bushings and Cable terminations:

Each cable compartment shall be provided with three bushings of adequate sizes to terminate the incoming and outgoing cables along with a terminal block (TB) located at convenient accessible location so as to wire all inputs & outputs (IOs) up to the terminal block (TB). The bushings shall be conveniently located for proper bend so as to allow easy working and termination of cables. The cable termination shall be done with Heat shrinkable /Push ON termination method so that adequate clearances are maintained between phases & cable shall be held by HDPE (fire retardant) cleat. 2 runs, of 3CX400 Sq mm, OR 1R of 3 NO. 1CX630 Sq mm shall be used for cable termination.(It shall be finalized during detailed engineering) All the cable secondary Wiring should be rooted through marshaling box separately for relay, CT etc. BA should provide bimetallic washer for tightening of cable.

5.1.8 Earthing:

The RMU outdoor metal clad, switchgear, Distribution Transformer, R.S. Joists, M.S Channels/M.S. angles etc, shall be equipped with an earth bus securely fixed along the base of the RMU. The size of earth busbar of GI Strip (75X12 mm) shall be as per IEC/IS. Provision shall be made on end of RMU for connecting the earth bus to the earth grid by erecting suitable 2 earth pipes of 50mm dia. M.S. rod of 3 meter in Pits. Both the earth pipes are also to be connected in a grid formation. Necessary terminal clamps and connectors shall be included in the scope of supply.

5.1.9 Voltage indicator lamps and phase comparators:

Each function shall be equipped with a fixed type voltage indicator box on the front to indicate whether or not there is voltage in the cables. The capacitive dividers Will supply low voltage power to the lamps. Three inlets can be used to check the synchronization of phases. These devices shall be in compliance with IEC 61958 standard.

5.1.10 Front Cover

The front cover shall provide a clear mimic diagram that indicates the different functions. The position indicators shall give a true reflection of the position of the main contacts. They shall be

clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The bidder shall provide a marking plate showing RMU's main electrical characteristics.

5.1.11 Fault Passage Indicators

Fault Passage Indicators shall be installed on the Ring Main Unit. These devices shall be, electronic devices with their own energy source and connected to Single 3 phase Split Core CTs (CBCT) . These shall be provided with bright LED s / flag. Indicators, which shall be clearly visible in the day time. These shall have the following resetting facilities:

- Manual reset
- Resetting after a set time duration
- Electrically reset from remote with at least 2-spare potential free Contacts.

The unit shall have Short Circuit and Earth fault adjustable to different settings with separate Current transformer. They shall be fully field-programmable and shall have at least 16 settings for Earth Fault + 4 settings for Phase-Phase. It shall be possible to Test these indicators at site thru "Test" push button. The Fault Passage Indicators shall also be provided with a SCADA output contact. These shall confirm to the following standards:

IEC 60068-2-6, IEC 60068-2-9	: Environmental testing — For Vibration, solar radiations
IEC 60950	:Information Technology equipment - Safety
IEC 1000-2	: Electromagnetic compatibility for low-frequency conducted disturbances and signaling in public low power supply systems
IEC1000-4	: EMC - Testing & Measurement
IEC 1000-6	: EMC- Immunity for Residential, Commercial and light industrial environments

5.1.12 Remote Control of the RMU:

Remote operation of the RMU line switches shall be possible using pre- fitted motors to the operating mechanism for both line switch and circuit-breaker functions. All the necessary accessories shall be supplied separately, to stores.

Auxiliary contacts for remote indication of switch status are also required.

The fitting of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches. An auxiliary contact to prevent motorized operation of the mechanism while the operating handle is inserted into the operating point shall also be provided.

Preferred Communication protocol for FRTU shall IEC-60870-5-104

Signal requirement for field RTU (which shall be mounted near RMU) is attached (refer Annexure1). Bidder shall quote the cost of field RTU (FRTU) separately with all technical details for acquisition of the signal as described in Annexure-1.

5.1.13 Paint

All paint shall be applied on clean dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The overall paint thickness shall be 70 to 125 microns. (will be decided by user at the time of issuance of tender as per site requirement). The paint shall not scale off

or crinkle or be removed by abrasion during normal handling. The enclosure of the RMU shall be painted with shade Dark Gray, i.e., BS381C or RAL 7032. Sufficient quantity of touch-up paint shall be furnished for application at site.

6. MARKING

All the components and operating devices of the RMU shall be provided with durable and legible nameplates containing all technical parameters. Name plates shall be suitably embossed with " PO no. with date", "PROPERTY OF TPCODL/TPNODL/TPSODL/TPWODL & PO Number along with the following information. A Danger plate of appropriate size shall also be provided on the enclosure.

- a) Manufacturer's Name
- b) Month and year of supply
- c) PO Number
- d) Rated Voltage
- e) System Frequency
- f) Rated Short time withstand current for 1 sec
- g) Rated Impulse withstand Voltage
- h) Degree of Protection
- i) Type Designation or Serial no.
- j) Year of manufacture
- k) Applicable Rated values
- l) Mass of unit
- m) SF6 gas filling pressure

7. TESTS

7.0 TESTS FOR RMU

All the Routine and acceptance tests shall be carried out in accordance with the relevant IS/IEC standards. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components within the RMU enclosure shall have been tested for Routine/acceptance and Type tests as per the relevant standards. All Type tests as per latest IS / IEC shall have been carried out on the RMU as a whole as per relevant IS/IEC. Following tests shall be necessarily conducted on the equipment and its components in addition to others specified in the IS/IEC:

Type Test

- a) Power Frequency withstand test
- b) Mechanical operation test and checking of interlocks
- c) Dielectric test on main and control circuits.
- d) Temperature Rise test.
- e) Internal Arc withstand test,
- f) Degree of Protection test.
- g) Test to check the capability of main and earthing circuits subjected to rated peak and short time withstand current.
- h) Test to check the total time taken to clear the faults (relay pick up+ Trip coil pick up + breaker trip) for instantaneous & time delay modes.under various settings of relay and trip coil thru secondary current injection.
- i) Salt Spray Test

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.

All Type tests must be conducted from CPRI/ERDA, Govt Laboratory or International Laboratory.

Routine test:

Following routine tests are to be done on 100% of the lot quantity

2. Dimensional & Visual Checks
3. Operational & Interlock Tests of breaker & isolator switches
4. Measurement of Circuit Resistance
5. Sf-6 chamber pressure withstand/leakage test.
6. HV withstand test across isolator distance.
7. HV withstand test of control and auxiliary circuits.
8. Voltage Indication Tests.
9. Breaker Contact Resistance Test
10. Total Trip Time Check Test through Current Injection in primary.
11. IR Value.

Below routine test has to be provided on cable Boot for cable termination:

- a) Visual inspection of the final finished product.
- b) Intactness with Bushing.
- c) Insulation Test.
- d) AC HV test.

Acceptance test:

All the tests specified under Routine Test Clause above shall be carried out as acceptance test on random samples as per sampling plan under IEC/IS for each lot.

Bidder should have all the requisite testing equipment's to carry out routine and acceptance test mentioned above including:

- a. Facility for primary current injection up to 1000amp.
- b. Facility to check total trip timing of breaker along with breaker main contacts through primary current injection

8.0 TYPE TEST CERTIFICATE

The Bidder shall furnish the type test certificates of the 11 KV RMU for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or any other International Laboratory as per the relevant standards. Type tests shall have been conducted in CPRI/ERDA or any other International laboratories during the period not exceeding time span as per CEA guidelines. 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/TPNODL/TPSODL/TPWODL.

9.0 PRE-DISPATCH INSPECTION

Equipment shall be subjected to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. 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. Supplier 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 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 TPCODL/TPNODL/TPSODL/TPWODL. 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) Other Documents (as applicable)

10.0 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.

11.0 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 48 months from the date of commissioning or 60 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 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 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

13.0 TENDER SAMPLE

Not applicable.

14.0 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 or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

15.0 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 & SPECIAL TOOLS/GAUGES

Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document. Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall give a minimum of 12 months notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.

Any spare 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.

18.0 DRAWINGS & DOCUMENTS

Following drawings and documents shall be prepared based on TPCODL/TPNODL/TPSODL/TPWODL 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 for RMU
- d) Power flow diagram
- e) Foundation plan
- f) Bill of material
- g) Experience List
- h) Type test certificates

Drawings / documents to be submitted after the award of the contract are as under:

Sl. No.	Description	For Approval	For Review/Information	Final Submission
1	General Technical Particulars	✓		✓
2	General Arrangement drawings	✓		✓
3	Schematic Diagram	✓		✓
4	Bill of materials	✓	✓	✓
5	Foundation Plan & loading details		✓	✓
6	Installation Instructions		✓	✓
7	Instruction for Use		✓	✓
8	Transport/ Shipping dimension drawing	✓	✓	✓
9	QA & QC Plan	✓	✓	✓
10	Test Certificates			

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish five copies of all relevant drawings for TPCODL/TPNODL/TPSODL/TPWODL approval.

Instruction Manuals: Bidder shall furnish two softcopies (CD) 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. GUARANTEED TECHNICAL PARTICULARS

Sl. No	Descriptions	As Specified By TPCODL/TPNODL/TPSODL/TPWODL
1	RMU Category	
2	RMU application	
3	Offered Model nos. and OEM type	
4	Dielectric medium	
5	Interrupting medium	
6	System Frequency	
7	Rated Voltage	
8	Service Voltage	
9	Rated current -Line Switches	
10	Rated Current-CB and LBS	
11	Rated Short time current withstand (3 sec)	
12	Rated Short time Making capacity	
13	Rated cable charging interrupting current of incomer load break switch	
14	Rated load interrupting line current	
15	Rated cable charging breaking current of breaker	
16	No. of operations at rated short circuit current on line switches, earthing switches should be E2	
17	Opening time of breaker (max.) Without relay time	
18	Closing time of breaker (max.)	
19	Breaker Duty Cycle	
20	i. Mechanical endurance for Isolator & Earth Switch	
	ii. Mechanical endurance for Circuit Breake	
21	Electrical operations of at rated current	
	a. LBS/Disconnecter b. Earth Switch	
22	Temp rise above ambient of 50 deg.	
23	Min Gas pressure in bar	
24	SF6 Gas pressure manometer with indicating bars/scale to measure the actual gas pressure (indirect method RFS etc. not accepted)	
25	Enclosure	
26	Guaranteed SF6 leakage per annum	

27	Degree of protection	
28	Internal Arc rating	
29	Internal Arc test	
30	Lightning Impulse withstand Voltage	
31	Power Frequency withstand voltage	
32	SF6 Tank design	
32.1	Tank material and grade of SS and welding	
33	Earth bus bars	
34	Material & size of earth bus bar	
35	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. closing shall be possible only when Isolator is open	
36	Incomer Load Break switch: Shall be SF6 insulated with least maintenance. Shall have at least 3 positions, Open, Close & earth with natural interlocks. Fitting of motor at site shall be possible & shall have mechanical interlock. The electrical interlock of cable charge with earth switch is preferred.	
37	Circuit Breakers: a. With VCB interrupter and SF6 insulated bus with minimum maintenance and shall have at least 2 positions i.e. Open & Close, Manual operation & fitting of motor at site shall be possible if required. b. In view of safety each VCB shall be assisted with feeder side disconnecter having 3 positions, open disconnected, closed, and earth (having fault making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.	
38	Protection Relay-Without auxiliary power & shall include , electronic relay, low energy release & fast on test receptacle for protection testing	
39	Make of self-powered Relay & offered model	
40	Flag indication for CB Trip on fault in relay/ mechanical	

41	Testing of Cable- If doors are opened then earth switch shall be in closed position with necessary interlocks and cable test rod fixing provision in bolt head which can be fixed on terminations through boot cap/opening for testing purpose AND if doors are opened it shall not be possible to operate, Isolator, E/Switch or CB through interlocks	
42	Protection against theft	
43	Doors	
44	Voltage indicator box shall be fixed type-This device shall be in compliance with IEC 62271-206:2011 standard only	
45	Cable cleats (full circle)	
46	Cable termination and bushing suitability	
46A	Cable Termination boot /Cable boot	
46	Cable compartment suitability shall be	
47	The cable compartment	
48	Size of bimetallic washer in all compartments	
49	Height of bushing terminal from base plate	
50	Fault passage indicator	
51	Operating handle	
52	Non removable MIMIC Diagram on Front of panel	
53	Main Bus bar Material	
53.1	Bus bar Cross Section	
54	Opening & Closing times with relay	
55	Current Transformer for CB compartment	
56	Future motorization and SCADA Compatibility with FRTU	
57	Guarantee	
58	Dimension (LxWxH) (mm x mm x mm)	
59	Total weight	
60	Paint	
61	Type test of product	
62	Availability of spares	
63	VPIS auxiliary contact	
64	VPIS	
65	Breaker operation counter	
66	LBS operation counter	
67	Moisture absorption material in SF6 tank	
68	Bidder should provide the detail of the moisture absorption material.	
69	Making of earthing operations	
70	Auxiliary contacts (total numbers and spare numbers)	

71	Control cable entry provision	
72	Shunt trip coil 24V DC	
73	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	
74	RMU Cable Boot/ terminal protector	
a	Terminal protector	
b	System voltage	
c	AC High voltage	
d	Impulse withstand voltage	
e	Bushing Diameter	
f	Bushing Types	
g	Cable cross section suitability	
h	Dimensions of cable protector	
i	Material of the component	
j	Type test reports	
For motorized RMU		
1	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	
2	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself	
3	Details of I/O	
4	System to prevent mal operation in case of latch command	
5	Technical Details of motors	
a	Operating Voltage	
b	Max. power rating	
c	Max current drawn	
d	Operating time	
e	Power Supply	

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

TPCODL

TPWODL

TPNODL

TPSODL

Specification No: ENG-HV-2010

**Specification Name: Specification for
11KV RMU Motorised Outdoor Type**

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

Seal of the Company:

Signature

Designation

ANNEXURE – 1
SIGNAL LIST FOR AUTOMATION

Description Type	Analog Inputs(AI)					Status(DI)		Reset Element
	Amp. Loading-R ph	Amp. Loading-Y ph	Amp. Loading-B ph	Phase Voltage	Power factor	Switch close	Switch Open	
RMU Switch *	0	0	0	0	0	1	1	
Breakers *	1	1	1	1	0	0	0	
FPI							1	1
Pressure Gauge (manometer)							1	

FRTU SIGNAL LIST

Description Type	Analog Inputs (AI)				
	Amp. Loading-R ph	Amp. Loading-Yph	Amp. Loading-B ph	Phase Voltage	Power factor
Switch *	0	0	0	0	0
Breakers *	1	1	1	1	1
Fault passage indicator *	0	0	0	0	0

Note: 0 indicate functionality not req. for that element, 1 indicate functionality required for that element

* Denotes the nos of switches/ Breaker s in RMU based on the type of RMU (3way, 4way, 5way & 7way).

Additional IOs

RMU switch Control Command
Earth Sw. 1 Status Input
Earth Sw. 2 Status Input
FPI Reset
FRTU Local/Remote Position
FRTU Door Open
FRTU Battery Charger Faulty
FRTU Battery Faulty
FRTU SwitchGear Supply Off
FRTU Aux Supply Off
FRTU Fault
Relay operation
CB OFF status
CB ON status
CB ON/OFF Command

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-HV-2013

Specification Name : Technical Specification for 11 kV AB switch (400 A & 200 A)

YASHOBANTA ROUT	DEEPAK BADATYA	J DURAIRAJ	Sandeep Saurav	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
07-01-2023	07-01-2023	09-01-2023	10-01-2023	10-01-2023	12-01-2023

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1. SCOPE

This specification covers design, manufacturing, testing at manufacturer's works, inspection, packing & delivery of 11 kV Air Break Switch with accessories for out-door installation for use on transformer centers and tap line in Central Odisha. Aforesaid item(s) shall include loading and unloading at anywhere in Odisha.

It is not the intent to specify completely herein all the details of design and construction of Air Break Switches. However, AB Switches will confirm in all respects to high standards of engineering design and workmanship and shall be capable of performing in continuous Commercial operation up to the supplier's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any material, which in his judgment i.e. not in accordance with the specifications/drawings.

The AB Switches offered shall be complete with all components necessary for its effective and trouble-free operation along with associated equipment etc. such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in the specification and/or in order or not. Also similar parts particularly removable ones shall be inter-changeable.

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	Description
IS 9920 (part-I to V)	Specification for helically formed fittings for Overhead lines up to 33 kV
IS 2633 (Part 1)	Method for testing uniformity of coating on zinc coated
IEC 62231	Composite station post insulators for substations with a.c. voltages greater than 1 000 V up to 245 kV – Definitions, test methods and acceptance criteria
IEC 60168:1994+AMD1:1997+AMD2:2000 CSV	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V
IS 9530	Recommended practice for silver plating
IS 5925	Recommended practice for silver plating for general engineering purposes
BS 2816	Testing of silver plating thickness

IS 1239	GI pipe('B' class or Medium class)
IS: 5561	Electrical Power Connectors
IS 2062	Hot rolled medium and high tensile structural steel — specification

3. CLIMATIC CONDITIONS OF THE INSTALLATION

SL.NO.	CONDITONS	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	
		400 Amps AB Switch	200 Amps AB Switch
1	Rating of AB Switch	400 Amps AB Switch	200 Amps AB Switch
1.a	Reference standards (latest amend.)	IS 9920, IEC 129, IEC 62231, IS 1239	
2	Installation	Outdoor	Outdoor
3	Suitable for Mounting	Horizontal Rotating Type	
4	Type	3 Pole	3 Pole
5	Service Voltage	11 kV	11 kV
6	Rated Voltage	12 kV	12 kV
7	Rated Frequency	50 Hz	50 Hz
8	Current Carrying Capacity	400 Amps	200 Amps
9	Rated short time current	16 kA for 1sec	16 kA for 1sec
10	Rated peak withstand current	40 kA	40 kA
11	Rated main active load breaking capacity	10 Amp	10 Amp
12	Rated line charging breaking capacity	2.5A	2.5A
12.a	Rated Cable charging breaking capacity	10A	10A
13	Rated Transformer off load breaking Capacity	6.3A	6.3A
14	One minute power frequency withstand voltage Dry	35kV RMS	35kV RMS
15	One minute power frequency withstand voltage Wet	35kV RMS	35kV RMS
16	Dry flashover Voltage	55kV	55kV
17	Power Frequency puncture withstand voltage	1.3 times of actual dry flashover Voltage	
18	Visible Discharge Voltage	9kV RMS	
19	1 Minute Power Frequency withstand voltage between pole and earth	28kV RMS	28kV RMS
20	1 Minute Power frequency withstand voltage across the isolation distance	32kV RMS	32kV RMS
21	Impulse withstand voltage for positive and negative polarity (1.2 / 50) micro second wave)		
a	Across Isolating distance	85kV Peak	85kV Peak
b	To earth and between poles	75kV Peak	75kV Peak
22	No. of Post Per Pole (Polymeric, IEC 62231)	2	2
23	Total No. of post	6	6
24	Minimum Creepage Distance	320 mm	320mm

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
24.a	FRP Dia. of the Post Insulator (min.)	24mm	24mm
24.b	Dai of Weather sheds	>100mm	>100mm
24.c	Thickness of Housing (min)	3mm	3mm
25.d	Type of Sheds	Aerodynamic	Aerodynamic
25	Phase to Phase Clearance	760mm	760mm
26	Isolation Distance in switch open condition	380mm	380 mm
27	Vertical clearance from Top of Insulator cap to mounting channel	254mm (min)	254mm (min)
28	Copper contacts Temp in Air should not exceed	65Degree	65 Degree
29	Size of fixed contacts (Copper Type Electrolytic with silver plated) (coating thickness not less than 10 microns)	80mmx50mmx8mm (50x8x2 Fingers)	70mmx35mmx6mm (35x6x2 Finger)
30	Size of Moving contacts (Copper Type Electrolytic with silver plated) (coating thickness not less than 10 microns)	220mmx50mmx8mm	220mmx35mmx6mm
31	Moving Contact supporting Angle	50mmx50mmx5mm	45mmx45mmx5mm
32	Size of rods used for arcing horns	10 mm	8 mm
33	Insulation for tinned Copper braid/rope	Polyolefin, (RSFR-H) type	Polyolefin, (RSFR-H) type
34	Copper Flexible BRAIDED Tape - 320mm Long, Tined plated with Brass Nut, bolt & Washers	450gm /Mtr	450gm /Mtr
35	Minimum size*Length of Coupling Hot Dip GI Solid Pipe for Phase coupling pipe, B Class (Nominal Bore)	25mm Dia &1800 mm long	25mm Dia &1800mm long
36	Operating Down Pipe, B class (IS 1239) (Nominal bore)	32mm Dia & 7Mtr Long (one piece)	32mm Dia & 7Mtr Long (one piece)
37	Temperature Rise Limit (w.r.t ambient temp) - Tinned Copper contacts - Terminals - Metal Parts	65°C 65°C 40°C	65°C 65°C 40°C
38	Bearings	4 nos. self-lubricating bearing to be provided with grease nipple including 4 th bearing being a thrust bearing.	
39	Locking arrangement	Provision for pad locking at both 'ON' & 'OFF' Position	
40	Earth Terminal	M12 Bolts with nuts and flat washer shall be provided at base channel as earthing Terminal.	
41	'T' Connection	The T connection provided on the channel having 'moving contact' shall be G.I Nut & bolt at the bottom end to facilitate replacement of this unit only during	

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
		requirements & avoid entire change of arm.
42	'I' bolt	The I bolt shall be longer with 75 mm thread.
43	Mounting Channel HDG 100 microns	75x40x4.8 mm hot dip galvanized channel length 480 mm min. (C/C slotted hole 18x 36 mm- 250mm)
44	Connectors	Connectors shall be of hard drawn electrolytic copper or brass. The connector should be of 4 bolted type and suitable for 55- 100 sqmm AAAC conductor. Or SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable for 55-100 sqmm AAAC conductor.
45	Marking/Engraving (Parameters should be embossed on SS sheet of thickness 1mm with black background. It should be riveted on MS channel of AB switch)	1. Rated Voltage 2. Manufacturer Name 3. Month/Year of Manufacture 4. Serial No. 5. PO No. 6. Rated Normal Current in Amps 7. Rated One Second Short-Time Current
46	Pressure Spring	Stainless steel

5. GENERAL CONSTRUCTIONS/REQUIREMENTS

- The Air break switch shall be outdoor type, rotating type gang operated and shall be suitable for horizontal installation having 2 no. of polymeric post insulators per phase.
- The Rotating type operating mechanism shall be suitable for manual operation from ground level and shall be designed in such way that all the three phases shall open and close simultaneously in smooth way.
- The air break switch shall be with the arcing horns, the sizes of the rods used for the arcing horns would be 10mm for 400 A and 8mm for 200 A AB switch of M.S. Hot dip galvanized.
- The current carrying connectors should be two-bolt type having nuts and bolts, with spring washer and plane washer.
- Each joint shall be provided with one plane and one spring of not less than 2mm thickness.
- Connectors shall be of H D electrolytic copper.
- The minimum cross section for fixed contact shall be 400 sq.mm for 400 Amp AB Switch and 200 sq.mm for 200 Amp AB Switch.
- Tinned Copper braid/rope shall be insulated by Polyolefin (RSFR-H) type to prevent animal electrocution. It shall be 320 mm long minimum and shall weigh 450 G/M. It shall be punched at both ends.
- All ferrous parts shall be hot dip galvanized with heavy coating after proper surface treatment as per standards. Coating thickness shall not be less than 100 micron at any point.
- All Copper parts shall be silver plated as per relevant standards and coating thickness not less than 10 microns at any point.
- Equipment grounding shall be provided by bidder at two points with terminals. .
- All the nut bolt used must be Hot dip Galvanized and of size not less than M10.
- A rigid base of galvanized steel channel of size approx.75x40x4.8 mm Length 480 mm min. (C/C slotted hole 18x 36 mm- 250mm shall be provided with clamps and bolts for Horizontal mounting firmly on steel structure.
- Each member of the switch shall be free from Rust, sharp edges, burr and any kind of deformation.

15. The phase coupling rod, operation rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operation mechanism with 'ON' & 'OFF' positions shall be provided.
16. The operation rod shall be medium gage of 32mm diameter nominal bore G.I. pipe single length 7 meters. The phase coupling rod for gang operation shall be of medium gauge 25mm dia. & 1800 mm length nominal bore G.I. pipe.
17. Non-threaded type spindle shall be provided for connection with down pipe.
18. Provision for operating handle earth with flexible copper wire shall be provided.

Technical particulars	400 Amps AB Switch	200 Amps AB Switch
Switching Blades	It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mm x50 x 8mm for 11 KV. The switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.	It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mmX35X 6mm. The Switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.
Fixed Contacts	The fixed jaw type female contacts (80x50x8)mm for 11 KV shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by phosphorus bronze/Stainless Steel high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contacts to take the shock arising from the closing of moving contact blade without the same being transmitted to the post insulator.	The Fixed Jaw type female contacts of size (70x35x6) mm shall be made of electrolytic copper (minimum 95% copper composition) duly silver coated controlled by phosphorous bronze/Stainless steel high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of move contract blade without the same being transmitted to the post insulator.
Terminal pads	Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. of 12mm dia. brass bolts, double nuts, plain washers & spring washers should be provided along with 2 nos. solder less bimetallic sockets for each connector suitable sockets for each connector suitable up to 55- 100 mm ² AAA conductor.	Terminal connectors shall be robust in design. The size of fixed connector shall be (70 X 35 X 6 mm) and size of movable connector shall be of (70 X 35) X (70 X 35) X 6mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95% copper composition with 2 nos. of 12mm dia. holes provided with suitable brass bolts and double nuts, flat washers, spring washers & 2nos.bimetallic solder less sockets suitable up to 55-100 mm ² AAA conductor.

6. MARKING

Below parameters should be embossed on SS sheet of thickness 1mm with black background. It should be riveted on MS channel of AB switch:

1. Rated Voltage
2. Manufacturer's Name
3. Month/Year of Manufacture
4. Serial Number
5. PO no.

6. Rated normal current in Amps
7. Rated one second short-time current in Amps

7. TESTS CERTIFICATE

7.1 Type Test

The A.B. switches shall be subjected to the following type tests in accordance with clause No. 6 of IS-9920 (Part-1)/2002.

- (i) Tests to prove that the temperature rise of any parts does not exceed the values specified in part-2 of this standard.
- (ii) Tests to prove the capability of the switch to carry the rated peak withstand current and the rated short time current.
- (iii) Measurement of the resistance of the main circuit.
- (iv) Tests to prove the ability of the switch to make and break the specified currents.
- (v) Tests to verify the insulation level including withstand tests at power frequency voltages on auxiliary equipment if any. Di-electric tests include impulse withstand tests, power frequency voltage withstand tests, and power frequency voltage withstand tests.
- (vi) Tests to prove satisfactory operation and Mechanical endurance.
- (vii) Tests to prove the integrity of the external insulation under conditions of the air pollution.

Note 1: The type test certificate should not be more than 5 years old as on due date of opening of tender.

Note 2: Type test certificate of polymeric post Insulator shall be submitted and shall be issued from CPRI/ERDA or Government lab only.

7.2 Acceptance Tests

The following acceptance test should be carried out as per IS: 9920 (P4/1985) on number of samples selected from the offered lot.

- (i) Visual Inspection.
- (ii) Checking of Dimensions (of all parts as per the approved drawing).
- (iii) Power frequency voltage dry test.
- (iv) Measurement of the resistance of the main circuit.
- (v) Test to prove satisfactory operation
- (vi) Galvanizing test as per IS: 2633.
- (vii) Temperature rise test.

7.3 Routine Tests:

Supplier shall provide a control plan, which will be implemented on AB switches. Routine test reports should be submitted by the manufacturer with inspection call.

The following routine tests as outlined in clause No.4 of IS: 9920 (Part4/1985) shall be carried out by the manufacturer on each unit to check certain essential requirements.

- i) Power frequency voltage dry tests.

- ii) Measurement of the resistance of the main circuit.
- iii) Test to prove satisfactory operation.

The tenderer shall clearly indicate what testing facilities are available in the works of manufacturer & whether facilities are adequate to carry out all Acceptance & Routine Tests. These facilities should be available to TPCODL/TPNODL/TPSODL/TPWODL's representative if deputed or carry out or witness the tests in the manufacturer works.

8. TESTS

Along with the bid, the bidder must submit Type Test Reports on AB switches as per this technical specification, carried out within last five years from the date of opening of techno-commercial bid of the tender from CPRI/ERDA labs only. Otherwise the tender may be rejected.

9. PRE DISPATCH INSPECTION

Equipment 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 option of the TPCODL/TPNODL/TPSODL/TPWODL and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Supplier 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 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 TPCODL/TPNODL/TPSODL/TPWODL. Following documents shall be sent along with material

- a) Routine Test reports
- b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
- c) Invoice in duplicate
- d) Packing list
- e) Drawings
- f) Delivery Challan
- g) Installation and maintenance Manual soft copy for all components
- h) Other Documents (as applicable)

10. INSPECTION AFTER RECEIPT AT STORES/SITE

The material received at TPCODL/TPNODL/TPSODL/TPWODL Store/Site will be inspected for acceptance and shall be liable for rejection if found different from the reports

of the pre-dispatch inspection. If any deviation or anomaly observed at this stage same need to be rectified by bidder at bidders own cost at earliest.

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 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.

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. The packing should be in such manner that during storage and its components should not be damaged. No single use plastic to be used in packing material. Packing should be done with environment friendly recyclable materials

13. TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/TPNODL/TPSODL/TPWODL).

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 TPCODL/TPNODL/TPSODL/TPWODL's or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections. To ensure proper operation of Product the bidder shall provide onsite training of TPCODL/TPNODL/TPSODL/TPWODL teams as and when required. To ensure quality of installations bidder shall provide supervision support during impartation.

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 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 documents to be submitted along with the bid for evaluation:

- a) Completely filled-in clause wise compliance of this specification.
- b) Signed and stamped copy of drawing
- c) Complete Type test reports
- d) Completely filled signed and stamped copy of tender document.
- e) Any other requisite document
- f) Experience List.

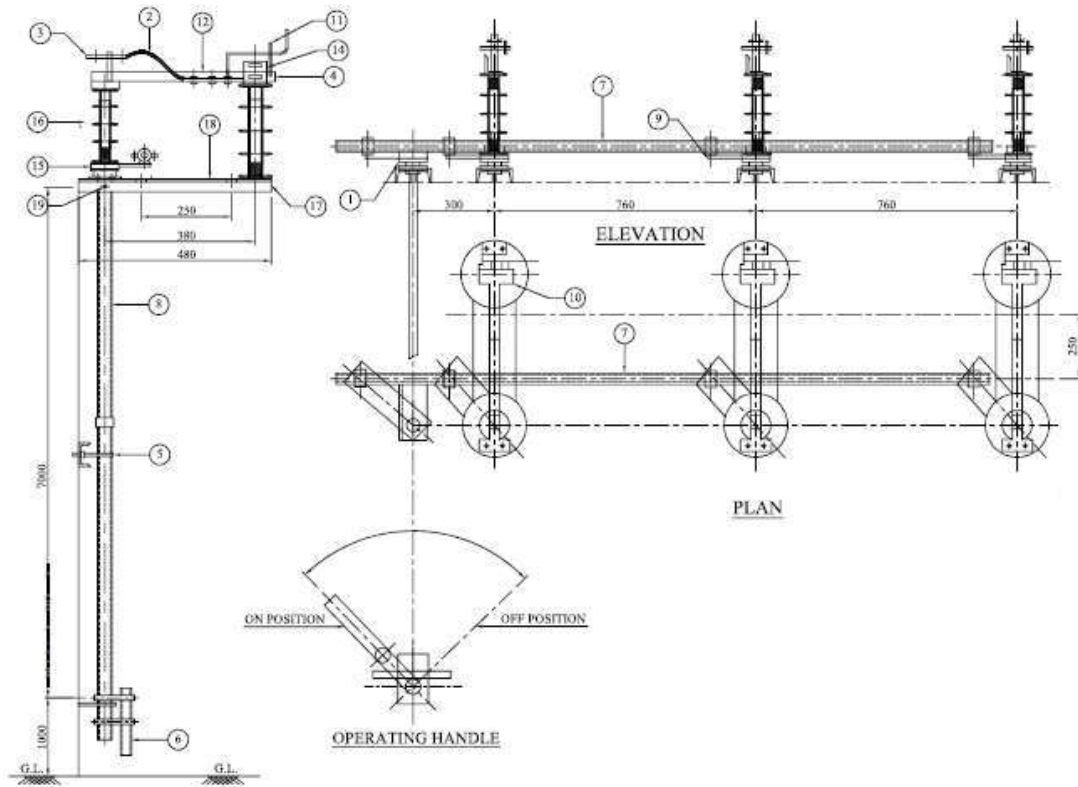
Following documents shall be submitted after award of RC/PO before manufacturing:

- a) Completely filled-in clause wise compliance of the specification.
- b) Signed and stamped copy of GA drawing
- c) Signed and stamped copy of installation drawing
- d) Compliance of all undertaking submitted during technical evaluation, if any
- e) Type test Certificates for each specified test if not submit during technical evaluation

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	Manual/Catalogues/drawings for all components.		√	
3	Technical details and test certificates.		√	√
4	Installation Instructions		√	√
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.



Indicative drawing of 11 KV 400 A and 200 A AB Switch

19. GUARANTEED TECHNICAL PARTICULARS

Completely filled-in clause wise compliance of this specification along with bid.

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:

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

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TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
10-01-2023	10-01-2023	11-01-2023	12-01-2023	12-01-2023	12-01-2023

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TPWODL*



Specification No: [ENG-HV-2016](#)

Specification Name:

Technical Specification For Heat Shrinkable
Straight through Joint & Termination for 11kV
Power Cable

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Specification No: [ENG-HV-2016](#)

Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11kV Power Cable

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.	CONDITONS	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:

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)



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- c) A2XWaY- (Aluminium stranded compacted conductor, XLPE insulation, Aluminium wire screen, PVC sheath)
 - i) 3CX95 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - ii) 3CX150 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - iii) 1CX55 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - iv) 1CX95 sq.mm. A2XC2Y/ A2XC2Y/ A2XWaY
 - v) 1CX150 sq.mm. A2XC2Y/ 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 U _o	pC	<10
3	Impulse Peak Withstand	kV	75 kV
4	Continuous operation withstand Temperature	°C	90
	Short Circuit withstand temperature	°C	250
5	Withstand short circuit current	kA/1Sec	As per Size of Conductors
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

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/mm ² (Minimum) and (8 N/mm ² for anti-tracking)
7	Ultimate Elongation	200% (Minimum)
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 200°C Min. (For stress control tube: 30 Minutes at 250°C Min.)
9	Low Temperature Flexibility	No cracking after 4 hrs. at minus -20°C Max.
10	Volume Resistivity	1x 10 ¹⁰ 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 250°C Min.



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Sl. No.	Parameter	Specified limit
9	Low Temperature Flexibility	No cracking after 4 hrs. @ minus -20°C 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	<p><u>Compression Lugs:</u></p> <ul style="list-style-type: none"> 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. <p><u>Mechanical Lugs:</u></p> <ul style="list-style-type: none"> 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.



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S. No.	Components	Requirement																																				
		<p>d) Approved make NILLED, PFISTERER, NEXANS, TYCO (GERMANY).</p> <p>e) Dimensions shall be as annexure-I of this specification.</p>																																				
2	Lug Seal, Anti-tracking tube, weather sheds, Stress control tube	<p>a) Heat Shrinkable</p> <p>b) Fire resistant and weather resistant as per ENA TS 09-13 – for lug seals, weather sheds and Anti-tracking tubes</p> <table border="1"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <p>For lower sizes length & OD of tubes should be adjusted suitably. BOM approval is mandatory before supply.</p>	Sl. no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm	1	3C 300/400 sqmm I/D & O/D	Stress control tube	3	130	50/25	2	3C 300/400 sqmm O/D	Anti tracking tube	3	60	55/20	3	1C 630 sqmm O/D & ID	Stress control tube	1	130	65/30	4	1C 630 sqmm O/D & ID	Anti tracking tube	1	400	70/30	5	1C 630 sqmm O/D & ID	Insulating tube	3	300	35/12
Sl. no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm																																	
1	3C 300/400 sqmm I/D & O/D	Stress control tube	3	130	50/25																																	
2	3C 300/400 sqmm O/D	Anti tracking tube	3	60	55/20																																	
3	1C 630 sqmm O/D & ID	Stress control tube	1	130	65/30																																	
4	1C 630 sqmm O/D & ID	Anti tracking tube	1	400	70/30																																	
5	1C 630 sqmm O/D & ID	Insulating tube	3	300	35/12																																	
3	Mastic tape	<p>a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant.</p> <p>b) Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.</p> <p>c) Stress grading mastic should be provided for both connector portion and semicon portion.</p> <p>d) Water resistant sealing mastic shall also be provided for end sealing in straight through kit and lug sealing in termination kit.</p>																																				
4	Heat Shrink Breakout & Lug seal	<p>a) Fire resistant and weather resistant as per ENA TS 09-13.</p> <p>b) Adhesive coated Breakouts shall be provided on outer sheath of the cable to prevent water ingress.</p> <p>c) Anti tracking lug seal with adhesive coated, flame retardant.</p>																																				



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S. No.	Components	Requirement
5	Tinned coated copper braid	<p>a) Shall be completely insulated by adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug.</p> <p>b) Fire resistant and weather resistant as per ENA TS 09-13.</p> <p>c) Size and length is as follows:</p> <p>d) 25 mm² x 500 mm x 1 Run for 3C 70, 95, 120 & 150 mm² cables.</p> <p>e) 50 mm² X 600 mm X 1 Run for above 150 mm² & up to 400 mm² cables.</p> <p>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.</p> <p>For Copper screened HT ABC, continuity of armor shall be through 25 sq.mm. X 500mm insulated tinned copper braid.</p> <p>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.</p>
6	Tinned coated copper braid as a Leakage Current Collector	<p>a) Leakage current collector tinned copper braid</p> <p>b) 1R X 7 mm² X 150 mm per core shall be provided for terminations.</p>
7	Tinned copper wire mesh	<p>a) Minimum 2.5mm² tinned copper mesh shall be provided on armour circumference beneath the copper braid.</p> <p>b) For 3 core cable 1R X 0.5mtr</p> <p>c) For 1 core cable 1R X 0.7mtr</p>
8	Sub-kit components	<p>a) GI Solid Collet dia of dia as per cable OD (1no only in 3C cables),</p> <p>b) Worm drive clip/ Jubilee clip of stainless steel (2 nos),</p> <p>c) Compatible support rings (Aluminium for single core and GI for three core cables)</p> <p>d) Soldering on copper screen is not acceptable</p> <p>e) Constant pressure roll spring shall be provided for screen connections as per compatible size. For 3 core- 3nos, for 1C - 1nos.</p> <p>f) Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same</p> <p>g) Tinned copper binding wire 20 SWG, qty 50gms</p> <p>h) Nylon string OD 1mm, 2mtr</p> <p>i) Silicone grease, 30 gms</p> <p>j) Cleaning liquid</p> <p>k) Vinyl tape</p> <p>l) Al oxide cloth</p> <p>m) Other necessary items</p>



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S. No.	Components	Requirement
9	Submission of BOM and instruction sheet	<p>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.</p> <p>*Note: BOM shall be approved by TPCODL/TPWODL/TPNODL/TPSODL authorized official at the time of pre-bid.</p>

5.2 Components of Straight Through jointing kit:

S. No.	Components	Requirement																																										
1	Heat Shrinkable insulating tube/ Sleeve	<p>a) Surface of material: shall be smooth and free from protrusion, voids and nicks.</p> <p>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.</p> <p>c) Wall thickness ratio (before recovery) of all sleeves/ tubes shall not be less than 60% at any two points of measurement.</p> <table border="1"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <p>d) For lower sizes length & OD of tubes should be adjusted suitably. BOM approval is mandatory before supply.</p>	Sl no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm	1	3C 300/400 sqmm	Stress control tube	3	470	45/20	2	3C 300/400 sqmm	Red Insulating tube	3	460	55/20	3	3C 300/400 sqmm	Dual wall tube	3	450	65/21	4	1C 630 sqmm	Stress control tube	1	500	65/30	5	1C 630 sqmm	Red Insulating tube	1	490	70/30	6	1C 630 sqmm	Dual wall tube	1	480	85/30
Sl no	Size	Tube type	Qty	Size (min in mm)	OD (Before/After shrinking) mm																																							
1	3C 300/400 sqmm	Stress control tube	3	470	45/20																																							
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3	3C 300/400 sqmm	Dual wall tube	3	450	65/21																																							
4	1C 630 sqmm	Stress control tube	1	500	65/30																																							
5	1C 630 sqmm	Red Insulating tube	1	490	70/30																																							
6	1C 630 sqmm	Dual wall tube	1	480	85/30																																							

S. No.	Components	Requirement
2	Compression lugs/ Mechanical Connectors	<p>a) Material : 99% Electrolytic grade Aluminium with Anti-corrosive paste</p> <p>b) Shape: As per IS 8308</p> <p>c) Dimensions as per Annexure-I of this Specification</p> <p>d) Conductivity of ferrules/mechanical connectors shall be as per IS 8309: 2003.</p> <p>e) Conductivity of Aluminium shall be min. 60% of IACS.</p> <p><u>Mechanical Lugs:</u></p> <p>a) Tinned coated Aluminium 185-400 mm²/ 630mm²/1000mm²</p> <p>b) Type Tested as per IEC 61238(part1):2003</p> <p>c) Dimensions shall be as annexure-I of this specification.</p> <p>d) Approved make NILLED, PFISTERER, NEXANS, TYCO (GERMANY).</p> <p>Dimensions shall be as annexure-I of this specification.</p>
3	Mastic Tape	<p>a) Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant.</p> <p>b) Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.</p> <p>c) Stress grading mastic should be provided for both conductor portion and semicon portion.</p> <p>d) Water resistant sealing mastic shall also be provided for end sealing in straight through kit and lug sealing in termination kit.</p>
4	Tinned coated copper braid for GI armour continuity / Ferrules for Aluminium armour continuity	<p>a) Shall be completely insulated with adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug at one end.</p> <p>b) Fire resistant and weather resistant as per ENA TS 09-13</p> <p>c) Size and length as per below:</p> <p>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.</p> <p>e) Uniformly tinned coated copper braid shall be provided for armor continuity</p> <p>f) Size of tinned copper braid shall be: 50 mm² x 1 Run for 150-400 sq.mm. three core cables. 25 mm² x 1 Run for below 150 sq.mm. three core cables.</p> <p>Ferrules for Aluminum armor continuity:</p> <p>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 mm² x 1 Run tinned copper braid to be provided.</p>



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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: 2.5mm ² (2" X 6mtr) c) For 1C cable: 2.5mm ² (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



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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



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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



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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)



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(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



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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



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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 U _o	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	



Specification No: [ENG-HV-2016](#)

Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11kV Power Cable

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

SI.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	



Specification No: [ENG-HV-2016](#)

Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 11kV Power Cable

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:

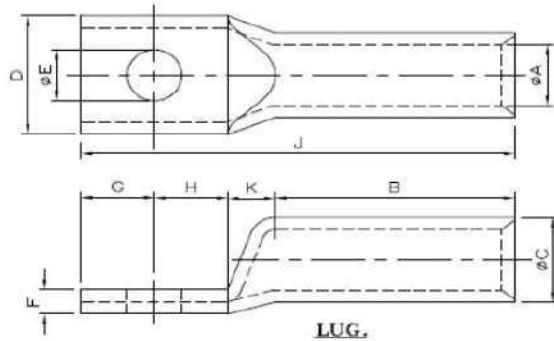
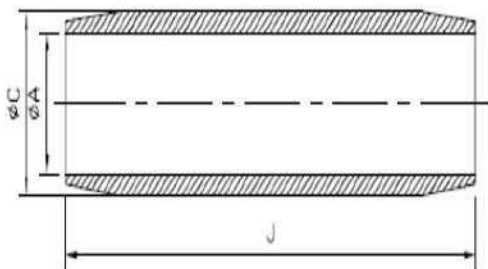
Signature

Designation

Annexure- Dimensions Ferrules & Lugs HT

Dimensional details of Aluminum ferrules for HT AL circular stranded compacted XLPE cables			
Cable Size in MM ²	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 MM ²	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

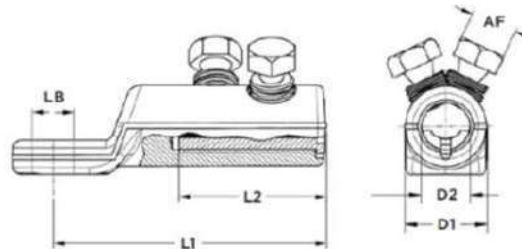
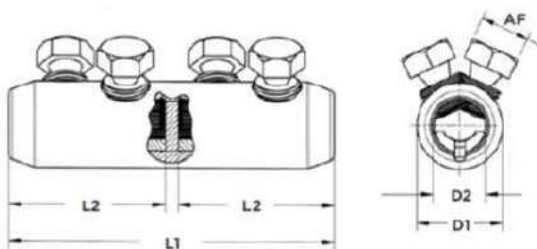


For remaining cable sizes, dimensions of Ferrules & Lugs shall be as per IS.

Annexure- Dimensions Mechanical connectors & Mechanical Lugs

Aluminium Mechanical connectors			
Cable Size in MM ²	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 MM ²	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-2021

Specification Name : Specification for 11kV 200A HG Fuse

Susavan Biswas	SATYA PRASAD NAYAK	JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPCODL	TPWODL	TPNODL	TPSODL	TPSODL
27-01-2023	01-02-2023	01-02-2023	01-02-2023	02-02-2023	02-02-2023

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1. SCOPE:

This specification covers the design, manufacture, testing and supply of 11 KV, 200 A, 3 pole HG Fuse sets for outdoor installations to be used for 33/11 KV Substations. Scope also includes transportation & unloading of poles 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 9385	High voltage fuses
IS 2062	Hot Rolled Medium and High Tensile Structural Steel
IS 209	Zinc Ingot
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
IEC 62231	Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV – Definitions, test methods and acceptance criteria.

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)

TPSODL/TPNODL/TPWODL/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. GENERAL TECHNICAL REQUIREMENTS:

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Name of Manufacturer	To be Specified by Bidder
2	Works Address	To be Specified by Bidder
3	Manufacturers Type	To be Specified by Bidder
4	Standard according to which the HGF are manufactured	IS 9385-1980 (Part-II) amended upto date, IEC 62231
5	Rated Voltage	12 kV
6	Rated Frequency	50 Hz
7	Lightning Impulse Withstand Voltage Positive & Negative Polarity (1.2/50 micro sec wave)	
a.	Across the Isolating distance	85 kV (Peak)
b.	To Earth & Between Poles	75 kV (Peak)
8	Dry Flashover Voltage	85 kV
9	Power frequency Puncture withstand Voltage	1.3 times of actual dry flashover voltage
10	Impulse Withstand Voltage (Switch in position)	75 kV (Peak)
11	Visible Discharge Voltage	9kV RMS
12	1 Min. Power Frequency Withstand Voltage (Dry & Wet)	
a.	Across the Isolating distance	32 kV
b.	To Earth & Between Poles	28 kV
13	Temperature Rise	Within permissible limit as per IS 9385-1980 (Part-II) amended upto date
14	Outdoor/Indoor	Outdoor
15	Type of mounting	Horizontal
16	Vertical clearance from top of insulator cap to mounting Channel	254mm (Minimum)
17	Continuous current Rating	200 Amp
18	Aluminium Strip for HG Fuse	30mmx5mmx425mm
19	11kV Polymer Post Insulator	
a.	Applicable Standard	IEC 62231 amended up to date
b.	Make of Post Insulator	To be Specified by Bidder
c.	Minimum failing load	5 kN
d.	CD of Post Insulator (min.)	320 mm
e.	Number of Insulators per Pole	2 Nos.
f.	Diameter of FRP Rod (min.)	24 mm
20	Total weight of Horn Gap Fuse	To be Specified by Bidder

21	Details of Arcing Horn	1 SWG (7.62 mm) dia. Solid copper rod silver plated provided with screwing arrangement on the fuse carrier made of copper for fixing fuse wire (Total length -635 mm). All the bolts, Nuts and washers should be made out of Brass
22	Riser Unit (150 mm height total)	The shape of connectors may be made out of straight copper Flat. Copper Riser 40 mm width x 5 mm Thick x 80mm height Copper Connector 40 mm width x 5 mm thick x 40 mm length. All Nonferrous parts shall be silver plated with coating thickness of (25 microns min.)
		b) 100 mm height G.I Riser made of 19 mm nominal bore medium gauge G.I pipe welded with 2 nos. of G.I flat of 30mmx5mm of both ends fixed with 10mm dia. bolts and nuts with flat & spring washer. All the bolts, Nuts and washers should be made out of Brass
23	Size of Base Channel	75mmx40mmx5mm Length Min. 500 mm (mounting slotted hole 18x 36 mm c/c 250 mm) a) All ferrous parts shall be hot dipped Galvanized as per IS.2633/1972 (Latest Amendment), IS 2629/1985 (1st. Revision), & all nonferrous parts should be duly electroplated with silver.
24	Connectors	SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable for 55-100 sq. mm AAAC conductor.
25	Marking/Engraving	TPSODL/TPNODL/TPWODL/TPCODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing.

5. GENERAL CONSTRUCTION:

The H.G. Fuses shall have adjustable arcing horns made of solid copper rod having 7.62 mm dia. The horns shall be fitted with screwing devices with fly nuts for fixing and tightening the fuse wire. It shall have robust terminal connector of size as per clause no.4 made of copper duly silver plated with two numbers of 12mm dia. brass bolts and double nuts with flat brass washers. The connector should be capable of connecting crimp able conductor up to 100 Sq.mm. size (AAAC) with bimetallic solder less sockets. The H.G. Fuse Set shall be suitable for horizontal mounting on Sub-station structures. All metal (ferrous) parts shall be galvanized and polished.

5.1 Insulators:

The post type insulators used for the Horn Gap Fuse Unit shall conform to IEC: 62231 (amended upto date) in all respects with regard to mechanical and electrical requirements.

The electrical characteristics of the insulators shall be as follows

1	System Voltage	11 kV
2	Lightning Impulse Withstand Voltage in kV	75
3	Power Frequency Withstand Voltage in kV (Dry)	55
4	Power Frequency Withstand Voltage in kV (Wet)	35
5	Power Frequency Flashover Voltage in kV (Dry)	85
6	Power Frequency Flashover Voltage in kV (Wet)	50
7	Creepage Distance in mm (min)	320
8	FRP Rod Dia. in mm (min)	24

Minimum failing loads for post Insulators should be 5kN for 11kV.

The type of insulation materials, metal fittings, Creepage distance, protected Creepage distance, tensile strength compression strength, torsion strength and cantilever strength shall be as provided in the guaranteed technical particulars in clause no.19.

The bidder shall furnish the type test certificate of the post insulators from their manufacturer for reference & scrutiny. For type, test reports refer cl no 7.3. Any fittings accessories or equipment which may not have been specifically mentioned in this specification but which are usually necessary in equipment shall be deemed included in the specification and shall be supplied by the Bidder without extra charge. All equipment shall be complete in all details whether such details are mentioned in the specification or not.

6. MARKING:

Below parameters should be embossed on SS sheet of thickness 1mm with black background. It should be riveted on MS channel of HG Fuse:

1. Rated Voltage
2. Manufacturer’s Name
3. Month/Year of Manufacture
4. Serial Number
5. PO no.
6. Rated normal current in Amps
7. Rated one second short-time current

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) Power frequency voltage dry test.
- ii) Tests to prove satisfactory operation.
- iii) Dimension check.
- iv) Galvanization test.

7.2 ROUTINE TESTS

- i) Power frequency voltage dry test.
- ii) Tests to prove satisfactory operation.
- iii) Dimension check.
- iv) Galvanization test.

7.3 TYPE TESTS

- i) Impulse voltage dry test
- ii) Power frequency voltage dry test
- iii) Power frequency voltage wet test
- iv) Temperature rise test.
- v) Mechanical endurance test / Mechanical strength test for the post insulator.

Type tests on Post Insulators

- i) Dry Lightning impulse withstand voltage test.
- ii) Wet power frequency test
- iii). Damage limit proof test and test of tightness of the interface between end fittings & insulator housing
- iv). Radio interference test
- v). Recovery of hydrophobicity test
- vi). Chemical composition test for silicon content
- vii). Brittle fracture resistance 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/ Other Govt. Lab** 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 TPSODL/TPNODL/TPWODL/TPCODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPSODL/TPNODL/TPWODL/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 TPSODL/TPNODL/TPWODL/TPCODL's representatives at all times when the work is in progress. Inspection by the TPSODL/TPNODL/TPWODL/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 TPSODL/TPNODL/TPWODL/TPCODL.

Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPSODL/TPNODL/TPWODL/TPCODL
- c) TPSODL/TPNODL/TPWODL/TPCODL 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 TPSODL/TPNODL/TPWODL/TPCODL 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 12 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 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:

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

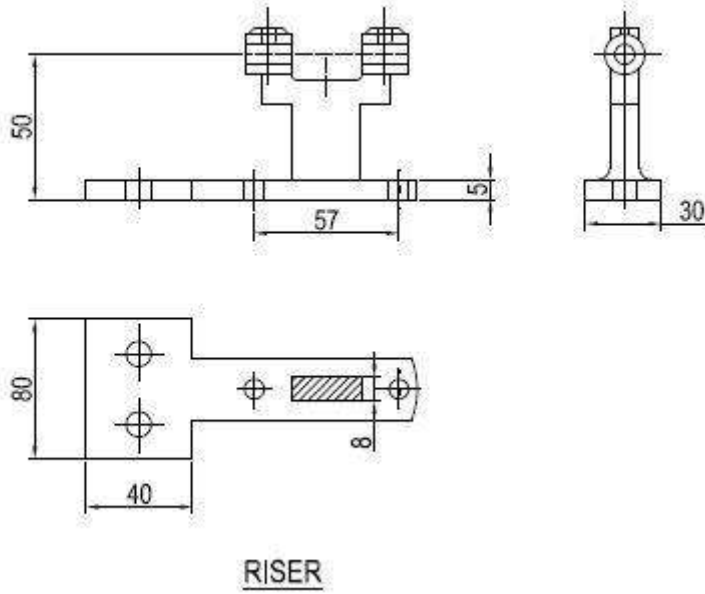
Not applicable.

18. DRAWINGS AND DOCUMENTS:

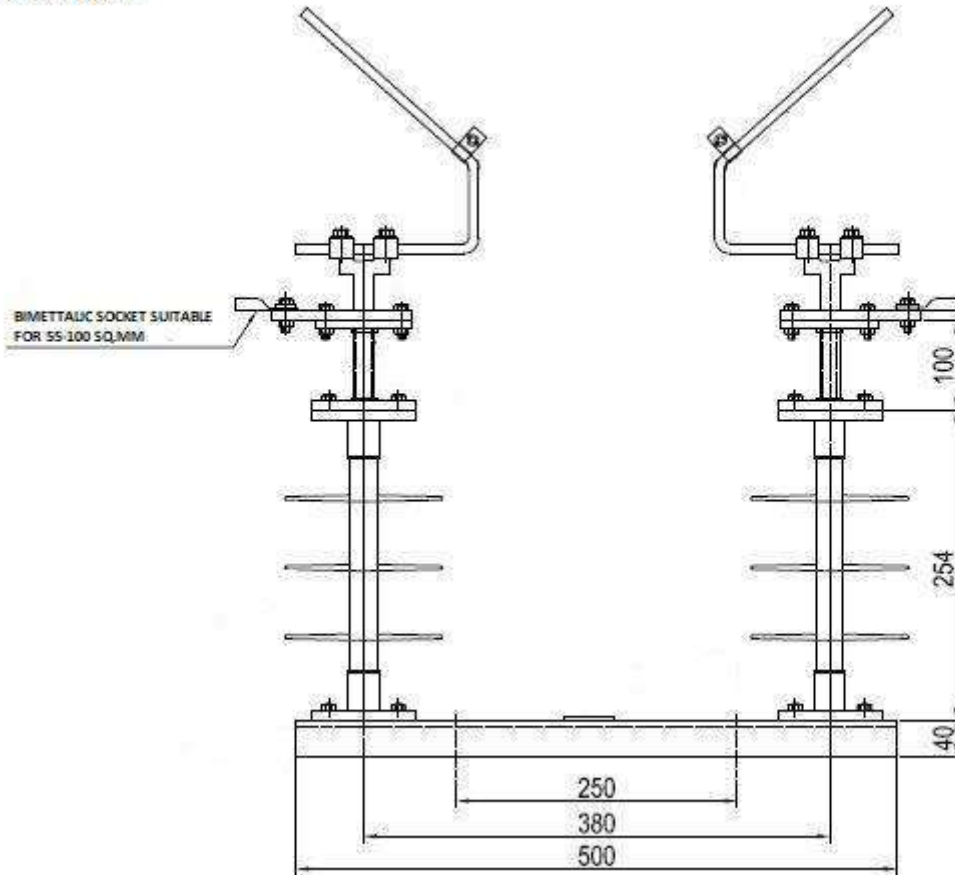
Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- a) Completely filled in Schedule "A" Guaranteed Technical Particulars.
- b) Work Experience details
- c) Type test certificates.
- d) Drawing (3 sets) of HG fuse containing complete information about manufacturing & fabrication etc.

19. Drawing (reference for tender purpose only)



REFERENCE FOR TENDER PURPOSE ONLY. FINALIZATION OF GTP WILL BE AT THE TIME OF DETAILED ENGINEERING



20. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	Desired Value
1	Name of Manufacturer	
2	Works Address	
3	Manufacturers Type	
4	Standard according to which the HGF are manufactured	
5	Rated Voltage	
6	Rated Frequency	
7	Continuous current Rating	
8	Post Insulator	
8.1	Lightning Impulse Withstand Voltage Positive & Negative Polarity (1.2/50microsecwave)	
a	Across the Isolating distance	
b	To Earth & Between Poles	
8.2	1 Minute Power Frequency Withstand Voltage (Dry)	
8.3	1 Minute Power Frequency Withstand Voltage (Wet)	
8.4	Visible Discharge Voltage	
8.5	Dry Flashover Voltage	
8.6	Power frequency puncture withstand voltage	
8.7	Impulse Withstand Voltage (Switching Position)	
9	1 Minute Power Frequency Withstand Voltage	
a	Across the Isolating distance	
b	To Earth & Between Poles	
10	Temperature Rise	
11	Outdoor/Indoor	
12	Type of mounting	
13	Vertical clearance from top of insulator cap to mounting Channel	
13B	Height of the riser for carrying the horns.	
13C	Details of Arcing Horns	
13D	Riser Unit	
14	Connectors	
15	Size of Base Channel (HDG)	
16	Aluminium Strip for HG Fuse	
17	11 kV Post Insulator	
a.	Applicable Standard	
b.	Make of Post Insulator	
c.	Minimum failing load	
d.	CD of Post Insulator (min.)	
e.	Number of supporting Insulators per Pole	
18	Total weight of Horn Gap Fuse	
19	Marking/Engraving	



Specification No: ENG-HV-2021

Specification Name: Specification for 11kV 200A HG Fuse

21. 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-2023

Specification Name : Technical Specification For HT stay (Guy) insulator

SAYANTANI DAS	MILAN MAITY	SANTOSH KUMAR PATRA	Susavan Biswas	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
24-01-2023	25-01-2023	25-01-2023	27-01-2023	30-01-2023	31-01-2023

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TPWODL*

TPCODL

TPWODL

TPNODL

TPSODL

Specification No: ENG-HV-2023

Specification Name: Technical Specification of
HT Stay (Guy) Insulator

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19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of porcelain HT Guy Strain Insulators for use in Distribution system. 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:

Ref IS	Description
IS 5300	Porcelain Guy Strain Insulators

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 Speed	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/ TPWODL/ 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	DESIRED VALUE
1	Manufacturer's Name	To be specified by Bidder
2	Type of insulator	Designation C
3	Standard Specification to which the material shall confirm	As per IS: 5300
4	ELECTRICAL CHARACTERISTICS	
(a)	Dry one minute power frequency Flashover voltage	32 kV
(b)	Wet one minute power frequency Flashover voltage	15 kV
(c)	Dry one minute power frequency Withstand voltage	27 kV
(d)	Wet one minute power frequency Withstand voltage	13 kV
5	Minimum Failing Load	88 KN
6	DIMENSIONS	
(a)	Length	140 mm
(b)	Width	85 mm
(c)	Cable Hole Dia	25 mm (+/- 1.5 mm)
7	Creepage Distance	57 mm
8	Type of Glaze	Brown / Dark Brown
9	Weight per piece	1.1 Kg approx.

5. GENERAL CONSTRUCTION:

- The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed.
- The design of the insulators shall be such that the stresses due to expansion and contraction in any part of the insulator shall not lead to its deterioration.
- The glaze shall be brown in color for insulators. The glaze shall cover the entire porcelain surface parts except those areas that serve as supports during firing.
- The standard guy strain insulators shall be of designation, 'C' as per IS: 5300 or its latest revision. The recommended type of guy strain insulators for use on guy wires of HT overhead line is Type-C.

6. MARKING:

Following distinct non-erasable embossing is to be made on each Insulator to be supplied to TPCODL/ TPNODL/ TPWODL/ TPSODL under this Tender.

- "TPCODL/ TPNODL/ TPWODL/ TPSODL"
- Failing Load in KN
- Manufacturer Name/ Trade Mark
- Year of manufacturing, Country 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) Verification of Dimensions.
- ii) Temperature cycle test
- iii) Mechanical strength test
- iv) Porosity test

7.2 ROUTINE TESTS

- i) Visual examination

7.3 TYPE TESTS

- i) Visual examination
- ii) Verification of dimensions
- iii) Temperature cycle test
- iv) Dry one-minute power frequency withstand test
- v) Wet one-minute power frequency withstand test
- vi) Mechanical strength test
- vii) Porosity 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 tests shall be conducted at **CPRI / ERDA / Other Government 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/ 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) TPCODL/ TPNODL/ TPWODL/ 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/ 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 54 months from the date of commissioning or 60 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 materials are to be packed in crates or boxes for rough handling. Packing shall be marked with the strength and voltage ratings. 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.

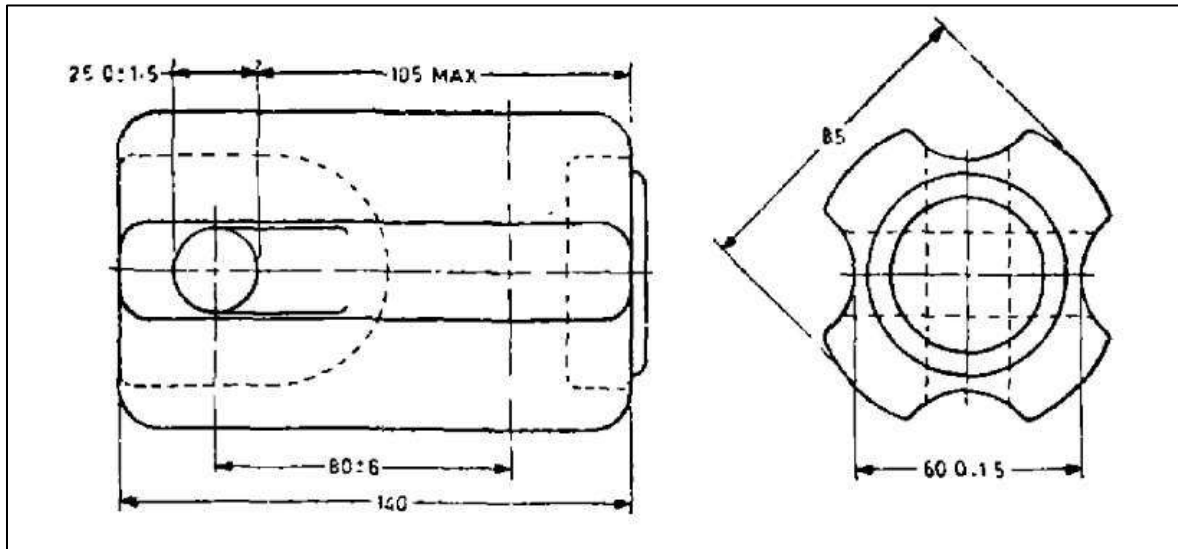
17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

The following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- a) Completely filled in Schedule "A" Guaranteed Technical Particulars.
- b) Work Experience details
- c) Type test certificates.
- d) Drawing (3 sets) of Guy Insulator containing complete information about manufacturing & fabrication etc.



Note: -All Dimensions are in mm unless noted otherwise specified. This is an indicative drawing of Guy Insulator used for tender purpose only.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	To be furnished by Bidder
1	Manufacturer's Name	
2	Type of insulator	
3	Standard Specification to which the material shall confirm	
4	ELECTRICAL CHARACTERISTICS	
(a)	Dry one minute power frequency Flashover voltage	
(b)	Wet one minute power frequency Flashover voltage	
(c)	Dry one minute power frequency Withstand voltage	
(d)	Wet one minute power frequency Withstand voltage	
5	Minimum Failing Load	
6	Power Frequency Punctured withstand voltage	
7	DIMENSIONS	
(a)	Length	
(b)	Width	
(c)	Cable Hole Dia	
8	Creepage Distance	
9	Type of Glaze	
10	Weight per piece	

20. SCHEDULE "B" DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

TPCODL**TPWODL****TPNODL****TPSODL****Specification No:** ENG-HV-2023**Specification Name:** Technical Specification of
HT Stay (Guy) Insulator

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-2024

Specification Name : Technical Specification For HT Stay set including Clamp

SAYANTANI DAS	MILAN MAITY	SANTOSH KUMAR PATRA	Susavan Biswas	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
16-02-2023	16-02-2023	21-02-2023	21-02-2023	22-02-2023	23-02-2023

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TPWODL*

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19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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 HT Stay Set.

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	Description
IS 4759	Hot Dip Galvanizing For Fabrication
IS 1852	Tolerance For Raw Material
IS 2062	Manufactured from raw material as per IS 2062 grade E-250 quality 'A'

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 PARTICULARS	DESIRED VALUE
1	Manufacturer Name & Address	To be specified by Bidder
2	Referred IS	IS: 2062, IS: 2633, IS: 2629
3	Dimensions	
4	Anchor Rod (20mm Dia): 1 No.	
a)	Dia of Rod	20mm (+ 5%, - 3%)
b)	Overall length of Anchor rod	1800mm (+ 0.5%)
c)	Inside Dia of Rounded Eye	40mm (+ 3%)
d)	Length of threaded portion	40mm (+ 11%, - 5%)
e)	Size of MS Nut & Bolt, Square MS Washers confirming to IS 1387 (1967) and IS 1363 (1967)	20mm Sq. Washer 50X 50 X 1.6mm (2No.s)
5	Anchor Plate: 1 No.	
a)	Size of the MS Anchor plate	300x300x8 mm
b)	Dia of the hole made at the centre of the plate	22mm
6. (A)	Turn Buckle	
(i)	Dia of the eye bolt	20mm (+ 3%, - 2%)
(ii)	Length of the eye bolt	450mm
(iii)	Length of the threaded portion of the bolt	300mm
(vi)	Inner dia of the circular eye made at other end of the bolt.	40mm
(B)	Bow with welded Channel	
(i)	Dia of the MS Rod used for bow	20mm dia
(ii)	Overall length and height of the bow	995mm 450mm
(iii)	Magnitude of the angle in radians by which bow is bended at the top	10 R
(iv)	Length and size of the GI Channel welded at the order end of the bow	200mm & 100x50x5 mm Channel
(v)	Number of holes made in the GI Channel	3
(vi)	Dia of the holes	22mm (3Nos.)
7	Thimble: 1 No.	
a)	Thickness of the MS Sheet used for thimble	1.5mm
b)	Size of thimble	75x22x40mm

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
8	Minimum strength of the welding provides on various components of Guy/Stay Sets (IS:823/1964)	4900Kg.
9	Average weight of finished stay set	14.523 kg (min) / 15.569 kg (Max)
10	Surface Finish of stay set	Hot Dip Galvanized
11	All Tolerance of the dimensions/weight	± 5%
12	Hot-Dip Galvanized, Flat (50X8) GI Flat for Stay Clamp	
1	Relevant Standard	IS: 2062, IS: 2633, IS: 2629
2	Grade of Steel	E 250 A
3	Minimum Tensile Strength	410 N/mm ²
4	Yield Stress	250 N/mm ²
5	Percentage Elongation (Min.) at Gauge Length	23%
6	Bend Test (Internal Dia)	Min-2t
7	Mass of Zinc Coating	705 gm/m ²
8	Zinc Coating Thickness	100 micron (6 Dip)
9	Chemical composition	Grade: E 250 (As per IS: 2062)
10	Markings/Embossing	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's trademark.

5. GENERAL CONSTRUCTION:

5.1 ANCHOR ROD WITH MS CHANNEL

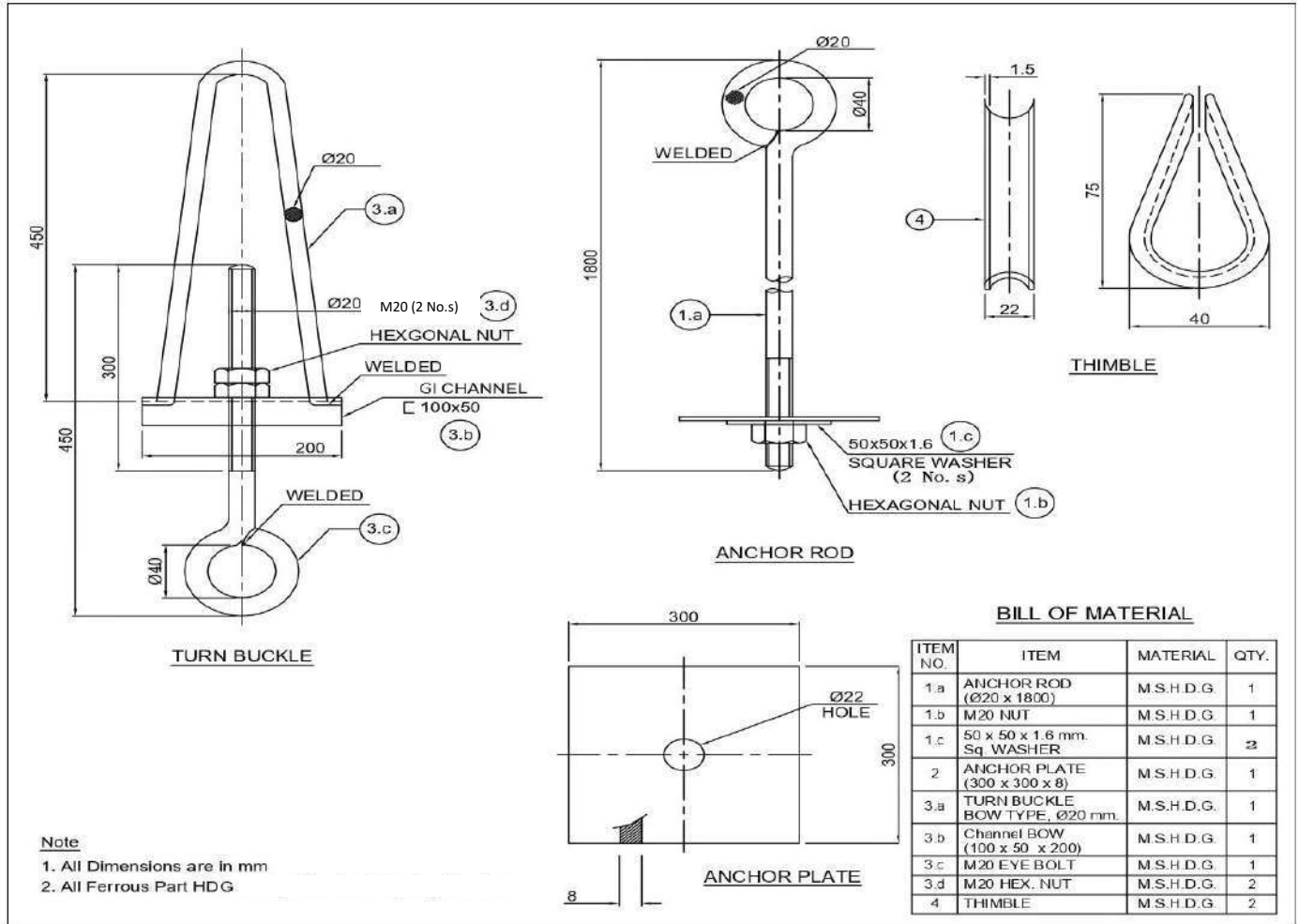
Overall length of rod should be 1800 mm made out of 20 mm diameter MS rod. One end of rod to be made into a round eye having an inner diameter of 40 mm. Other end fitted with MS channel 100 x 50 x 5 mm; 200 mm long. Hot Dip galvanized as per IS 4759-1996.

5.2 EYE BOLT

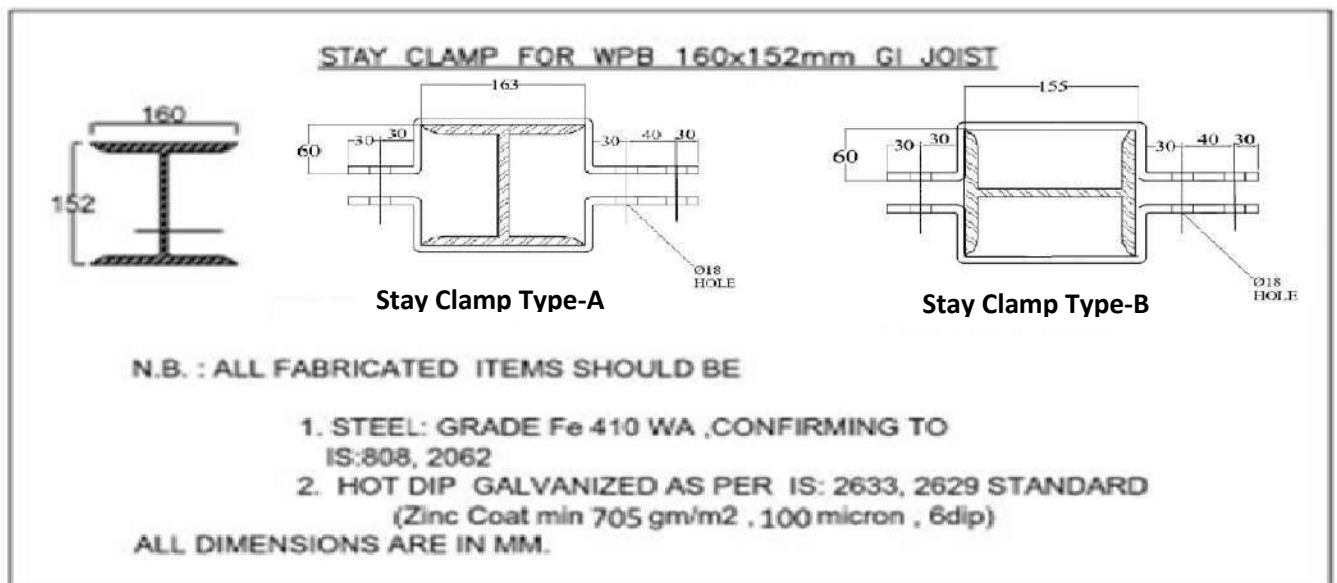
Eye bolt to be made of 20 mm dia MS Rod having an overall length of 450 mm. One end of the rod to be threaded up to 300 mm length. The other end of the rod shall be rounded into a circular eye of 40 mm inner dia with proper and good quality welding. Eye Bolt being a threaded fastener be hot dip galvanized as per relevant IS : 1367 (part 13) – 1983.

DRAWINGS

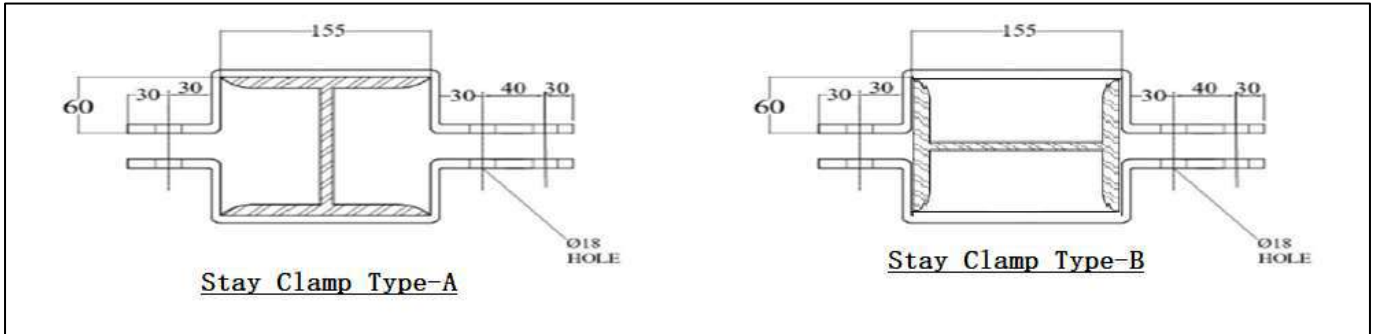
HT Stay Set :



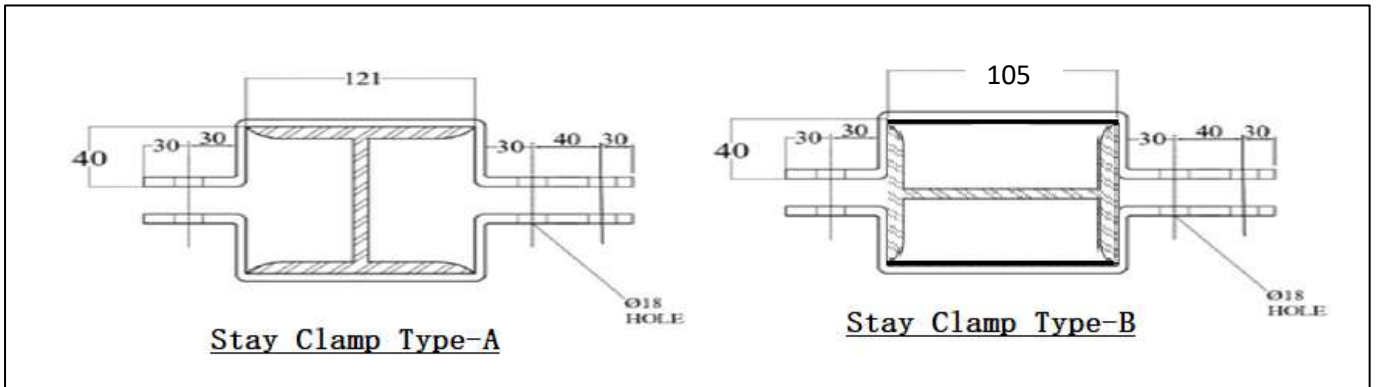
HT Stay Clamp for WPB Pole (50x8 mm):



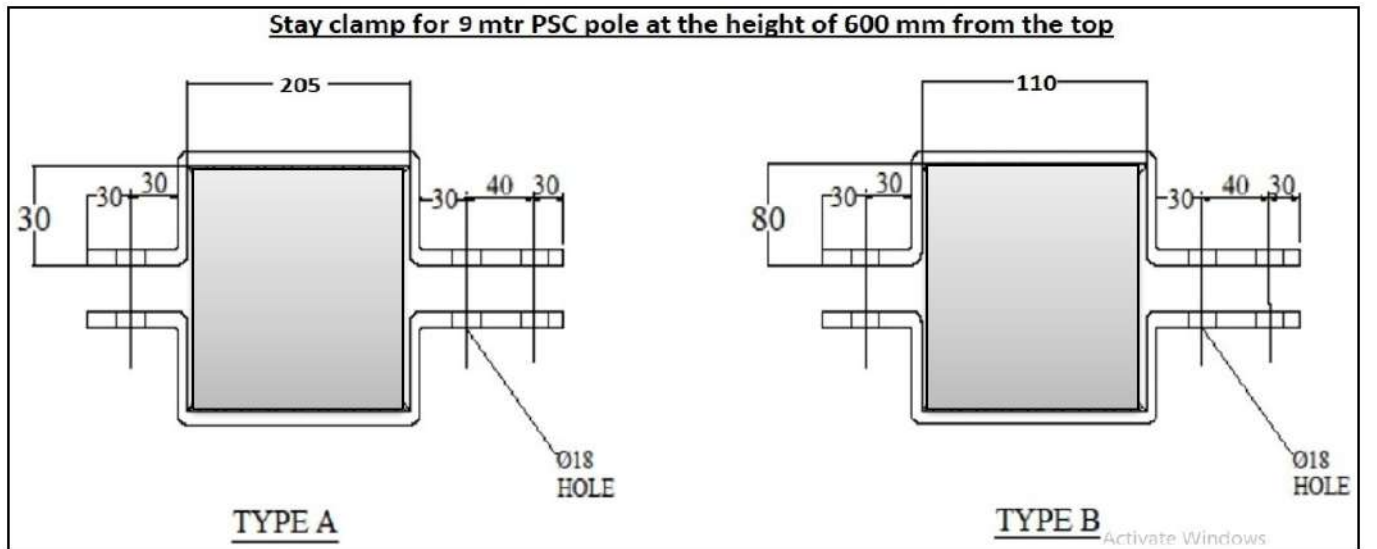
HT Stay Clamp for 150x150 RSJ Pole (50x8 mm):

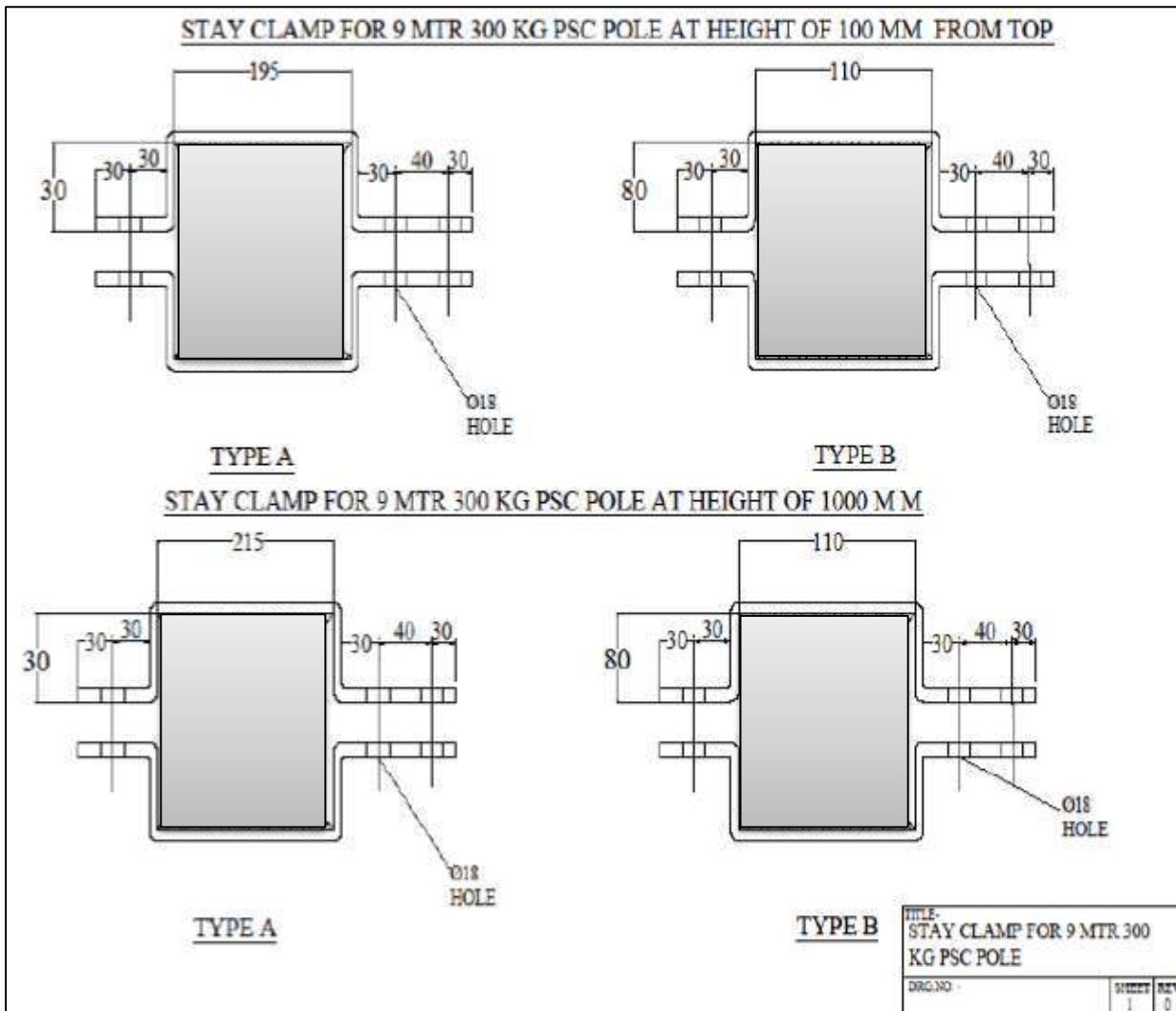


HT Stay Clamp for 116x100 RSJ Pole (50x8 mm):



HT Stay Clamp for 9 mtr PSC Pole (50x8 mm):





Specific requirements as per Tender, are to be fulfilled at the time of detailed engineering.

6. MARKING:

Following distinct non-erasable embossing to be made on each HT Stay Set and clamp Supplied to TPCODL/ TPNODL/ TPSODL/ TPWODL under this Tender.

- a) Manufacturer Name/ Trade Mark
- b) Engraved Marking (Punching before galvanization)
- c) "TPCODL/ TPNODL/ TPSODL/ TPWODL"
- d) Year of manufacturing, Country 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 examination, Verification of dimension and marking test.
- ii) Tensile Strength.
- iii) Galvanization (Uniformity) test.

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS

- i) Chemical Composition
- ii) Mechanical Properties
- iii) Test in respect of Hot Dip Galvanization i.e. thickness of zinc coating in microns

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 Labs** as per relevant IS. Type tests should have been conducted in certified 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



Specification No: ENG-HV-2024

Specification Name: Technical Specification of HT Stay Set including Clamps

- 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 12 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.

Galvanization Guarantee- Quality of Hot Dip Galvanization should be guaranteed for any type of damage due to harsh climatic condition for 5 Years.

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.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY THE BIDDER
1	Manufacturer Name & Address	
2	Referred IS	
3	Dimensions	
4	Anchor Rod (20mm Dia): 1 No.	
a)	Dia of Rod	
b)	Overall length of Anchor rod	
c)	Inside Dia of Rounded Eye	
d)	Length of threaded portion	
e)	Size of MS Nut & Bolt, Square MS Washers confirming to IS 1387 (1967) and IS 1363 (1967)	
5	Anchor Plate: 1 No.	
a)	Size of the MS Anchor plate	

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY THE BIDDER
b)	Dia of the hole made at the centre of the plate	
6. (A)	Turn Buckle	
(i)	Dia of the eye bolt	
(ii)	Length of the eye bolt	
(iii)	Length of the threaded portion of the bolt	
(vi)	Inner dia of the circular eye made at other end of the bolt.	
(B)	Bow with welded Channel	
(i)	Dia of the MS Rod used for bow	
(ii)	Overall length and height of the bow	
(iii)	Magnitude of the angle in radians by which bow is bended at the top	
(iv)	Length and size of the GI channel welded at the order end of the bow	
(v)	Number of holes made in the GI Channel	
(vi)	Dia of the holes	
7	Thimble: 1 No.	
a)	Thickness of the MS Sheet used for thimble	
b)	Size of thimble	
8	Minimum strength of the welding provides on various components of Guy/Stay Sets (IS:823/1964)	
9	Average weight of finished stay set	
10	Surface Finish of stay set	
11	All Tolerance of the dimensions/weight	
12	Hot-Dip Galvanized, Flat (50X8) GI Flat for Stay Clamp	
1	Relevant Standard	
2	Grade of Steel	
3	Minimum Tensile Strength	
4	Yield Stress	
5	Percentage Elongation (Min.) at Gauge Length	
6	Bend Test (Internal Dia)	
7	Mass of Zinc Coating	
8	Zinc Coating Thickness	



Specification No: ENG-HV-2024

Specification Name: Technical Specification of HT Stay Set including Clamps

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY THE BIDDER
9	Chemical composition	
10	Markings/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-LV-3001

**Specification Name : ENG-ELC-034- TECHNICAL SPECIFICATION FOR 1.1 KV
POWER CABLES- R1**

JYOTIPRAKASH MOHANTY	Ranjan Kumar Sahoo	SHANTAPRIYA JENA	SATYA PRASAD NAYAK	VARUN BHATNAGAR	VARUN BHATNAGAR
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPWODL	TPSODL	TPNODL	TPCODL	TPWODL	TPWODL
16-01-2023	16-01-2023	16-01-2023	17-01-2023	17-01-2023	17-01-2023

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TPWODL*



Specification No: [ENG-LV-3001](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 1.1 kV XLPE
POWER CABLE

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18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's work, packing, forwarding, supply and unloading at site/store of 1.1 kV LT XLPE Power Cable for trouble free and efficient operation.

Applicable for 1.1 kV LT XLPE insulated Power Cable of following sizes:

Four Core Cables	Two Core Cables	Single Core Cable
4C X 300 sq.mm.	2C X 50 sq. mm.	1C X 630 sq. mm.
4C X 240 sq. mm.	2C X 25 sq. mm.	1C X 300 sq. mm.
4C X 150 sq.mm.	2C X 16 sq. mm.	1C X 185 sq. mm.
4C X 95 sq.mm.	2C X 10 sq. mm.	1C X 150 sq. mm.
4C X 50 sq.mm.	2C X 6 Sq. mm.	1C X 95 sq. mm.
4C X 35 sq.mm.	2C X 4 Sq. mm.	1C X 25 sq. mm.
4C X 25 sq.mm.		1C X16 sq. mm.
4C X 16 sq.mm.		1C X 4 sq. mm.
4C X 10 Sq.mm.		1C X 2.5 sq. mm.

2. APPLICABLE STANDARDS:

LT 1.1 kV Cable covered by this specification shall unless otherwise stated, be designed, manufactured, and tested in accordance with latest revisions of relevant Indian Standards/ IEC/ International Standards and shall conform to the regulations of local statutory authorities.

Standards	Title
IS-7098 (Part-I)	Specifications for Cross Linked Polyethylene PVC Sheathed Cables: Part 1-For Working Voltages up to and including 1100 Volts
IS-8130	Conductor for insulated electric cables & flexible cords.
IS-5831	PVC insulation and sheath of electric cables.
IEC-60228/3-	Conductor of insulated cables
IS 10810	Methods of tests for Cables
IEC-60502-1	Specification for power cables with extruded solid insulation with a rated voltage rating between 1 kV and 3 kV
IS-3975	Low carbon galvanized steel wires, formed wires & tapes for armouring of cables
IS 10418	Specification for Drums of Electric cables
IS 3961 Part 6	Recommended Current Ratings for Cables – XLPE insulated PVC sheathed cables
IS 4826	Hot-dipped galvanized coatings on round steel wires
IS 1554 (Part-1)	PVC insulated (heavy duty) electric cables
IEC 332-1	Test on electric cables on fire conditions
IS 10462-1	Fictitious calculation method for determination of dimensions of protective coverings of cables
ICEA T-31-610	Test method for conducting longitudinal water penetration resistance tests on blocked conductors
ASTM 2863	Oxygen Index Test
IEC 60754	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content

**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:

SL.NO.	CONDITONS	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 atmospheres.

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 as mentioned in above table.

4. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Parameter	Requirement		
1	Voltage level	1.1 kV (Earthed System)		
2	Nominal System voltage	415 V- 433V		
3	Supply frequency	50 Hz		
4	Variation in supply frequency	± 5%		
5	Types of Cables	4 core (3 phase + 100% neutral), 2 core (1 phase + 100% neutral), 1 core (1 phase)		
6	Cable components	4 CORE CABLE	2 CORE CABLE	1 CORE CABLE
	Conductor	Less than 150 sq.mm.		Stranded Aluminium
		150 sq.mm. and above		Watertight Stranded Aluminum
	Insulation	XLPE		
	Core identificationn strip	As per Clause No. 5. III of ENG-LV-3001	NA	
	Inner sheath	Extruded PVC ST-2 type	NA	
	Armour	Annealed low carbon heavily coated galvanized steel round wires	NA	
Outer sheath	PVC FRLSH ST-2 type			

5. GENERAL CONSTRUCTION:

The cross-linked polyethylene insulated (XLPE) 1.1 kV cable (Sioplas/ self-cured) shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – 1)/ relevant IEC/International standards and their latest amendments. All material used in the manufacturing of cables shall be virgin 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 for different laying configuration of cables shall be provided by the bidder

I. CONDUCTOR:

S. No.	Parameter	Requirement			
1	Material	Plain Aluminium, grade H2/H4 as per IS 8130			
2	Class	Class II			
3	Shape	No. of Cores		Size of cable	Shape
		Single Core Cable		2.5 sq.mm. 4 sq.mm.	Stranded Non-Compacted Circular
				16 sq.mm. and above	Stranded Compacted Circular
		Two Core Cable		10 sq.mm.	Stranded Non-Compacted Circular
				16 sq.mm. and above	Stranded Compacted Shaped
		Four Core Cable		10 sq.mm.	Stranded Non-Compacted Circular
16 sq.mm. and above	Stranded Compacted Shaped				
4	No. of strands & electrical parameters	Nominal size of conductor mm ²	Min. number of strands	Max. DC resistance @ 20 deg C (Ohm/km)	Conductor Short circuit current rating for 1 second(kA)
		2.5	3	12.1	0.235
		4	3	7.41	0.376
		6	3	4.61	0.564
		10	7	3.08	0.94
		16	6	1.91	1.50
		25	6	1.20	2.35
		35	6	0.868	3.31
		50	6	0.641	4.70
		95	15	0.320	8.93
		150	15	0.206	14.2
		185	30	0.164	17.39
		240	30	0.125	22.6

		300	30	0.10	28.20
		630	53	0.0469	59.22
6	Longitudinal water sealing of conductor (For 150 sq.mm.and above only)	<p>a) Non-conductive water swellable yarn/tape/ combination of both shall be provided in between interstices of the conductor.</p> <p>b) 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.</p> <p>c) It shall not affect the electrical conductivity of the conductor.</p>			
7	Cleanliness and uniformity	<p>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.</p> <p>b) Stranded Conductor shall be free from oil traces & aluminum dust. Conductor (after stranding) shall be super cleaned.</p> <p>c) Traces of aluminum dust on conductor shall not be acceptable.</p>			
8	Raw material supplier	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta only.			
9	Diameter of conductor (For single core cable only)	To be specified by bidder			
10	Weight of conductor/km (approx.)	Nominal size of conductor		Min. weight of conductor	
		mm ²		(kg/km/core)	
		2.5		6.5	
		4		10.4	
		6		15.6	
		10		26	
		16		42	
		25		65	
		35		91	
		50		130	
		95		247	
150		390			
185		482			

		240	625
		300	780
		630	1640

II. INSULATION:

S. No.	Parameter	Requirement
1	Material and extrusion process	XLPE insulation shall be applied through extrusion process.
2	Curing process	Curing shall be done by Sioplas/ self-curing method.
3	Min. thickness of Insulation	As per Table no. 3 of IS 7098 part 1. Tolerance on thickness shall be as per Clause no. 9.3 of IS 7098—Part 1
4	Raw material supplier	(i) XLPE compound shall be super cleaned and procured from reputed raw material suppliers viz., Dow, Borealis, Hanwa Kalpana, KLJ only. (ii) XLPE compound from cable manufacturer may be considered only after evaluation of the compound manufacturing process.
5	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.
6	Insulation fitting to the conductor	(i) Insulation shall fit tightly to the conductor and shall be applied concentrically about the conductor in thickness consistent with the voltage classification. (ii) The insulation shall be so applied that it shall be possible to remove it without damaging the conductor.
7	Weight of core	To be specified by bidder

III. CORE IDENTIFICATION

4C Cable	Core color: 'red' for R phase, 'blue' for B phase, 'yellow' for Y phase & 'Black' for Neutral.
2C Cable	Core color: 'red' for phase, & 'Black' for Neutral.
1C Cable	For single core cable, XLPE insulation shall be black in colour.

IV. LAYING UP OF CORES

Laying up	(i) Cores shall be laid up together as per table-4 of Clause 11.2 of IS 7098, Part-1. (ii) Where necessary, the interstices shall be filled with non-hygroscopic material.
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V. INNER SHEATH (For Multi core cables only)

S. No.	Parameter	Requirement
1	Material	Black coloured Polyvinyl chloride (PVC) type ST-2 compound.
2	Thickness	(i) The sheath shall have adequate thickness, mechanical strength and elasticity, as per IS 5831. (ii) Min. thickness of inner sheath shall be as per Table no.5 of IS 7098 part 1. (iii) For 2 Core: Inner sheath shall be applied by pressure extrusion method. For 4 Core: Inner sheath shall be applied by normal extrusion process.
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 may be considered only after evaluation of the compound manufacturing process.

VI. ARMOUR (For Multi core cables only)

S. No.	Parameter	Requirement	
1	Material	Annealed (soft) low carbon hot dipped heavily coated galvanized round steel wires.	
2	Compliance to Standard	It shall comply with the requirements of IS 3975 along with the latest amendments. Hot dipped galvanizing layer shall be uniform on low carbon annealed steel wires. Zinc coating shall be heavily coated as per IS 4826:1979.	
4	Approx. Armour Short circuit rating of armour for 1 sec (kA)	Area of Conductor (sq.mm.)	Short circuit rating of Armour for 1 sec (kA)
		4	1.37
		6	1.53
		10	1.88
		16	2.54
		25	3.17

		35	4.30
		50	5.22
		95	6.97
		150	10.98
		240	13.92
		300	16.18
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	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 Kg/km	To be furnished by Bidder	
9	Raw material supplier	Armour steel shall be procured from reputed raw material suppliers viz., TATA Steel, Jindal Steel, SAIL, Bansal (BWIL)	

VII. Outer Sheath

S. No.	Parameter	Requirement
1	Material	Polyvinyl chloride (PVC) ST-2 FRLSH type compound (as per IS 5831) with ' lead naphthenate ' additive.
2	Configuration	Polyvinyl chloride (PVC) ST-2 FRLSH type compound with ' lead naphthenate ' additive as 'termite & rodent repellent' shall be applied by extrusion process. The outer sheath shall have adequate thickness, mechanical strength and elasticity, as per IS 5831. Thickness of outer sheath shall be as per Table no. 8 of IS 7098 part 1.
3	Colour	Blue, colour code: 103 as per IS 5:2007.
4	Surface uniformity	(i) The outer sheath shall be ultraviolet protected for operation in direct sunlight. (ii) Surface of outer sheath shall be free from cavity/ nicks/ other visible defects.

5	Raw material supplier	PVC compound shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam
		PVC compound from cable manufacturer may be considered only after compound manufacturing process evaluation.
6	Weight of outer sheath kg/km	To be provided by bidder
7	Weight of complete cable Kg/km	To be provided by bidder
8	Overall diameter of cable	To be provided by bidder

VIII. Other Requirements

Parameter	Requirement
End seal	Adhesive coated polyolefin heat shrinkable end caps shall be provided on both ends of cable.

6. MARKING:

Wooden drums shall be free from sharp edges and visual defects.

Cable length on one drum shall be:

- (a) 4 Core Cable – 95 sq.mm. to 300 sq.mm. – 500 meters with + 5% tolerance
- (b) 4 Core Cable – 16 sq.mm. to 50 sq.mm. – 1000 meters with + 5% tolerance
- (c) 2 Core & 1 Core Cables – 1000 meters with + 5% tolerance (as per PO terms and conditions)

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 (as per PO terms)
- 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. The following details shall be **embossed** on the **outer PVC sheath**.

Embossing shall be clearly visible. **At interval of every 1 meter, following details to be embossed:**

- a) Sequential meter marking (**shall be marked through printing**)
- b) Property of TPCODL/TPNODL/TPSODL/TPWODL
- c) Manufacturer name
- d) Month & Year of Manufacture
- e) Voltage grade
- f) Size of the cable
- g) Purchase Order no.
- h) Cable code

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 TPCODL/TPNODL/TPSODL/TPWODL's authorized representative. All the components should also be type tested as per the relevant standards. The following tests shall be necessarily conducted on the 1.1 kV cables in addition to others specified in IS/IEC standards.

7.1 ACCEPTANCE TESTS

All acceptance tests mentioned below shall be witnessed by TPCODL/TPNODL/TPSODL/TPWODL's representative during the inspection stage.

S.No.	Test name	Specific value		Test method	
		ClauseNo.	Reference Standard	Clause No.	Reference Standard
(I) Test on Conductor					
1	Conductor resistance test	ClauseNo. 5(A.4)	ENG-LV-3001	10	IS 10810-part 5
2	Test for non-conductivity of water swellable tape/yarn of conductor (For conductor size: 150 sq.mm. and above)	ClauseNo. 5(A.6)	ENG-LV-3001	Through multimeter	
3	Visual inspection for conductor cleanliness	ClauseNo. 5(A.7)	ENG-LV-3001	Check for presence of any Aluminium dust	

4	Tensile test (non-compacted conductor only)	Clause No.3.1	IS 8130	8	IS 10810-part 2
5	Wrapping test (non-compacted conductor only)	Clause No.6.2.2	IS 8130	8	IS 10810-part 3
6	Conductor water penetration test	ICEA T-31-610			
(II) Test on Insulation					
7	Tensile strength & Elongation at break (before ageing)	Table 1	IS 7098 parts 1	8	IS 10810-part 7
8	Insulation thickness	Table 3	IS 7098 parts 1	8	IS 10810-part 6
9	Depth of embedded, extruded colourline (For multi-core cable only)	Max depth 50% of insulation thickness	ENG-LV-3001	Through profile projector/ magnifying optical scale	
10	Brightness of embedded, extruded colourline (For multi-core cable only)	Clause No. 5.C	ENG-LV-3001	Visual check from a distance of 1 meter	
11	Hot set test	Table 1	IS 7098-part 1	8	IS 10810-part 30
12	Surface smoothness of insulation	Clause No. 5(B.7)	ENG-LV-3001	To be checked by inspector	
(V) Test on Inner sheath					
13	PVC thickness	Table 5	IS 7098 parts 1	8	IS 10810-part 6
14	Colour of inner sheath	Clause No. 5 (D.1)	ENG-LV-3001	To be checked by inspector	

(VI) Test on Armour (for multicore cables only)

15	Tensile test	8	IS 3975	IS 1608
16	Mass of zinc coating	Table 1 Heavily coated soft wire	IS 4826	IS 6745
17	Uniformity of zinc coating	9	IS 3975	IS 2633
18	Adhesion test	9	IS 3975	IS 3975
19	Diameter	Table 6	IS 7098 parts 1	Value to be measured by inspector
20	No. of wires & Coverage %	ClauseNo. 5(E.6)	ENG-LV-3001	Value to be measured by inspector

(VII) Test on PVC Outer Sheath

21	Thickness		IS 7098 parts 1	IS 10810 Part 6
22	Tensile strength and Elongation at break (before ageing)	Table 2	IS 5831	8 IS 10810 part 7
23	Colour of outer sheath	ClauseNo. 5 (F.3)	ENG-LV-3001	To be checked by inspector
24	Surface uniformity of outer sheath (onfull drum)/ shall befree from any damage-void, nick, cavity.	ClauseNo. 5 (F.4)	ENG-LV-3001	Through rewinding of drum (As per TPCODL/TPNODL/TPSODL /TPWODL specification)
25	Anti-termite and rodent property test in PVC outersheath	Chemicaltest	As per manufacturer Process/ Method	To be checked by inspector

26	Flammability test	IS 10810-part 61			
27	Oxygen index	IS 10810-part 58			
28	Temperature Index test	IS 10810-part 64			
29	Acid gas generation	IS 10810-part 59			
30	Smoke density	IS 10810-part 63			
(VIII) Tests for complete cable					
31	High voltage test	7.2 kVfor 5 minutes As per Clauseno. 16.2.1	IS 7098 parts 1	8	IS 10810 part 45
(IX) Additional tests					
32	Raw material consumption	Clause No. A.8, B.4, D.3, E.9, F.5	Document verification as proof to be submitted		
		Invoice to be shown from procurement to consumption			
33	Sequential marking check	Clause no. 6.ii	ENG-LV-3001	To be checked by inspector	
34	Cable drumlength verification	Clause no. 6	ENG-LV-3001	To be checked by inspector	
35	Packaging of cable-on-cabledrum	By recyclable PVC sheet- As per Clauseno.12	ENG-LV-3001	To be checked by inspector	
36	End caps	Clause No. G	ENG-LV-3001	To be checked by inspector	

37	Weight of conductor Kg/km	To be checked by inspector
38	Weight of core Kg/km	To be checked by inspector
39	Weight of armour Kg/km	To be checked by inspector
40	Weight of complete cable Kg/km	To be checked by inspector
41	Overall approx. diameter of complete cable	To be checked by inspector

7.2 ROUTINE TESTS

Test	Clause No.	Reference Standard
Conductor resistance test	15.3	IS 7098-part 1
High voltage test with power frequency	15.3	IS 7098-part 1

7.3 TYPE TESTS

S.No.	Test	Specific value		Test method	
		Clause No.	Reference Standard	Clause No.	Reference Standard
Tests on Conductor					
1	Conductor resistance test	Table 2	IS 8130	10	IS 10810 part 5

2	Conductor water penetration test (For conductor size - 150 sq.mm. and above)	ICEA T-31-610	ICEA T-31-610	4	ICEA T-31-610
3	Tensile strength (For non-compacted conductor)	6.2.1	IS 8130	8	IS 10810 part 2
4	Wrapping test (For non-compacted conductor)	6.2.2	IS 8130	8	IS 10810 part 3
Tests on Insulation					
5	Tensile strength & Elongation at break (Before ageing)	Table 1	IS 7098 part 1	8	IS 10810 part 7
6	Ageing in air oven	Table 1	IS 7098 part 1	8	IS 10810 part 11
7	Tensile strength & Elongation at break (After ageing)	Table 1	IS 7098 part 1	8	IS 10810 part 7
8	Tests for thickness of insulation	Table 3	IS 7098 part 1	8	IS 10810 part 6
9	Hot set test	Table 1	IS 7098- part 1	8	IS 10810 Part 30
10	Shrinkage test	Table 1	IS 7098 part 1	8	IS 10810 part 12
11	Gravimetric test (Water absorption)	Table 1	IS 7098 part 1	8	IS 10810 part 33
12	Volume resistivity/ Insulation Resistance	Table 1	IS 7098 part 1	8	IS 10810 part 43
Tests on Inner Sheath					

13	PVC thickness	Table 5	IS 7098 part 1	8	IS 10810 part 6
Tests on Outer Sheath (PVC)					
14	Flammability test for outer sheath	Clause No. 16.3	IS 7098 Part 1	As per IEC 332-part 1	
15	Tensile strength and Elongation at break (Before ageing)	Table 2	IS 5831	8	IS 10810 part 7
16	Tensile strength and Elongation at break (After ageing)	Table 2	IS 5831	8	IS 10810 part 7
17	Variation due to ageing	Table 2	IS 5831	8	IS 10810 part 7
18	Loss of mass test	Table 2	IS 5831	8	IS 10810 part 10
19	Shrinkage test	Table 2	IS 5831	8	IS 10810 part 12
20	Hot deformation test	Table 2	IS 5831	8	IS 10810 part 15
21	Heat shock test	Table 2	IS 5831	8	IS 10810 part 14
22	Thermal stability test	Table 2	IS 5831	Append ix B	IS 5831:1984
23	Oxygen index	As per ASTM 2863			
24	Temperature index	ASTM 2863			
25	Acid gas generation	IEC 60754			
26	Smoke density	ASTM 2843			
Tests on Armour for multi-core Cable					

27	Tensile test	8	IS 3975	6	IS 1608
28	Torsion test	8	IS 3975	7	IS 1717
29	Wrapping test	8	IS 3975	5	IS 1755
30	Resistance test	8	IS 3975	8	IS 10810 Part 42
31	Mass of zinc coating	Table 1	IS 4826	6	IS 6745
32	Uniformity of zinc coating	9	IS 3975	4	IS 2633
33	Adhesion test	9	IS 3975	9.3	IS 3975
Tests on complete cable					
34	High voltage test	7.2 kV for 5 minutes As per Clause no. 16.2	IS 7098 part 1	8	IS 10810 Part 45

8. TYPE TEST CERTIFICATES:

The bidder shall furnish the type test report of **1.1 kV** cable for the tests as mentioned in Clause no. 7 of this specification and as per reference standards.

Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA/ Approved labs by TATA ODISHA DISCOMs only. Type test report shall be submitted for the type, size and rating of the cable mentioned in the bid/ OR for any size higher (than required) of similar type and similar voltage grade. Conductor Water penetration test as per ICEA T 31-610 shall be conducted at CPRI/ERDA Approved labs by TATA ODISHA DISCOMs only.

Type test should have been conducted in certified test laboratories during the period not exceeding from the date of 10 years from the date of opening of 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 type tests, if any) not carried out, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL.

In case the type test certificates are dated beyond 5 years and up to 10 years, though the basic component design of cable is same, then acceptance for '*no change in design*' shall be submitted by bidder on their organization's letter head.

TPCODL/TPNODL/TPSODL/TPWODL will have the rights to accept/reject these type test reports.



Specification No: [ENG-LV-3001](#)

Specification Name:

TECHNICAL SPECIFICATION FOR 1.1 kV XLPE
POWER CABLE

9. PRE-DISPATCH INSPECTION:

Inspection shall be carried out by duly authorized representative of TPCODL/ TPNODL/ TPSODL/ TPWODL.

The 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 may be made at any stage of manufacturing at the discretion of TPCODL/TPNODL/TPSODL/TPWODL and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection.

Inspection by TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specification.

Dispatch of material: 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 the supplied material:

- a) Test reports
- b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
- c) Invoice in duplicate
- d) Packing list
- e) Delivery Challan

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.

11. GUARANTEE:

The bidder shall confirm for guarantee towards design, material, workmanship & quality of process / manufacturing for integrated product delivered under the contract.

In the event any defect is found by TPCODL/TPNODL/TPSODL/TPWODL, up to a period of at least 60 months from the date of commissioning or 72 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 their own costs, within mutually agreed time frame, and to the entire satisfaction of TPCODL/TPNODL/TPSODL/TPWODL, failing which TPCODL/TPNODL/TPSODL/TPWODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPCODL/TPNODL/TPSODL/TPWODL's own charges (@ 20% of expenses incurred), from the Bidder or from 'Security cum Performance Deposit' as the case may be.

Free replacement: 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 TPCODL/TPNODL/TPSODL/TPWODL.

12. PACKING AND TRANSPORT:

- a) **Standard length of Cable:** The cable shall be supplied in continuous **standard length** as per Clause no.6 of this specification.
- b) **Filling condition:** Drum shall not be overfilled.
- c) **Cable drum:** The cable shall be wound on non-returnable drums without any extra cost to TPCODL/TPNODL/TPSODL/TPWODL 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.
- 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.
- Material preservation shall be applied to the entire drum.
- f) The bottom end of cable should be clamped on drum by jute or nylon rope.
- g) **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. The drums shall withstand normal handling and transport.
- h) **Packaging shall be as per climate change perspective.**

The cable wound on cable drum shall be covered by recyclable PVC sheet for dustproof.

TPCODL/TPNODL/TPSODL/TPWODL encourages the use of environmentally friendly packaging.

13. TENDER SAMPLE:

Not Applicable

14. QUALITY CONTROL:

The bidder shall submit a 'Quality Assurance Plan' followed by him in respect of bought out items, items manufactured by him, Raw materials in process, Final inspection Packaging & Marking. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPCODL/TPNODL/TPSODL/TPWODL reserves the sole rights for the type test of 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.

TPCODL/TPNODL/TPSODL/TPWODL's nominated representative shall have free access to the bidder'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 International / Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder will have to submit (after placement of RC) technical compliance document and drawing of cable as per RC line items for getting approval before mass manufacturing. Bidder shall start manufacturing of mass quantity only after getting CAT-A approved drawings and technical compliances or as per intimation from TPCODL/TPNODL/TPSODL/TPWODL.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS:

Following documents shall be submitted along with the bid for approval after award of RC/PO:

- a) Completely filled-in clause wise compliance of this specification
- b) Type test Certificates for each specified test
- c) Cross sectional drawing of the cable
- d) Rating factors for variation in ground and air temperature, depth of laying, thermal resistivity of soil and different laying configuration of cables.

Following documents shall be submitted after award of contract for approval before manufacturing:

- a) Completely filled-in clause wise compliance of this specification
- b) Cross sectional drawing of the cable

All the Documents and Drawings shall be in English Language.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

Bidder to submit clause wise compliance.



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Specification Name:
TECHNICAL SPECIFICATION FOR 1.1 kV XLPE
POWER CABLE

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-3002

**Specification Name : TECHNICAL SPECIFICATION FOR LT AB cable- 3 cores /
Insulated messenger / Street Light**

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

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Specification No: [ENG-LV-3002](#)

Specification Name:
Specification for LT AB cable - 3
Cores/ insulated messenger/ street
light

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1. SCOPE:

This specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at store/site and performance of LT ABC cable for trouble free and efficient operation. The specific requirements are covered in the enclosed technical data sheet.

The sizes specified in the specifications are tabulated below:

SI.No	Phase Conductor (No. of Cores x Size in sqmm)	Insulated Messenger (No. of Cores x Size in sqmm)	Streetlight (No. of Cores x Size in sqmm)
1	3C x 95	1C x 70	1C x 16
2	3C x 70	1C x 50	1C x 16
3	3C x 50	1C x 35	1C x 16
4	3C x 35	1C x 25	1C x 16
5	1C x 35	1C x 25	—
6	3C x 50	1C x 35	—
7	3C x 35	1C x 25	—

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-398 (Part IV)	Aluminum conductor for overhead transmission purposes- Part IV Aluminum alloy stranded conductor
IS-5216	Guide for safety procedures and practices in electric works
IS-7098 (part-I)	Specification for Cross-linked_ polyethylene insulated PVC sheathed cables- Part I for working voltage up to and including 1100 volts.
IS-8130	Specification for Conductor for insulated electric cables & flexible cords.
IS-10418	Specification for drums for electric cables
BS-5468	Cross-linked polyethylene insulation of electric cables
IEC-540	Test methods for insulations and sheaths of electric cables and cords
IEC-60228/3	Conductor for insulated cables
IEC-60502-1	Power cables with extruded insulation and their accessories for rated voltages from 1kV (Um=1.2kV), up-to 30kV(Um=36kV)-Part 1:Cables for rated voltages of 1 kV /Um=1,2kV) and 3kV/Um=3.6kV)
ASTM G-53/DIN 56687	UV testing of XLPE insulation
SANS 1713	South African Standard for Aerial Bunched conductor
IS14255	Aerial Bunched conductors for working voltages up to and including 1100 volts

3. CLIMATIC CONDITIONS:

SL.NO.	CONDITIONS	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 as mentioned above.





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4. GENERAL TECHNICAL REQUIREMENTS:





SL NO	DESCRIPTION	UNITS	3C×95 mm ² (P)+1C×70mm ² (M)+1CX16 mm ² (StreetLight)	3C X 70 mm ² (P)+ 1C X 50 mm ² (M) +1C x 16 mm (Street Light)	3C×50 mm ² (P)+1C×35mm ² (M)+1CX 16mm ² (Street Light)	3C X 35 mm ² (P) + 1C X 25(M)+ 1C x 16 mm ² (StreetLight)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase and streetlighting core twisted around the insulated neutral cum messenger wire			
2	Size of Aerial Bunched cable		3C×95 mm ² (P)+1C×70 mm ² (M)+1CX 16 mm ² (Street Light)	3C X 70 mm ² (P)+ 1C X 50 mm ² (M) +1C x 16 mm (Street Light)	3C×50 mm ² (P)+1C×35 mm ² (M)+1C X16 mm ² (Street Light)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)+ 1C x16 mm ² (Street Light)
3	Rated Voltage	kv	1.1	1.1	1.1	1.1
4	System Voltage	kv	0.415- 0.433	0.415 - 0.433	0.415 - 0.433	0.415 - 0.433
5	Nominal Area of Phase Conductor	mm ²	95	70	50	35
6	Nominal Area of Messenger	mm ²	70	50	35	25
7	Phase Core		Stranded compacted circular aluminum conductor, Extruded XLPEinsulated			
8	Neutral core & MessengerWire		Stranded compacted circular aluminum alloy conductor, Extruded XLPEinsulated			
9	Maximum conductor temperature during continuous operation	Deg C	90	90	90	90
10	Maximum conductor temperature during short circuit	Deg C	250	250	250	250
11	Phase Core RYB insulated					
a)	Conductor					
(i)	Material		EC Grade Aluminum of H4Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4Grade to IS: 8130:1984	EC Grade Aluminum of H4Grade to IS: 8130:1984

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(ii)	No. of Cores & Nominal Size	mm ²	3Cx95	3Cx70	3Cx50	3Cx35
(iii)	Minimum number of strand wires		15	12	6	6
(iv)	Diameter		Shall be suitably selected to meet conductor DC resistance as per IS 8130			
(v)	Max. DC Resistance of phase conductor at 20 deg.C	Ω/km	0.32	0.443	0.641	0.868
(vi)	Shape of Conductor		Stranded Compacted Circular			
(vii)	Short Circuit current rating of conductor for 1 sec	kA	8.93	6.58	4.7	3.29
(viii)	Continuous current rating in air at 40Deg. C	A	230	200	149	125
b)	Insulation					
i)	Material		XLPE Insulation as per IS 14255:1995			
ii)	Nominal Thickness	mm	1.5	1.5	1.5	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255			
12	Street light core					
a)	Conductor					
i)	Material		EC grade aluminum of H4 grade to IS: 8130:1984			
ii)	Nominal size	mm ²	16	16	16	16
iii)	Nominal no. of wire		7	7	7	7
iv)	Max DC resistance at 20 deg. C	Ohm/km	1.91(As per IS 8130:1984)	1.91(As per IS 8130:1984)		
v)	Shape of conductor		Stranded compacted circular			
b)	Insulation					
i)	Material		As per IS: 14255:1995			
ii)	Nominal thickness	mm	1.2	1.2	1.2	1.2
iii)	Tolerance in Insulation Thickness		XLPE Insulation as per IS 14255:1995			
13	Neutral Cum Messenger Wire					
a)	Messenger wire					
i)	Material		Aluminum Alloy Wire			
ii)	Nominal size	mm ²	70	50	35	25

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iii)	No. and Nominal Dia. of each strand	No./m m	7/3.57	7/3.02	7/2.54	7/2.14
iv)	Calculated Maximum resistance at 20 deg C	ohm/k m	0.492	0.689	0.986	1.38
v)	Shape of conductor		Stranded circular-compacted			
vi)	Short circuit rating for 1 sec	kA	6.58	4.7	3.29	2.35
vii)	Material of insulation		XLPE Insulation as per IS 14255			
viii)	Thickness of insulation	mm	1.5	1.5	1.2	1.2
ix)	Min Breaking load of messenger wire	KN	19.7	14	9.8	7
14	Core Identification		RIDGES for Phase identification: 1 ridge for R phase 2 ridges for Y phase 3 ridges for B phase For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.			
15	Formation of cable		3 phase cores & 1 street lighting core xlpe insulated are laid up over insulated messenger with R-H direction of Lay			
17	Maximum conductor temperature during continuous operation (RYBN)	Deg C	90	90	90	90
18	Maximum conductor temperature during Short circuit (RYBN)	Deg C	250	250	250	250
19	Standard Drum Length	Mtr	500	500	500	500
20	Tolerance in Drum length	%	+/-5%	+/-5%	+/-5%	+/-5%
21	Reference Standard		IS 14255			
22	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100V, size of cable, ISI, month & year of manufacturing, Property of TPCODL/TPNODL/TPWODL/TPSODL, PO number & date.			

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SL NO	DESCRIPTION	UNITS	1C X 35 mm ² (P) + 1C X 25 mm ² (M)	3C×50 mm ² (P)+1C×35 mm ² (M)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase core twisted around the insulated neutral earth cum messenger wire		
2	Size of Aerial Bunched cable		1C X 35 mm ² (P) + 1C X 25 mm ² (M)	3C×50 mm ² (P)+1C×35 mm ² (M)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)
3	Rated Voltage	kV	1.1	1.1	1.1
4	System Voltage	kV	0.415-0.433	0.415-0.433	0.415-0.433
5	Nominal Area of Phase Conductor	mm ²	35	50	35
6	Nominal Area of Messenger	mm ²	25	35	25
7	Phase Core		Stranded compacted circular Aluminum Conductor, Extruded XLPE Insulated		
8	Neutral core & Messenger Wire		Stranded compacted circular aluminum alloy conductor, Extruded XLPE insulated		
9	Maximum conductor temperature during continuous operation	Deg C	90	90	90
10	Maximum conductor temperature during shortcircuit	Deg C	250	250	250
11	Phase Core RYB insulated				
a)	Conductor				
(i)	Material		EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984
(ii)	No. of Cores & Nominal Size	mm ²	1C*35	3C*50	3C*35
(iii)	Minimum number of Strand wires		6	6	6
(iv)	Diameter		Shall be suitably selected to meet conductor DC resistance as per IS 8130		

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(v)	Max. DC Resistance of phase conductor at 20 deg. C	Ω/km	0.868	0.641	0.868
(vi)	Shape of Conductor		Stranded Compacted Circular		
(vii)	Short Circuit current rating of conductor for 1 sec	kA	3.29	4.7	3.29
(viii)	Continuous current rating in air at 40Deg.C	A	125	149	125
b)	Insulation				
i)	Material		XLPE Insulation as per IS 14255:1995		
ii)	Nominal Thickness	mm	1.2	1.5	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255:1995		
c)	Messenger wire				
i)	Material		Aluminum Alloy Wire	Aluminum Alloy Wire	Aluminum Alloy Wire
ii)	Nominal size	mm ²	25	35	25
iii)	No. and Nominal Dia. of each strand	No./m	7/2.14	7/2.54	7/2.14
iv)	Calculated Maximum resistance at 20 degC	ohm/km	1.38	0.986	1.38
v)	Shape of conductor		Stranded circular-compacted	Stranded circular-compacted	Stranded circular-compacted
vi)	Short circuit rating for 1sec	kA	2.35	3.29	2.35
vii)	Material of insulation		XLPE Insulation as per IS 14255	XLPE Insulation as per IS 14255	XLPE Insulation as per IS 14255
viii)	Thickness of insulation	mm	1.2	1.2	1.2
ix)	Min Breaking load of messenger wire	KN	7	9.8	7

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12	Core Identification		RIDGES for Phase identification: 1 ridge for R phase 2 ridges for Y phase 3 ridges for B phase. For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.		
13	Formation of cable		1 phase core XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay
14	Continuous current rating in air at 40DegC of phase conductor	A	125	149	125
15	Maximum conductor temperature during continuous operation (RYBN)	Deg C	90	90	90
16	Maximum conductor temperature during short circuit (RYBN)	Deg C	250	250	250
17	Standard Drum Length	Mtr	500	500	500
18	Tolerance in Drum length	%	+/-5%	+/-5%	+/-5%
19	Reference Standard		IS 14255		
20	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100V, size of cable, ISI, month & year of manufacturing, Property of TPCODL/ TPNODL/ TPWODL/ TPSODL, PO number & date.		

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5. GENERAL CONSTRUCTION

5.1 Conductors:


- 5.1.1 All conductors shall be Class 2, Stranded, compared circular, High electrical conductivity, Aluminum, Grade H2/H4 as per IS 8130:1984.
- 5.1.2 Before stranding, the conductor shall be circular in cross section, uniform in quality, solid, smooth and free from scale, sharp edges and other defects.
- 5.1.3 Conductor shall conform to the standards for permissible number of joints in any one of the single wires forming every complete length of conductor, for location of joints in same layer of conductors and for method of making such joints. No joint shall be made in any conductor after it is stranded.
- 5.1.4 All conductors shall be of high electrical conductivity Aluminum as specified, conforming to requirement of relevant standards.

5.2 INSULATION

- 5.2.1 The insulating material shall be Cross Linked Polyethylene (XLPE) applied by extrusion as per latest IS:14255 and its latest amendments.
- 5.2.2 The insulation shall be both heat and moisture resistant and shall be suitable for continuous operation at conductor temperature of 90 Degree Centigrade, rising momentarily to 250 Degree Centigrade under short circuit conditions.
- 5.2.3 It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. The XLPE insulation shall be ultraviolet protected for operation in direct sunlight.
- 5.2.4 It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. Average thickness of the insulation shall not be less than nominal value specified in latest IS:14255 with latest amendments. The tolerance on the thickness shall be as specified in latest IS:14255.
- 5.2.5 The insulating material shall have excellent electrical properties with regard to resistivity, dielectric constant and loss factor and shall have high tensile strength and resistance to abrasion. This shall not deteriorate at elevated temperatures or when immersed in water. The insulation shall be preferably fire resistant and resistant to chemicals like acids, alkalis, oils and ozone.

5.3 MESSENGER WIRE

The insulated messenger wire shall be made of aluminum alloy, generally conforming to latest IS:14255. The conductor shall be of heated aluminum-magnesium-silicon alloy wires containing approximate 0.5% magnesium and approximately 0.5% silicon conforming to IS 398(Part 4). Insulation shall be as per IS 14255.

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5.4 CORE IDENTIFICATION

The following shall be embossed on the one side of the core:

RIDGES REQUIRED for Phase identification:

- 1 ridge for R phase
- 2 ridges for Y phase
- 3 ridges for B phase

For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.

5.5 LAYING OF CORES

Cores shall be laid up with a right-hand lay, and shall have a lay length not exceeding $28(d1+d2)$, where;

d1 is the core diameter, including sheath, in mm.

d2 is the diameter of the messenger, including the outer protective covering where applicable, in mm.

5.6 STRANDING

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfy all the relevant requirements of IS 398(Part-IV): 1994. The lay ratio of the different layers shall be within the limits given in IS 398(Part-IV): 1994. The successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded. The lay ratio of any layer shall not be greater than the lay ratio of layer immediately beneath it.


5.7 CABLE DRUM

Cables shall be furnished in the specified reels or coil lengths of 500 meters. Drums shall be of non-returnable wooden drums as per IS 10418:1982 and the drums should be free from defects such as through cracks, knots, warps and split. The ends of the cables shall be suitably sealed by means of non-hygroscopic sealing. The tolerance on the Drum length shall be +/- 5% / as per PO terms.

6. MARKING:

The cable shall carry the following information either stenciled on the drum or contained in a label attached to it:

- a) Reference to the Standards.
- b) Manufacturer's name.
- c) Type of cable.
- d) Voltage grade.
- e) Number of cores.
- f) Nominal cross-section area of the conductor.
- g) Length of the cable on the drum.
- h) Length of the cable perm.

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- i) Marking of PO
- j) Direction of rotation of the drum.
- k) Gross mass.
- l) Country of manufacture.
- m) Year of manufacture.
- n) ISI Certification mark.

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 shall also be type tested_ as per the relevant standards. Following tests shall be necessarily conducted on the LT ABC cables in additions to others specified in the IS/IEC/SANS Standards.

7.1 ACCEPTANCE TESTS

- i) Tensile test (for phase/street light conductor)
- ii) Wrapping Test (for phase/street light conductor)
- iii) Breaking load test for messenger conductor
- iv) Elongation test for messenger conductor
- v) Conductor Resistance test for messenger and phase conductor.
- vi) Test for thickness of insulation
- vii) Hot set test for XLPE insulation
- viii) Tensile strength and elongation test at break for test of insulation
- ix) High voltage test.
- x) Insulation resistance (volume resistivity test).
- xi) UV test for XLPE insulation (black carbon content and dispersion test).


7.2 ROUTINE TESTS

- i) Conductor resistance test
- ii) High voltage test

7.3 TYPE TESTS

- i) Tests on phase/street light Conductor
 - a) Tensile test
 - b) Wrapping test
 - c) Resistance test
- ii) Tests on messenger Conductor
 - a) Breaking load test
 - b) Elongation test.
 - c) Resistance test.

iii) Physical Test for XLPE Insulation:

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- a) Tensile strength and elongation at break
- b) Ageing in air oven
- c) Hot test
- d) Shrinkage test
- e) Water absorption (gravimetric)
- f) Carbon black:
 - 1) Content
 - 2) Dispersion.
- g) Insulation resistance (Volume resistivity) test.
- iv) Test for thickness insulation.
- v) High voltage test.

7.4 OPTIONAL TESTS

- i) Bending Test

8. TYPE TEST CERTIFICATES:


The Bidder shall furnish the type test certificates of the cable for the tests as mentioned as 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 in certified Test laboratories 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, or any/all type tests (including additional 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 manufacturing 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

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- 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 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 30 months from the date of commissioning or 36 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 30/36 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.

The 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:

The cable shall be wound on wooden drums and packed in line with requirements of IS 10418-1982. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.

Bidder shall ensure that all 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. TENDER SAMPLE:

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/ TPNODL/ TPSODL/ TPWODL).

14. QUALITY CONTROL:

The bidder shall submit Quality Assurance Plan (QAP) indicating the various stages of inspection,

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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.

17. SPARES, ACCESSORIES AND TOOLS

The bidder shall provide a list of complete set of accessories and tools required for erection and maintenance of LT ABC along with the installation procedure.





18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on TPCODL/ TPNODL/ TPSODL/ TPWODL 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 brochure.

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.

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SL.No	Description	For Approval	For Review information	Final Submission
1	Technical Particulars	✓		✓
2	Manual/Catalogues/drawings for all components		✓	
3	Technical details and test certificates of XLPE compound		✓	✓
4	Cross sectional area of the cable		✓	✓
5	Installation instructions		✓	✓
6	Instructions for use		✓	✓
7	Transport/shipping dimension drawing		✓	✓
8	QA & QC Plan	✓	✓	✓
9	Routine, Acceptance and type test certificates	✓	✓	✓
10	Fault level calculation for armor and manual	✓	✓	✓

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.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS: (To be furnished by bidder)

All clauses and points in the specification to be complied as per **Clause Number 4.0(GENERAL TECHNICAL PARAMETERS) & Clause Number 5.0 (GENERAL CONSTRUCTION)**

 	 	Specification No: ENG-LV-3002 Specification Name: Specification for LT AB cable 3 Cores insulated messenger street light
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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-3003

Specification Name : Accessories of LT AB cables (Insulated Messenger)

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
13-01-2023	13-01-2023	16-01-2023	16-01-2023	17-01-2023	17-01-2023

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TPWODL*



Specification No: [ENG-LV-3003](#)

Specification Name:
Specification for Accessories of LT AB cables
(Insulated Messenger)

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1. SCOPE

The Specification covers the design, manufacture, supply, testing preferably at manufacturer's works before supply and delivery of Accessories for anchoring, suspending & making connections to Aerial Bunched Cables with insulated neutral cum messenger rated 1100 volts. Aforesaid items shall include loading and unloading at anywhere in Odisha.

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	Description
NFC 330-020	Insulating piercing connector
NFC 330-021	Junction Sleeve
NFC 33-209 IS 14255	LV Aerial Bunched Cables
NFC 20-540	Environment Testing for Outdoor
NFC 33-004	Electrical Ageing Test
NFC 33-040	Suspension Equipment
NFC 33-041	Anchoring Devices
NFC 33-042	Service Clamps

3. CLIMATIC CONDITIONS OF THE INSTALLATION

SL.NO.	CONDITIONS	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. Cm/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.

TPCODL/ TPNODL/ TPSODL/ TPWODL service area has heavy saline conditions the coast and high cyclonic intensity winds with speed up to 300km/h. 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

4.1 CABLE DATA

The Accessories of LT XLPE Insulated Aerial Bunched Cables (ABC) with insulated messenger are specified below:

- a. Since ABC accessories are to be used with **insulated messenger**, their design should incorporate specific features to prevent damage to the insulation which meeting the required electrical, mechanical & thermal requirements.
- b. All mechanical, electrical & thermal ratings should meet or exceed 90% of the corresponding ratings of the cable, or the values specified herein, whichever are more stringent.
- c. The accessories should provide "Double Insulation" so that a single point failure of insulation will not result in the system tripping.

The ABC Accessories shall consist of the following:

1	Insulation Piercing Connectors	For making tap-off/branch connectors/service (IPC) connector to an ABC line.
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2	Anchoring Assembly (AA)	For fitting onto a pole for anchoring the end of a length of ABC, or for a major change in direction.
3	Suspension Assembly (SA)	For supporting a length of ABC at an intermediate pole in a length, with small angle of deviation
4	Service clamp (SC)	For anchor Insulated service lines (armored or unarmored)
5	Junction Sleeves	For Phases, messengers & Street lighting conductor.
6	Eye Hook/ Eye Bolt with necessary clamp fittings and nuts & bolts	For fixing of cable accessories

4.2 INSULATION PIERCING CONNECTORS (IPC)

IPCs are designed to make a connection between the uncut main conductor and a branch cable conductor without having to strip either cable to expose the conductor instead the tightening action of the IPC will first pierce the Insulation, then make good electrical contact between the main end and branch conductor while simultaneously insulating and sealing the connection.

SL. NO.	DESCRIPTION	DESIRED VALUE		
		Main Size	Branch Size	Current Rating
1	IPC Type A	Bidder to specify	Bidder to specify	350 A
2	IPC Type B	Bidder to specify	Bidder to specify	200 A
3	IPC Type C	Bidder to specify	Bidder to specify	100 A
4	IPC Type D	Bidder to specify	Bidder to specify	100 A
5	Rated Voltage	0.415 kV - 0.433 kV		
6	System Frequency	50 Hz		
8	Maximum Tightening Torque (Nm)	Not exceeding 20 Nm for conductor cross-sections up to 95 sq.mm. & 30 Nm for conductor cross-section over 95 sq.mm. and up to 150 sq.mm.		
9	Insulation body	Weather, heat & UV resistant, flame retardant glass fiber reinforced black thermoplastic.		
10	Contact Plates	Tinned copper		
11	No. of contact bridges	Minimum 4 nos.		
12	Coating on contact plates	Tinning on copper		
13	Bolt	Material: Hot dip galvanized steel, minimum 8.8 grade Shape: Hex/semi-circular head square/round neck compatible with body design		
14	Shear off nut	Material: non-corrosive metallic Shape: shear off portion of nut shall have hexagonal shape. Rest of the portion of long nut shall have circular shape. Circlip or ring shall be provided beneath the shear off nut to rest the tightening tool.		

SL. NO.	DESCRIPTION	DESIRED VALUE
15	Compression Plate/ Belleville spring washer	Material: Anti-corrosive metal Shape: Square/ Rectangular compression plate or Belleville spring washer compatible to upper body shall be provided beneath the nut
16	Seals and End caps	Material: Elastomer seals and end cap shall be provided. The IPC shall be free from grease / gel for water protection. Elastomer seals shall be Blue colors.
17	Voltage withstand with Water emersion in kV	6kV in 1 Min

4.3 ANCHORING ASSEMBLY

- a. The clamps should be designed to Anchor LT AB cable with insulated messenger. The clamp should consist of an Aluminum alloy corrosion resistant castled body, bail of stainless steel and self-adjusting plastic wedges which shall anchor/hold the messenger.
- b. No losable part in the process of clamping arrangement.
- c. The clamp should conform to the standard NFC 33041 and 33042 or equivalent I.S. if any.
- d. The clamp body should be made of corrosion resistant Aluminum alloy, bail should be of stainless steel and wedges should be weather and UV resistant polymer.
- e. Ultimate tensile strength of the clamp should not be less than 12 KN for 25-35 Sq.mm, 15 KN for 50-70 Sq.mm and shall not be less than 20 KN for 70-95 sq.mm sized insulated AB cable respectively.
- f. Slip load of the clamp should not be less than 80% of Ultimate tensile strength (UTS) of relevant messenger wire.

	TECHNICAL PARTICULARS	DESIRED VALUE		
		(25-35 mm ² Insulated Messenger Wire)	(50-70 mm ² Insulated Messenger Wire)	(70-95 mm ² Insulated Messenger Wire)
1	Name & Address of the Manufacturer	To be furnished by Bidder		
2	Standard	NFC 33-041		
3	Range of messenger size	25-35 mm ² Insulated Messenger Wire	50-70mm ² Insulated Messenger Wire	70-95mm ² Insulated Messenger Wire
4	Type of design	wedge type		
5	Material of Clamp	Aluminium alloy corrosion resistant castled body, bail of stainless steel and self-adjusting plastic wedges		
6	Dimensions (mm)	GA To be Provided		
7	Approximate weight (Kg)	To be furnished by Bidder		
8	Ultimate Tensile Strength (KN)	12	15	20

SL.NO	TECHNICAL PARTICULARS	DESIRED VALUE		
		(25-35 mm ² Insulated Messenger Wire)	(50-70 mm ² Insulated Messenger Wire)	(70-95 mm ² Insulated Messenger Wire)
9	Slip	80% of UTS of relevant messenger cable		
10	Galvanization	All ferrous Part shall be Hot dip Galvanized as per IS 2633/2629		
11	Tolerance	+/-5%		
12	Marking	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's name or trademark, Year of Manufacturing.		

4.4 SUSPENSION CLAMP FOR INSULATED MESSENGER

- a. The clamp should be designed to hang LT AB cable with insulated messengers. The messengers should be fixed by an adjustable grip device. A movable link should allow longitudinal and transversal. The movement of the clamp body can accommodate small angle deviation of 30°.
- b. No losable part in the process of clamping arrangement.
- c. The clamp should conform to the standard NFC 33040 or equivalent I.S, if any.
- d. The clamp and the link made of Polymer should provide an additional insulation between the cable and the pole.
- e. The clamps and movable links should be made of weather and UV resistant glass fiber reinforced polymer.
- f. Clamps should be fixed with pole by eye hook / bracket/ eye bolt. Bracket should be made of corrosion resistant aluminum alloy.
- g. Ultimate tensile strength of the clamp should not be less than 16 KN for 70/95 Sq.mm & 50/70 Sq.mm and shall not be less than 12 KN for 25/50 sq.mm insulated neutral cum messenger respectively.

SL.NO	TECHNICAL PARTICULARS	DESIRED VALUE
1	Name & Address of the Manufacturer	To be furnished by Bidder
2	Standard	NFC 33-040
3	Range of conductor size	25-50 mm ² Insulated Messenger Wire 50-70 mm ² Insulated Messenger Wire 70-95 mm ² Insulated Messenger Wire
4	Type of design	Bolt less
5	Material for clamp Body	Made of weather UV resistant glass fiber reinforced polymer
6	Colour of Non-metallic parts	Black
7	Ultimate tensile strength	Ultimate tensile strength of the clamp should not be less than 16 KN for 70/95 Sq.mm & 50/70 Sq.mm and shall not be less than 12 KN for 25/50 sq.mm insulated neutral cum messenger respectively.
8	Slip	There should not be any slippage up to 300 N
9	Tolerance	+/-5%
10	Marking	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's name or trademark, Year of Manufacturing.

4.5 SERVICE CLAMPS

- a. The clamps should be designed to anchor insulated service lines (armored or unarmored) with 2/4 conductors.
- b. The clamps should be made of weather and UV resistant polymer.
- c. No losable part in the process of clamping arrangement
- d. The clamp should conform to the standard NFC 33042 or equivalent I.S., if any.
- e. Breaking load of the clamp should not be less than 3 KN.

4.6 JUNCTION SLEEVE

- a. The sleeves should be pre-Insulated for phases, messengers and street lighting conductors.
- b. Sleeve should be made of Aluminum, insulated with an Anti-UV black thermoplastic tube hermetically sealed two ends with 2 flexible rings.
- c. Dia. reference, size and strip length are indicated on the sleeve itself.
- d. Sizes needed: 16 sq.mm to 150 sq.mm for Aluminum XLPE insulated cable.
- e. Reference standard: NFC 33021 or equivalent I.S. if any.

4.7 EYE HOOKS/ EYE BOLTS

- a. Eye hooks/ Eye Bolts should be designed as to hold suspension clamps and dead-end clamps and to be installed with the pole clamp.
- b. Eyehooks should be made up of forged Galvanized steel.
- c. The clamps corrosion resistance should conform to the standards I.S. 2629 & I.S.2633.
- d. Bolts and nuts should be made of hot dip Galvanized steel according to VDE 0210 and VDE 0212.
- e. Ultimate Tensile strength (UTs) of the clamp be 20 KN or higher.

SL.NO	TECHNICAL PARTICULARS	DESIRED VALUE
1	Name & Address of the Manufacturer	To be furnished by Bidder
2	Application	To hold suspension clamp and Dead-End clamp with pole
3	Material	Mild Steel Grade E250 A, IS 2062
4	Finish Material	Hot dip galvanized Steel (As per IS 2633 with latest amendment,
5	Type of Hook	Flat Eye Hook
6	Type of Design	Forged Eye Hook
7	Dimension	As per GA Drawing
8	Ultimate Tensile Strength, Min	20 KN
9	General Tolerance	+/-5 %
10	Type of packing	40 Pcs in Gunny Bags
11	Marking	TPCODL/ TPNODL/ TPSODL/ TPWODL, Manufacture's name or trademark, Year of Manufacturing.

5. GENERAL CONSTRUCTIONS/REQUIREMENTS

5.1 INSULATION PIERCING CONNECTORS (IPC)

- a. The housing shall be made entirely of mechanical and weather resistant plastic insulation material and no metallic part outside the housing is acceptable except for the tightening bolt.
- b. Any metallic part that is exposed must not be capable of carrying a potential during or after connector installation.
- c. Screws or nuts assigned for fitting with IPC (Insulating Piercing connector), must be fitted with torque limiting shear heads to prevent over tightening or under tightening (min & max torque values to be specified by Manufacturer).
- d. The IPC must perform piercing and connection on Main and Branch cable simultaneously.
- e. The IPCs shall be waterproof and the water tightness shall be ensured by appropriate elastomer materials and not by grease, gel or paste alone.
- f. Design of IPC should be such as to not cause damage to insulation of adjacent conductors due to vibration and relative movement during service.
- g. The connector shall have a rigid removable end cap which can be slide fitted onto the main connector body on either right or left by the installer (depending on site requirement) for sealing the cut end of the branch cable. Once the connector is fitted, it should not be possible to remove the cap without removing the connector.
- h. All the metallic parts of the connector should be corrosion resistant and there should not be any appreciable change in contact resistance & temperature after overloads & load cycling.
- i. The contact plates should be made of tinned copper.
- j. Elastomer seals and end cap shall be provided. The IPC shall be free from grease / gel for water protection. Elastomer seals shall be Blue colors.
- k. The Insulation material should be made of weather & UV resistant reinforced polymer.
- l. The outer metallic part should have potential free tightening bolts to allow safe installation on live lines.

The insulation piercing connectors shall be of the following type(s) depending on the applications.

Type	Description	Application
A	Insulation piercing multiple port (4 way) connector.	For providing service connection from ABC
B	Insulation Piercing Connector for networking	For main-to-main networking or branching of ABC to another ABC
C	Insulation Piercing Connector for Street Lighting	For street lighting/earthing connection from AB Cable
D	Bare Connector for Earthing/Neutral Connections	For Earthing connection from AB Cable

Standard size ranges for Type A multiple tap insulation piercing connector for service connector shall be as follows:

Type	Application	Method of Branch Connection	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
A	For service connections from Smaller size and Capacity AB Cable	dis-connectable	25 - 95	4 x (2.5) 6 – 35
	For service connections from Smaller size and Capacity AB Cable	dis-connectable	50 - 150	4 x (2.5) 6 – 35

Standard size ranges for Type B insulation piercing connectors for main to main networking or branching of ABC shall be as follows:

Type	Application	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
B	For Main-to-Main network connections from smaller size and Capacity AB Cable	16 - 95	16 - 95
	For Main-to-Main network connections from smaller size and Capacity AB Cable	25 - 150	25 - 150
	For Main-to-Main network connections from smaller size and Capacity AB Cable / Charging of Distribution Box	16 - 150	4 - 50
	For Main-to-Main network connections connections from smaller size and Capacity AB Cable / Charging of Distribution Box	16 – 95	4-35
	For Main-to-Main network connections connections from smaller size and Capacity AB Cable / Charging of Distribution Box	10 – 95	1.5 – 10 (16)

Standard size range for Type C, insulation piercing connector for street lighting

Type	Application	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
C	For Street Lighting connections	10 - 95	1.5 – 10

Standard size range for Type D, Bare connector for Earthing

Type	Application	Main Cable Size Range (mm ²)	Branch Cable Size range (mm ²)
D	For Earthing/Neutral Connections	10 - 95	1.5 – 10

5.2 ANCHORING ASSEMBLY

Each Anchoring Assembly shall include.

a. One number tension bracket.:

The tension bracket shall be made from a single piece of Aluminum alloy suitable for attachment to a pole either by 20mm galvanized eye hook (s) or two stainless Steel straps of 20 x 0.7 mmx 0.75 m.

The tension bracket should be designed to ensure the Flexible rope cannot slip out at any angle.

b. One number wedge type tension clamp

Wedge type clamps shall be used for clamping the messenger. The clamp shall be capable of clamping an uncut messenger so that it can continue without break to the connecting point or next span. The clamp shall be fully insulating type of mechanical and weather resisting thermoplastic. No bolts or loose parts are allowed as part of the Clamping system. No tools shall be needed for fitting the messenger into the clamp. The clamp shall be self-tightening.

c. Flexible Rope for fixing tension clamp to bracket

The Anchoring assembly shall be supplied with a stainless-steel flexible rope to connect the Tension Clamp to the Tension Bracket. The rope should have sufficient flexibility to ease the torsional movement of the AB Cable System. The Rope should be pre-fitted with compression type end fittings to secure the tension clamp. A wear resistant moveable saddle should be loosely fitted on the Rope to prevent abrasion at the point of fitting into the tension bracket. The Rope should have sufficient mechanical strength to withstand the mechanical test for the complete assembly tests in this specification.

5.3 SUSPENSION CLAMP FOR INSULATED MESSENGER

Suspension Assemblies shall be supplied in sets to ensure compatibility of the materials against corrosion or wear of rotating/moving parts. Each Suspension Assembly shall consist of:

a. One number Suspension Bracket

The Suspension bracket shall be made from a single piece of Aluminium alloy suitable for attachment to a pole either by 20 mm galvanized steel bolt (s) or two stainless Steel straps of 20 x 0.7 mmx0.75m The Suspension Bracket shall be provided with an upper bulge to prevent the clamp from turning over on the Bracket for more than 45 mm from the horizontal or to within less than 60 mm from the pole / fixing structure. The Suspension Bracket should be so designed to ensure that the articulated link cannot slip out of it.



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b. One number moveable (articulated) connecting link

Movable Links are used between the Suspension Bracket and Suspension Clamp to allow a degree of movement and flexibility between the two. The Movable link should be unlosable fitted to the Bracket and the Clamp.

c. One number Suspension Clamp

Suspension Clamps are used for locking the messenger of the ABC bundle and allowing the messenger to become dismounted from the fitting. The Suspension Clamp shall accommodate messenger wires from 16 sq.mm to 150 sq. mm. The Suspension Clamp shall be made fully of insulating type of mechanically strong and weather resistant Plastic. Bolts should not be used for clamping / locking the messenger in the clamp.

5.4 Stainless steel strap and buckles

The stainless-steel strap shall consist of

- a) Stainless steel strap of size 20mm \pm 0.2 x 0.7mm \pm 0.05 mm x 750 M and shall have tensile strength of 7.5KN min., elongation 30% Min, finish 2B, and the stainless-steel material shall be of high mechanical strength, corrosion and wear resistant as per ASTM SS 202.
- b) Tensile strength of strap is to be min 7.5KN to be tested on a loop with buckle. Minimum 2 Number of loops for mounting the bracket on pole to be allocated as per load requirement for dead-end and suspension clamp specified in this specification.
- c) Min two loops of 0.75 meter each with one buckle to be considered for attaching the brackets to the poles. For dead-end or suspension pole bracket a total of 1.5 meter of SS Strap and two buckle are required.
- d) The SS Strap should be engraved with the name of the Manufacturer, month and year of manufacturing and length at a distance of approx. 250 mm for traceability.
- e) The SS buckle to suit above strap shall be used to tension & fix it. It should have a slot width of not less than 20.5 mm x 1.5 mm
- f) The Buckle should be made from ASTM SS 304 of thickness not less than 1.2 mm.
- g) SS Strap must be supplied in 50-meter roll in plastic dispenser casing with indication of remaining length.
- h) Buckles should be supplied in plastic bags containing 100 pcs per bag.

6. MARKING

Each product shall be clearly identified with manufacturer name or trade mark, reference and capacity of the item and batch no. and suitable identification marking of the property "TPCODL/ TPNODL/ TPSODL/ TPWODL".

The marking should be engraved/embossed.

7. TESTS

Along with the bid, the bidder must submit Type Test Reports on same fittings carried out within last 7 years from the date of opening of techno-commercial bid of the tender CPRI/ERDA/Any Govt Lab that is NABL accredited.

8. TYPE TESTS CERTIFICATE

8.1 Type Test

The following shall constitute Type Tests for IPC:

- a. Electrical Ageing Test
- b. Dielectric and Water Tightness Test.
- c. Mechanical Tightening Test
- d. Effect of Tightening on main Core
- e. Effect of Tightening on Branch core
- f. Over-current Test (if applicable)

The following shall be Type Test for Suspension Assembly (SA)

- a. Mechanical Test
- b. Voltage Test
- c. Climatic Aging Test
- d. Corrosion Test

The following shall be Type Tests for Anchoring Assemblies (AA)

- a. Mechanical Test
- b. Voltage Test
- c. Dynamic Test
- d. Climatic Aging Test
- e. Corrosion Test

8.2 Acceptance Tests

The following shall constitute Acceptance Tests for Insulation Piercing Connectors (IPC)

- a. Visual *
- b. Dimensional (as per SCD and overall dimensions submitted with Tender Offer) *
- c. Dielectric and Water Tightness Test. **
- d. Mechanical Tightening Test **
- e. Effect of Tightening on Main Core **
- f. Effect of Tightening on Branch Core **

The above tests are to be carried out as per sampling plan below. However, the electrical ageing test on IPC (market***) is to be done on only one connector of each type and size.

In case of random failure/defect, double the sample lot is to be drawn and there should be no failure/defect exceeding half the permissible defects (rounded down) shown in the chart.

Lot Size	For tests marked*		For tests marked**	
	Sample Size	Maximum Permissible defects	Sample Size	Maximum Permissible defects
Up to 100	2	nil	2	nil
101 to 1000	6	nil	4	nil
>1001	0.01% subject to min. 6 pieces	0.1% of pieces checked	4	nil

The following shall constitute acceptance tests for Anchor Assemblies:

- a. Visual *
- b. Dimensional (as per SCD and overall dimensions submitted with Tender Offer) *
- c. Mechanical Test on Bracket**
- d. Mechanical Test on Clamp **
- e. Voltage Test *

The following shall constitute acceptance tests for Suspension Assemblies:

- a. Visual *
- b. Dimensional (as per SCD and overall dimensions submitted with Tender Offer) *
- c. Mechanical Test on Bracket**
- d. Mechanical Test on Clamp **
- e. Voltage Test *

The above tests (for AA & SA) are to be carried out as per sampling plan below. In case of random failure/defect, double the sample lot is to be drawn and there should be no failure/defect exceeding half the permissible defects (rounded down) shown in the chart.

Lot Size	For tests marked*		For tests marked**	
	Sample Size	Maximum Permissible defects	Sample Size	Maximum Permissible defects
Up to 100	2	nil	1	nil
101 to 1000	5	1	2	nil
501-2500	10	2	2	nil
2501 and above	10+ 0.2%	2+ 10% pf addl. Sample quantity	4	1

8.3 Routine Tests:

Supplier shall provide a control plan, which will be implemented on each item. Routine test reports should be submitted by the manufacturer with inspection call.

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 always grant free access to the places of manufacture to TPCODL/ TPNODL/ TPSODL/ TPWODL's representatives 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. 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/ 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 24 months from the date of commissioning or 36 months from the date of last supplies made under the contract whichever is later, (the time scale of 24/36 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 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.

Guarantee clause is applicable for all the items covered under this specification.

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.

The packings of the fittings should carry the following information: -

- a. Manufacturer's name and trade-mark
- b. Name of the purchaser
- c. Batch No., date, month and year of manufacture
- d. Any other markings agreed to between the manufacturer and the Purchaser.
- e. Installation instruction should be included in packaging.

13. TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/TPNODL/TPSODL/TPWODL).

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. All bidders should preferably be ISO-9001 certified. The ABC accessories should be of proven design with minimum 2 years record of satisfactory operation with a major utility. Order copies and Performance Certificates should be enclosed with the offer.**

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 AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS

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:

- a. Completely filled in Technical Particulars.
- b. General description of the equipment and all components including brochures.
- c. Type test Certificates
- d. Experience List.

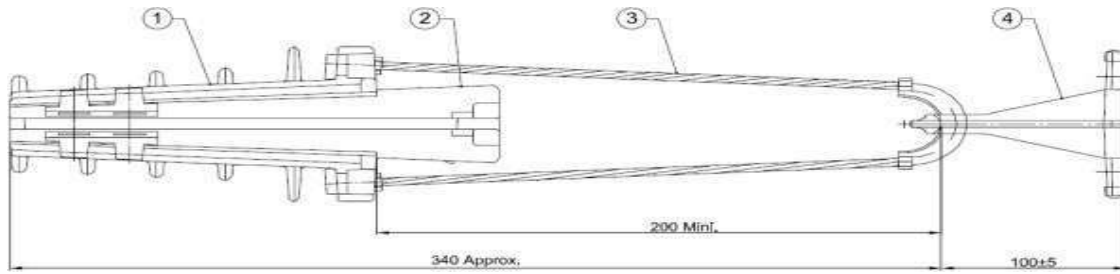
After the approval of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch 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	Manual/Catalogues/drawings for all components.		√	
3	Technical details and test certificates.		√	√
4	Installation Instructions		√	√
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.

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.

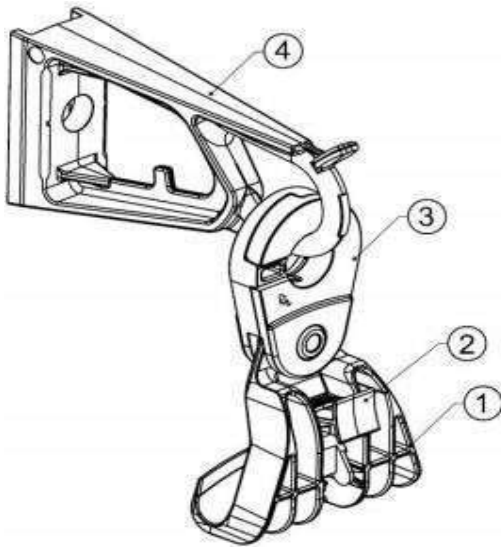


DETAILED DRAWING TO BE PROVIDED

Sl.no	Description	Qty	UoM
1	Body	1	Nos
2	wedge	1	Nos
3	Assembly	1	Nos
4	Bracket	1	Nos

FIG.1: - ANCHOR CLAMP ASSEMBLY

DETAILED DRAWING TO BE PROVIDED



Sl.no	Description	Qty	UoM
1	Clamp Body	1	Nos
2	Closing lever	1	Nos
3	Mobile Link	1	Set
4	Bracket	1	Nos

FIG.2: -SUSPENSION CLAMP ASSEMBLY

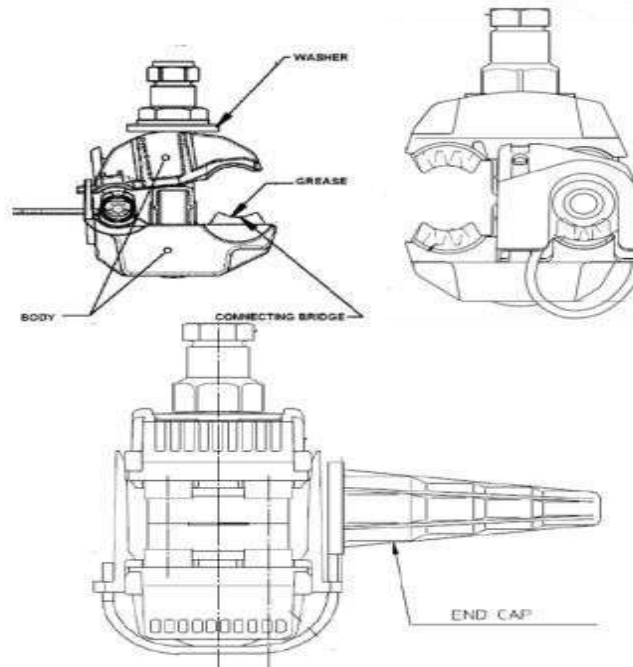


FIG.3: - INSULATING PIERCING CONNECTOR

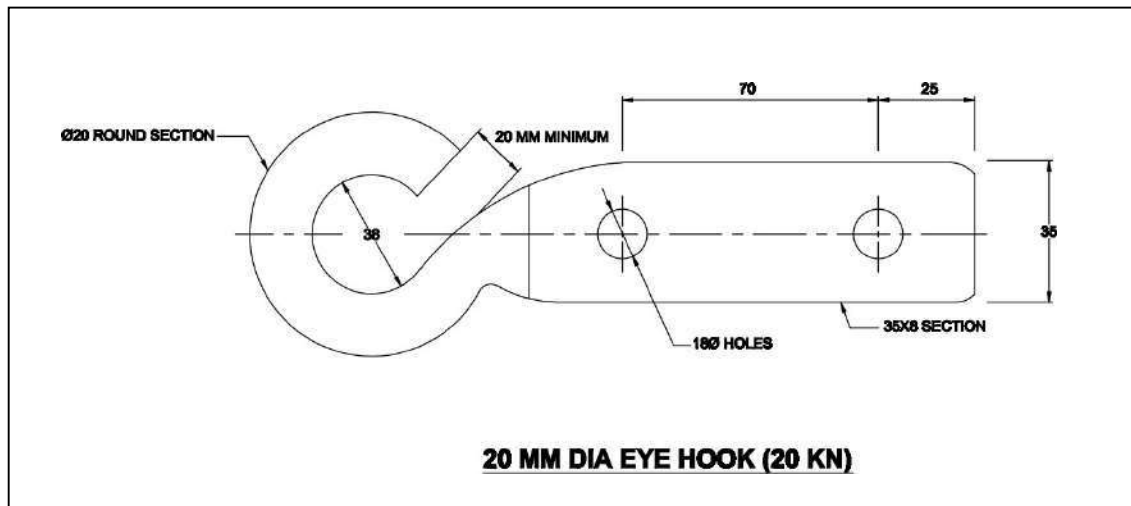


FIG.4: - EYE HOOK WITH POLE FIXING CLAMP

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Specification No: [ENG-LV-3003](#)

Specification Name:
Specification for Accessories of LT AB cables
(Insulated Messenger)

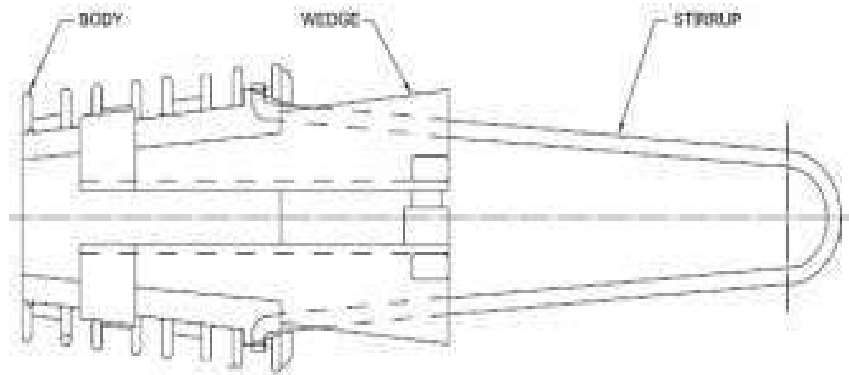


FIG.5: -SERVICE CLAMPS

19. GUARANTEED TECHNICAL PARTICULARS

The GTP is to be furnished by the Bidder as mentioned in clause 4 & clause 5.



Specification No: [ENG-LV-3003](#)

Specification Name:
Specification for Accessories of LT AB cables
(Insulated Messenger)

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:

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



Specification No: [ENG-LV-3004](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

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4. GENERAL TECHNICAL REQUIREMENTS
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17. SPARES, ACCESSORIES AND TOOLS
18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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.	CONDITONS	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 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	°C	85	85	85	85
11	Allowable conductor temperature during short circuit	°C	160	160	160	160
12	Max. DC resistance at 20°C – 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 27°C	%	29	29	29	29
15	Guaranteed value of min. temp. index	°C	250	250	250	250
16	Smoke Density Rating		Max. average 60 SDR	Max. average 60 SDR	Max. average 60 SDR	Max. average 60 SDR



Specification No: [ENG-LV-3004](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

5. GENERAL CONSTRUCTION:

i) The PVC Insulated Cable shall be manufactured and tested strictly in accordance with the Indian Standard 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 best available 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, galvanized round 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 wires shall comply with the requirements of IS: 3975 with latest amendments

5.2 OUTER SHEATH:

The Outer Sheath shall be of polyvinyl chloride (PVC) compound conforming 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.

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ARMOURED CONTROL CABLES

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 the offer: -

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



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- 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.



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TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

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 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



Specification No: [ENG-LV-3004](#)

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TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

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 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:

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:

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	°C				



Specification No: [ENG-LV-3004](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 1.1KV FRLSH
ARMOURED CONTROL CABLES

Sr. No	General Technical Particulars	UNITS	To Be Furnished by the Bidder			
11	Allowable conductor temperature during short circuit	°C				
12	Max. DC resistance at 20°C – Main	Ohm/km				
13	Max. AC resistance at max. Operating temp.	Ohm/km				
14	Guaranteed value of min oxygen index at 27°C	%				
15	Guaranteed value of min. temp. index at 21 oxygen index	°C				
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 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-3008

Specification Name : Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV 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

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TPWODL*



Specification No: [ENG-LV-3008](#)

Specification Name:

Technical Specification For Heat Shrinkable
Straight through Joint & Termination for 1.1KV
Cable

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17. SPARES, ACCESSORIES AND TOOLS
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19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS



Specification No: [ENG-LV-3008](#)

Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV Cable

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 1.1 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: 2011(Part-1)	Cable Accessories for extruded power cables, for working voltages for 1.1 kV up to and including 3.3 kV – test methods and test requirements
2	IS 7098- 2003 (Part1)	Cross linked polyethylene insulated PVC sheathed cables up to and including 1.1 kV Cable.
3	IS 14255	LT Aerial Bunched cable working up to 1.1 kV
4	ENA TS 09-13	High voltage heat shrinkable material components for use up to and including 36 kV
5	IEC 61238-1: 2003	Compression and Mechanical Connectors for Power Cables
6	IS 8308 : 2003	Compression type tubular inline connector for Aluminium conductors of insulated cables
7	IS 8309 : 2003	Compression type tubular terminal ends for Aluminium conductors of insulated cables
8	IS 2633	Methods for testing uniformity of coating of zinc coated articles
9	IS 4826	Hot dipped galvanized coatings on round steel wires
10	IS 12444	Continuous Cast and Rolled electrolytic copper wire rods for electrical conductors
11	IS 191	Copper Specification
12	IS 10810	Methods of test for cables



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SL. No.	IEC/IS	Description
13	EN 50393	European Cable Jointing Standard
14	ASTM D-2303	Standard Test Methods for Liquid-Contaminant, Inclined-Plane Tracking and Erosion of Insulating Materials
15	ASTM G 154-12a	Exposure to UV radiation
16	IS 10810 (Pt.7): 1984	Tensile strength and elongation before & after UV exposure

3. CLIMATIC CONDITIONS:

SL.NO.	CONDITONS	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.



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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. Four Core Cables, 1.1KV A2XWY (Aluminium conductor stranded sector shaped, XLPE insulation, PVC inner sheath, GI round wire armour, PVC outer sheath) & A2XFY

- i) 4CX400 sq.mm.
- ii) 4C X 300 sq.mm.
- iii) 4CX240 sq.mm.
- iv) 4C X 185 sq.mm
- v) 4C X 150 sq.mm.
- vi) 4C X 95 sq.mm.
- vii) 4C X 50 sq.mm.
- viii) 4C X 35 sq.mm.
- ix) 4C X 25 sq.mm.

B. Three & half core cables

- i) 3.5C x 95 sq. mm.
- ii) 3.5C x 150 sq. mm.
- iii) 3.5C x 240 sq. mm.
- iv) 3.5C x 300 sq. mm.
- v) 3.5C x 400 sq. mm.



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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
4C & 3.5C Cables – all sizes	Straight through joints/ Indoor/ Outdoor termination

4.3 General requirement for Heat Shrinkable Jointing and Termination kit:

- 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 and IS 13573 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):
- Insulating tube for outdoor termination should be of black colour & type tested for UV rays protection.

S. No.	Parameter	Units	Requirement
1	Max. Withstand System Voltage	kV	1.1
2	Continuous operation withstand Temperature	°C	90
	Short Circuit withstand temperature	°C	250
3	Withstand short circuit current	kA/1Sec	As per Size of Conductors
4	Storage Temperature Range	°C	-10°C to + 45°C
5	Shelf life of kit components excluding mastic and solution	Years	Min. 5
6	Shelf life of mastic and solution	Years	Min. 2

4.4 General Technical Particulars for Heat Shrinkable Insulation Tubing/ Sleeves/ Wrap around Sleeve:



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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.
5	Dielectric Strength	10 KV /mm (Minimum)
6	Tensile Strength	10 N/mm ² (Minimum) and (8 N/mm ² for anti-tracking)
7	Ultimate Elongation	200% (Minimum)
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 200°C Min. (For stress control tube: 30 Minutes at 250°C Min.)
9	Low Temperature Flexibility	No cracking after 4 hrs. at minus -20°C Max.
10	Volume Resistivity	1x 10 ¹⁰ Ohm- meter (Minimum) (For stress control, tube VR: 1x 10 ⁷ Ohm-meter min.)
11	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)



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Sl. No.	Parameter	Specified limit
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 250°C Min.
9	Low Temperature Flexibility	No cracking after 4 hrs. @ minus -20°C 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.

5. GENERAL CONSTRUCTION:

5.1 Components of Indoor/ Outdoor Termination Kit:

S. No.	Components	Requirement
1	Compression Lugs/ Tinned coated Mechanical Lugs	<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.
2	Lug Seal	a) Fire resistant and weather resistant as per ENA TS 09-13
3	Heat Shrinkable insulating tube/ Sleeve	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% at any two points of measurement. c) For outdoor kits all 4 tubes should be of black colour with UV radiation protective coating. d) Length of insulating tube: Outdoor- 600mm, Indoor- 400mm
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.
5	Heat Shrink Breakout	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.
6	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 mm ² x 500 mm x 1 Run for below 300 mm ² cables. e) 50 mm ² x 500 mm x 1 Run for above 300 mm ² cables f) Compatible Supporting ring with SS jubilee clips shall be provided to connect tinned copper braids



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S. No.	Components	Requirement
7	Tinned copper wire mesh	a) Minimum 2.5mm ² x 500 mm shall be provided for wrapping over armor circumference beneath the copper braid
8	Sub-kit components	a) Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and other necessary items.
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:

S. No.	Components	Requirement
1	Heat Shrinkable insulating tube/ Sleeve	a) Surface of material: shall be smooth and free from protrusion, voids and nicks. b) Recovered thickness: Recovered thickness of insulation tubes over ferrule circumference shall not be less than 2.5 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.
2	Ferrule	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 Aluminium shall be min. 60% of IACS.
3	Mastic Tape	a) Mastic tape or sealant 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.
4	Tinned coated copper braid	a) Uniformly tinned coated copper braid shall be provided for armor continuity b) Size of tinned copper braid shall be: 50 mm ² x 1 Run for 4CX 400 sq.mm, 4CX 300 sq.mm. & 4CX 240 sq.mm. cable. 25 mm ² x 1 Run for 4CX 150 sq.mm. and 4C X 95 sq.mm. cable 10 mm ² x 1 Run for 50 sq.mm. cable and below sizes. c) Length of tinned copper braid shall be as per approved BOM



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S. No.	Components	Requirement
5	Tinned copper wire mesh	a) Minimum 2.5 mm ² X 1000 mm for 4CX400 mm ² , 4CX300mm ² , 4CX240 mm ² and 4C X 150 mm ² . b) 2.5 mm ² X 300 mm – 95 sq.mm. and below sizes c) shall be provided for wrapping over armour circumference beneath the copper braid
6	GI wire mesh	a) Mechanical protection shall be provided in GI armored cables by means of heavily zinc coated GI mesh as per IS 4826.
7	Breakouts	a) Adhesive coated Breakouts shall be provided on outer sheath at both sides on the cable to prevent water ingress.
8	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. g) Additionally, adhesive coated sleeve approx. 300 mm length shall be provided at ferrule joint area beneath the wrap around sleeve.
9	Sub-kit Components	a) Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and 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 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.



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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



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Test	Clause No.	Reference Standard
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 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
AC Voltage withstand Test (Air)	8.6	IS 13573(Part-1)
AC Voltage withstand test (Immersed)	8.6	IS 13573(Part-1)
Impulse voltage withstand at ambient Temp.	8.2	IS 13573(Part-1)
Heat Cycle test (in air and water)	8.3	IS 13573(Part-1)
Insulation Resistance (in air)	8.4	IS 13573(Part-1)
Insulation Resistance (immersed)	8.4	IS 13573(Part-1)
Visual Examination	8.8	IS 13573(Part-1)



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(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 and Compression Ferrules

Test	Clause No.	Reference Standard
Conductivity test	8.3	as per IS 8309/ 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



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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 joiner 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



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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.



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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) BOM
- 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	Continuous operation withstand Temperature	°C	
	Short Circuit withstand temperature	°C	
3	Withstand short circuit current	KA/1Sec	
4	Storage Temperature Range	°C	
5	Shelf life of kit components excluding mastic and solution	Years	
6	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	
3	Internal diameter of tube after full recovery	
4	Longitudinal change	



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S.No.	Parameter	To be Furnished by Bidder
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

SI.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	
11	Flame Retardant (For anti-tracking moulded components)	



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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



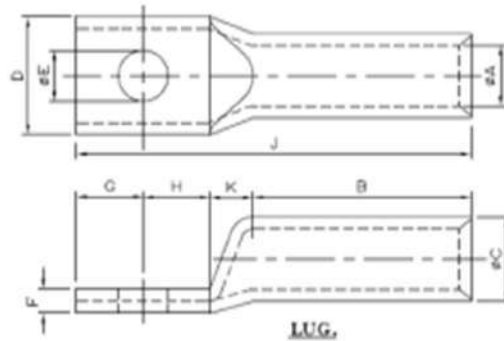
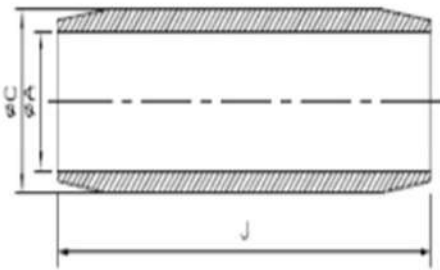
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Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV Cable

Cable Size in MM ²	φA (mm) +/-0.3mm	φC (mm) +/-0.3 mm	J (mm)
16	5.4	8.3	65-75
25	7.2	9.7	65-75
50	10	13.5	80-90
95	12.9	17.3	100-110
150	16.3	21.5	120-130
300	23.6	31	140-150

Cable Size in MM ²	φE (mm) ±0.1mm in centre of palm	φA (mm) ±0.3mm	φC (mm) +0.5 mm	D (mm) ±1.5mm	F (mm) -0mm	B±3.0mm	J (mm) ±5mm
300	17	23.9	31	45	7	89	157



For remaining cable sizes, dimensions of Ferrules & Lugs shall be as per IS.

Annexure- II

Inspection Test Plan for HS Jointing kit components

S. No.	Name of test	Specified value(Range)	Reference documents	Test Result	Pass/Fail
1	Visual inspection	Free from pin holes, cracks, nicks, protrusion and other visible defects.	ENA-TS-09-13 Clause No. 3.15 & TPCODL/ TPWODL/ TPNODL/ TPSODL/ specification		
2	Physical verification of kit contents and dimensions	Dimensions as per TPCODL/ TPWODL/ TPNODL/ TPSODL approved BOM			
3	Electric Strength test	10 KV /mm (Minimum)	ENA-TS-09-13		



Specification No: [ENG-LV-3008](#)

Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV Cable

S. No.	Name of test	Specified value(Range)	Reference documents	Test Result	Pass/Fail
			Clause No. 3.4		
4	Ultimate Elongation tests	200% (Minimum)	ENA-TS-09-13 Clause No. 3.12		
5	Tensile Strength	10 N/mm ² (Minimum) For anti-track tube-8 N/mm ²	ENA-TS-09-13 Clause No. 3.12		
6	Tracking resistance test(Anti-tracking Tube)	NO Tracing erosion to top surface /flash failure after 1 hr 2.5 KV 1hr 2.75KV 20 min 3.5 KV	ENA-TS-09-13 Clause No. 3.14		
7	Volume Resistivity	1x10 ¹⁰ Ohm- meter (Minimum)	ENA-TS-09-13 Clause No. 3.16		
8	Wall thickness ratio	0.6 or 60% (Minimum at any two points of measurements)	ENA-TS-09-13 Clause No. 3.3		
9	Expanded and recovered diameters	As per TPCODL/ TPWODL/ TPNODL/ TPSODL approved BOM	ENA-TS-09-13 Clause No. 3.3(i)		
10	Longitudinal change after recovery	10% max	ENA-TS-09-13 Clause No. 3.3(ii)		
11	Heat shock test	No splitting, cracking, dripping or flowing after 30 min @200°C min	ENA-TS-09-13 Clause No. 3.7.1/ 3.7.2		
12	Low temperature flexibility	No cracking after 4 Hrs @ Minus 20°C max	ENA-TS-09-13 Clause No. 4.5		
13	Insulation build up thickness after shrink on Ferrule as per IS 10810 -6	Not less than as specified in specification	as per IS 10810 -6 Clause No. 8.1		
14	Flame retardant test	After one min burn: burnt or charred length 250 mm max.	ENA-TS-09-13 Clause No. 3.5.1/ 3.5.2		



Specification No: [ENG-LV-3008](#)

Specification Name:

Technical Specification For Heat Shrinkable Straight through Joint & Termination for 1.1KV Cable

S. No.	Name of test	Specified value(Range)	Reference documents	Test Result	Pass/Fail
15	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			
16	Ferrules/ connectors/ lugs dimension and conductivity test	As per annexure-I in this specification	as per IS 8309 Clause 8.3		
17	Uniformity of zinc coating on GI mesh as per IS 2633	No reddish color after one dip for ½ minute in CuSO4 solution	as per IS 2633 Clause 4.1		

STANDARD TECHNICAL SPECIFICATION COVER SHEET

Specification No. : ENG-LV-3009

**Specification Name : Technical Specification For LT Distribution Box-RING
SYSTEM**

SATYA PRASAD NAYAK	SHANTAPRIYA JENA	JYOTIPRAKASH MOHANTY	Jyoti Ranjan Sahu	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	19-01-2023	21-01-2023	30-01-2023	22-02-2023	23-02-2023

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TPWODL*

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1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of LT Distribution Box Complete with accessories and other miscellaneous equipment specified in this specification, which are necessary or usual for their efficient performance and trouble free 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	Description
IS: 6875/1973	Control switches, push buttons and related Part I & II control switches
IS: 13947/1993	Specification for Low-voltage Switchgear and Control gear
IS: 13607/1992	Ready mixed paint, Finishing, General purpose, Synthetic
IS 2633	Methods for testing uniformity of coating of zinc coated articles
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: 5-1994	Colour of ready mixed paints and enamels

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/TPWODL/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	Desired Values	
		For I/C 630 Amp	For I/C 400 Amp
1	Rated Voltage	415 V \pm 10%	
2	Rated Frequency	50 HZ	
3	Continuous Current Rating	630 A	400 A
4	Type	Out door	
5	Mounting	On concrete foundation	
6	Suitable for	3 Ph 4 wire with earthed Neutral	
7	Maximum system Voltage	1.1kV	
8	Rated short Circuit Level	35kA	
9	Enclosure Details		
a)	Overall dimension	Suitable design and size without exceeding temperature rise limit @ full load & necessary clearances to be met	
b)	Sheet Thickness	3mm (Body) 2mm (Doors)	
c)	Degree of Protection	IP 55	
10	MCCB (Incoming)		
a)	Make	Siemens/ABB/Schneider/L&T/Havells	
b)	Current Rating (A)	630 A	400 A
c)	Breaking Capacity	35kA	
d)	Pole (Nos)	3	
e)	Impulse withstand voltage(kV)	8	
f)	Rated Insulation Voltage	600 V	
g)	Utilization Category	A	
h)	Ambient Temperature	50 deg	
i)	Storage Temperature	0 to 70 deg	

j)	Release	Microprocessor based protection (O/C,S/C & E/F)	
11	MCCB (Outgoing)		
a)	Current Rating (A)	100 A	
b)	Breaking Capacity	35kA	
c)	Pole (Nos)	3	
d)	Impulse withstand voltage(kV)	8	
e)	Rated Insulation Voltage	600 V	
f)	Utilization Category	A	
g)	Release	Microprocessor based protection (O/C,S/C & E/F)	
12	MCB		
a)	Make	Siemens/ABB/Schneider/L&T/Havells	
b)	Rating (A)	63 A	
c)	Pole (Nos)	2	
d)	Tripping Characteristics	C	
e)	Breaking Capacity	20kA	
f)	Voltage Rating	415	
g)	Mechanical life time (cycle)	100000	
h)	Electrical life time (cycle)	100000	
13	Current Transformer on Both Incomers		
a)	Applicable Standards	IS 2705	
b)	CT ratio (Amps)	630/5A	
c)	Accuracy Class	0.5	
d)	Burden (VA)	10	
e)	System Voltage	415	
f)	Insulation Level	3kV for 1 min	
g)	Frequency	50 Hz	
h)	Rated Continuous Thermal Current	1.2 times Rated Current	
i)	Insulation Class	E	
j)	CT Type	Resin Cast	
k)	Internal Diameter	To be furnished by Bidder	
l)	Outer Diameter	To be furnished by Bidder	
14	Busbar		
a)	Material	Aluminium	
b)	Grade	EC Grade	
c)	Size	80x08-PH 80x08-N	40x10-PH 40x10-N
d)	Earthing Bolt	M8x25 mm	
e)	Current Density	1 Amp/ Sq.mm	
15	Wire		
a)	Material	PVC Multi strand Copper wire	

b)	Size	35 mm ² for 100A Triple Pole MCCB 16 mm ² for 63A DP MCB 2.5 mm ² for CT 1.5 mm ² for phase indication & Meter Power wire
----	------	--

5. GENERAL CONSTRUCTIONS:

- a) LT Distribution Box shall be suitable for the purpose for which they are intended to be used.
- b) Each box shall be complete with following accessories for 630 Amps:
 - i) 630 Amps MCCBs for both incoming L.T. UG cable
 - ii) Sph-63 Amps MCBs for single phase consumers:- 18 nos.
 - iii) 3-Ph, 100 Amps MCCBs for 3-Ph consumers:- 6 nos.
 - iv) Provision for Electronic TV Energy meters (on both incomers) suitable for recording energy
 - v) Lock & key
 - vi) Interlocking arrangement with MCCB between two incomers supply
 - vii) Incoming/Outgoing Circuit stickers shall be fixed inside the box for indicative purposes.
 - viii) Laminated SLD of the connections diagram shall be fixed on the inside door.
- c) Each box shall be complete with following accessories for 400 Amps:
 - i) 400 Amps MCCBs for incoming L.T. UG cable
 - ii) 1-Ph-63 Amps MCBs for single phase consumers:- 9 nos.
 - iii) 3-Ph ,100 Amps MCCBs for 3-Ph consumers:- 3 nos.
 - iv) Provision for Electronic TV Energy meters (on both incomers) suitable for recording energy
 - v) Lock & key
 - vi) Interlocking arrangement with MCCB between two incomers supply. Castle Key Arrangement
- d) LT Distribution Box shall have access for sufficient ventilation and heat dissipation.
- e) The LT Distribution Boxes shall be made of Galvanized steel sheet of 3 mm thickness to with stand in the weather.
- f)The LT Distribution Box shall be suitable to mount on brick concrete foundation. Necessary provision for foundation bolt in the pillar shall be made for 4 Nos GI foundation bolts of size 12mm. Nuts, Bolts and 2 Nos. of Washers. Base channels shall be provided for mounting LT distribution box on concrete foundation.
- g) The box shall be provided with suitable rain shed and all bolt and washers used shall be galvanized mild steel.
- h) A danger board as shown in the sketch shall be provided in the front of the box.
- i) The box shall be provided with two Nos. of earthing points internally connected with accessible position on the sides. The earthing point shall be provided by 50x6 mm GI flat

with galvanized bolts and nuts and marked with \perp symbol.

- j) LT Distribution Box shall be provided with PVC insulated sleeved bus bar to with stand 1.1 kV. The bus bar sizes shall be 2 layers of required dimension made up of aluminum with Red, Yellow and Blue colour for three phases and black for neutral.
- k) The bus bar shall be made out of E.C. Grade Alluminium flats. The bus bar shall be suitably supported on an insulating base rigidly fitted to the metal box.
- l) The connection to the neutral bus bar is by means of socket. Necessary holes may be drilled on the bus bar for mounting the bus bar.
- m) MCCBs shall be suitable to work on 415 V, 630 Amps/400 Amps, three pole 50Hz, heavy duty, front operated type, with replaceable silver plate contacts conforming to IS 4064/1978, superior type arc chambers with necessary insulating barriers and enclosed in a compact insulating cover. The switch shall be designed break the current of 630A/400A and able to withstand breaking stresses with quick and reliable spring loaded operating handle with microprocessor based protection O/C,E/F and S/C.
- n) The location of operating handle shall be so as to facilitate convenient operation. The position of ON & OFF must be clearly indicated.

6. MARKING:

The LT Distribution Box shall be provided with transparent label or card of removable type and the following information are to be recorded.

- a) Title
- b) Cable Size of both incomers
- c) Current Rating of both I/C
- d) Current Rating of both O/G
- e) Current Rating of MCBs and MCCBs
- f) No. of Outgoing service mains with their code numbers

The label or card shall be fitted on the side of the door and circuit numbering means shall be indicated by symbol or diagram relating to the service mains.

The Circuit plate with following engraved information has to be riveted to the inside of the door of the Distribution Box in an accessible position for easy reading

Incoming Line from :

Incoming Line to :

Outgoing Line ___Amps to : (--- nos.) S-Ph, (--- nos.) 3-Ph.

7. TESTS:

A type test shall be performed on Distribution Box. The bidder shall be required to submit

complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

- i) Overall Dimensions Checking
- ii) Insulation Resistance Tests
- iii) High Voltage Test at 2500 V, 50 Hz AC for one minute.
- iv) Operation Test on MCCB
- v) Thermal overloading Test for MCCB
- vi) Contact Resistance Test
- vii) Temperature rise test

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) Operation Test on MCCB
- v) Thermal overloading Test for MCCB
- vi) Contact Resistance Test

7.3 TYPE TESTS

On Complete Box

- i) Temperature rise test
- ii) High voltage test
- iii) Short Time Withstand Current Test
- iv) Degree of protection on complete box
- v) Time /current characteristic test on MCCBs
- vi) Type tests on MCCB as per IS-13947 amended upto date shall be carried out

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA/Other Govt. Labs** as per the relevant IS/IEC. 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:

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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).

PROTOTYPE AND STAGE INSPECTION:- Successful Bidders also need to prepare a prototype design & get the same inspected & cleared by E&Q department of the TPCODL/TPNODL/TPWODL/TPSODL before starting mass production of these LTDBs.

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 54 months from the date of commissioning or 60 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. 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 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.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

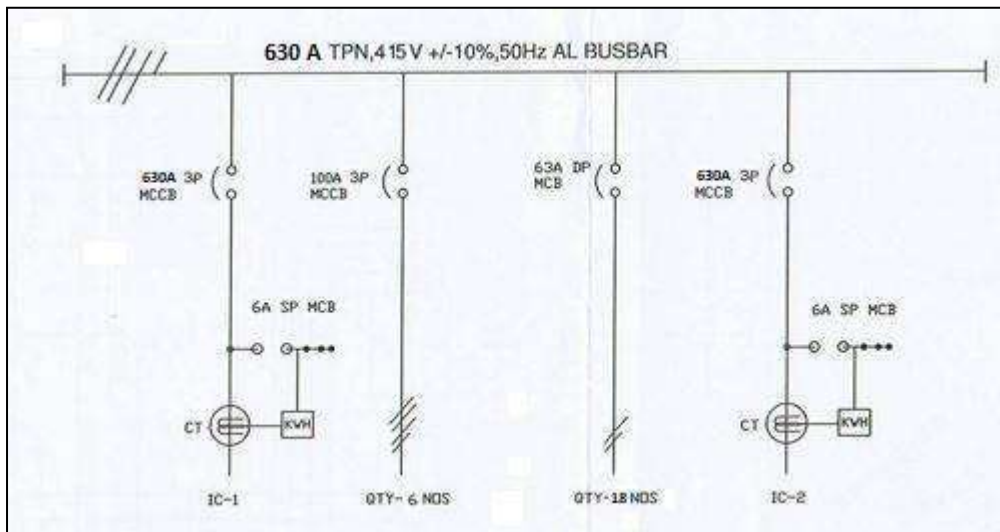
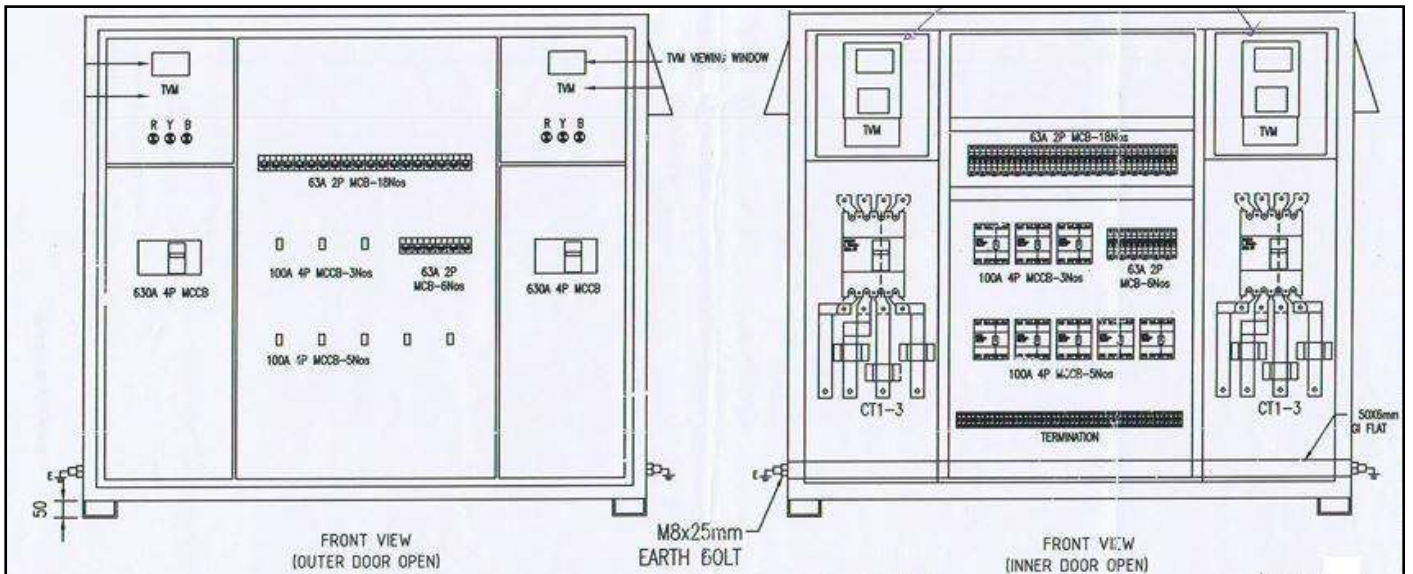
18. DRAWINGS AND DOCUMENTS

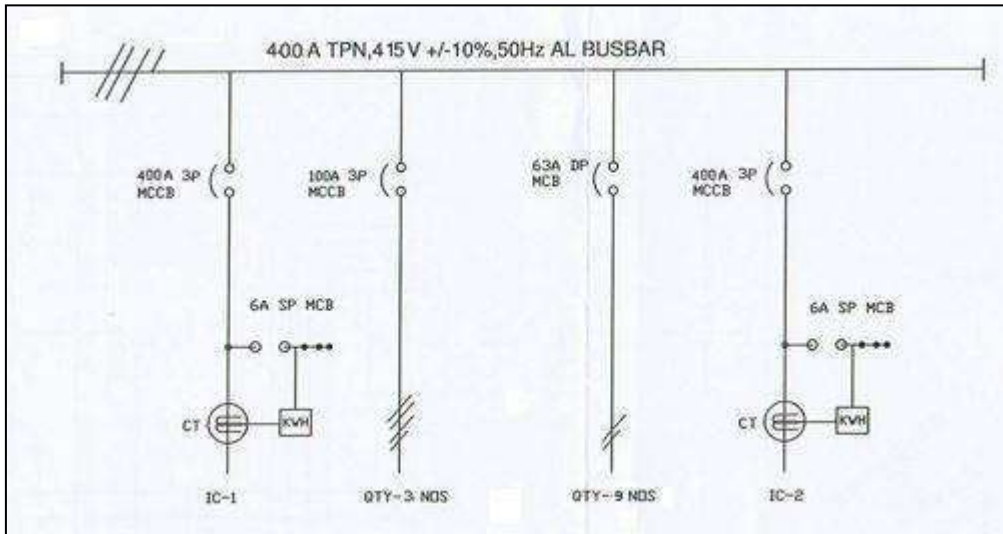
Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

- 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:- Indicative drawings for tender purpose only.
Ratings shall vary during detailed engineering stage**

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

SL. No.	Technical Particulars	Desired Values	
		For I/C 630 Amp	For I/C 400 Amp
1	Rated Voltage		
2	Rated Frequency		
3	Continuous Current Rating		
4	Type		
5	Mounting		
6	Suitable for		
7	Maximum system Voltage		
8	Rated short Circuit Level		
9	Enclosure Details		
a)	Overall dimension		
b)	Sheet Thickness		
c)	Degree of Protection		
10	MCCB (Incoming)		
a)	Make		
b)	Current Rating (A)		
c)	Breaking Capacity		
d)	Pole (Nos)		
e)	Impulse withstand voltage(kV)		
f)	Rated Insulation Voltage		
g)	Utilization Category		
h)	Ambient Temperature		
i)	Storage Temperature		
j)	Release		
11	MCCB (Outgoing)		
a)	Current Rating (A)		

b)	Breaking Capacity	
c)	Pole (Nos)	
d)	Impulse withstand voltage(kV)	
e)	Rated Insulation Voltage	
f)	Utilization Category	
g)	Release	
12	MCB	
a)	Make	
b)	Rating (A)	
c)	Pole (Nos)	
d)	Tripping Characteristics	
e)	Breaking Capacity	
f)	Voltage Rating	
g)	Mechanical life time (cycle)	
h)	Electrical life time (cycle)	
13	Current Transformer on Both Incomers	
a)	Applicable Standards	
b)	CT ratio (Amps)	
c)	Accuracy Class	
d)	Burden (VA)	
e)	System Voltage	
f)	Insulation Level	
g)	Frequency	
h)	Rated Continuous Thermal Current	
i)	Insulation Class	
j)	CT Type	
k)	Internal Diameter	
l)	Outer Diameter	
14	Busbar	
a)	Material	
b)	Grade	
c)	Size	
d)	Earthing Bolt	
e)	Current Density	
15	Wire	
a)	Material	
b)	Size	

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-3018

Specification Name : Technical Specification For LT Stay (Guy) Insulator

SAYANTANI DAS	MILAN MAITY	SANTOSH KUMAR PATRA	Susavan Biswas	KHAJAN BHARDWAJ	POURUSH GARG
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPCODL	TPNODL	TPWODL	TPSODL	TPCODL	TPCODL
24-01-2023	25-01-2023	25-01-2023	27-01-2023	30-01-2023	31-01-2023

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TPCODL

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TPNODL

TPSODL

Specification No: [ENG-LV-3018](#)

Specification Name: Technical Specification of
LT Stay (Guy) Insulator

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18. DRAWINGS AND DOCUMENTS
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20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of porcelain LT Guy Strain Insulators for use in Distribution system. 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:

Ref IS	Description
IS 5300	Porcelain Guy Strain Insulators

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 Speed	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/ TPWODL/ 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	DESIRED VALUE
1	Manufacturer's Name	To be specified by Bidder
2	Type of insulator	Designation A
3	Standard Specification to which the material shall confirm	As per IS: 5300
4	ELECTRICAL CHARACTERISTICS	
(a)	Dry one minute power frequency Flashover voltage	24 kV
(b)	Wet one minute power frequency Flashover voltage	10 kV
(c)	Dry one minute power frequency Withstand voltage	18 kV
(d)	Wet one minute power frequency Withstand voltage	8 kV
5	Minimum Failing Load	44 KN
6	DIMENSIONS	
(a)	Length	90 mm
(b)	Width	65 mm
(c)	Cable Hole Dia	16 mm (+/- 1.5 mm)
7	Creepage Distance	41 mm
8	Type of Glaze	Brown / Dark Brown
9	Weight per piece	0.45 Kg approx.

5. GENERAL CONSTRUCTION:

- a) The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed.
- b) The design of the insulators shall be such that the stresses due to expansion and contraction in any part of the insulator shall not lead to its deterioration.
- c) The glaze shall be brown in color for insulators. The glaze shall cover the entire porcelain surface parts except those areas that serve as supports during firing.
- d) The standard guy strain insulators shall be of designation, 'A' as per IS: 5300/1969 or its latest revision. The recommended type of guy strain insulators for use on guy wires of LT overhead line is Type-A.

6. MARKING:

Following distinct non-erasable embossing is to be made on each Insulator to be supplied to TPCODL/ TPNODL/ TPWODL/ TPSODL under this Tender.

- a) "TPCODL/ TPNODL/ TPWODL/ TPSODL"
- b) Failing Load in KN
- c) Manufacturer Name/ Trade Mark
- d) Year of manufacturing, Country 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) Verification of Dimensions.
- ii) Temperature cycle test
- iii) Mechanical strength test
- iv) Porosity test

7.2 ROUTINE TESTS

- i) Visual examination

7.3 TYPE TESTS

- i) Visual examination
- ii) Verification of dimensions
- iii) Temperature cycle test
- iv) Dry one-minute power frequency withstand test
- v) Wet one-minute power frequency withstand test
- vi) Mechanical strength test
- vii) Porosity 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 tests shall be conducted at **CPRI / ERDA / Other Government Labs** as per relevant IS. 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) TPCODL/ TPNODL/ TPWODL/ 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/ 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 54 months from the date of commissioning or 60 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 materials are to be packed in crates or boxes for rough handling. Packing shall be marked with the strength and voltage ratings. 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.

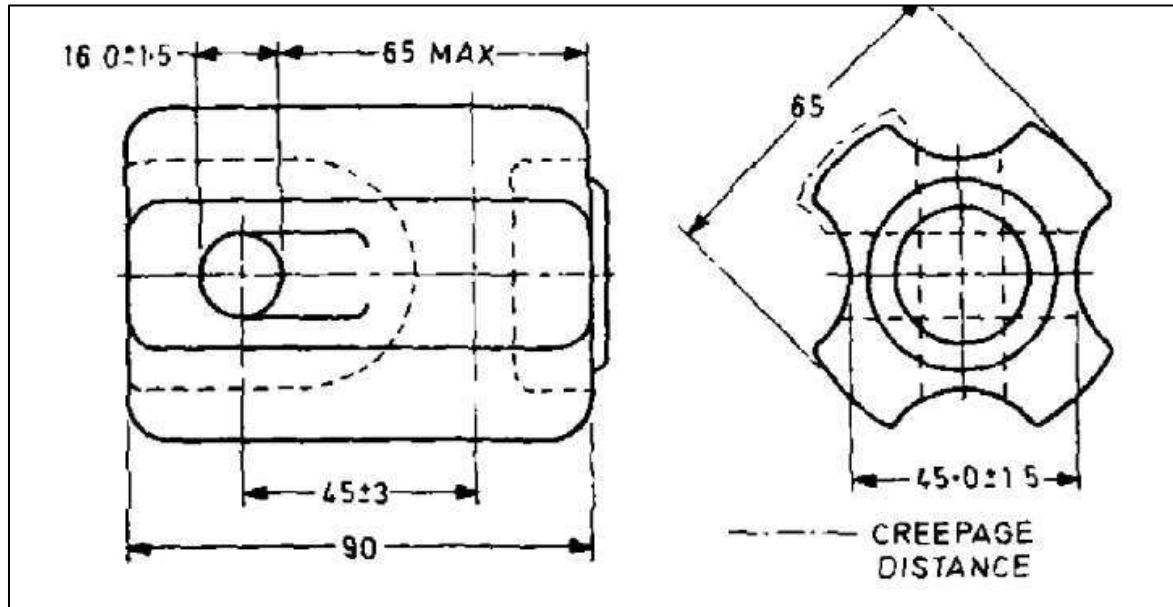
17. SPARES, ACCESSORIES AND TOOLS:

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.
- b) Work Experience details
- c) Type test certificates.
- d) Drawing (3 sets) of Guy Insulator containing complete information about manufacturing & fabrication etc.



Note: -All Dimensions are in mm unless noted otherwise specified. This is an indicative drawing of Guy Insulator used for tender purpose only.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	To be furnished by Bidder
1	Manufacturer's Name	
2	Type of insulator	
3	Standard Specification to which the material shall confirm	
4	ELECTRICAL CHARACTERISTICS	
(a)	Dry one minute power frequency Flashover voltage	
(b)	Wet one minute power frequency Flashover voltage	
(c)	Dry one minute power frequency Withstand voltage	
(d)	Wet one minute power frequency Withstand voltage	
5	Minimum Failing Load	
6	Power Frequency Punctured withstand voltage	
7	DIMENSIONS	
(a)	Length	
(b)	Width	
(c)	Cable Hole Dia	
8	Creepage Distance	
9	Type of Glaze	
10	Weight per piece	



Specification No: [ENG-LV-3018](#)

Specification Name: Technical Specification of
LT Stay (Guy) Insulator

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-3021

Specification Name : SPECIFICATION FOR 415V ACDB

Jyoti Ranjan Sahu	SATYA PRASAD NAYAK	JYOTIPRAKASH MOHANTY	SHANTAPRIYA JENA	Shailendra Kumar Jaiswal	SHIRISH SHARAD DIKAY
Prepared by	Reviewed by	Reviewed by	Reviewed by	Approved by	Released by
TPSODL	TPCODL	TPWODL	TPNODL	TPSODL	TPSODL
04-02-2023	04-02-2023	04-02-2023	06-02-2023	06-02-2023	07-02-2023

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1.0 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 415Volts ACDB with all accessories and necessary training for trouble free & efficient performance. It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform to practices consistent with sound environmental management and local statues. It is also expected that equipment shall comply 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 the TPCODL/TPNODL/TPSODL/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.

2.0 APPLICABLE STANDARDS

The equipment covers by this specification shall unless otherwise stated, be designed, manufactured & tested in accordance with latest edition of the following standards /IEC and shall conform to the regulation of local statutory authorities.

a)	IS 13947 / IEC 60947	:	Specification for Low voltage Switchgear and Control gear
b)	IS 2705	:	Current transformer
c)	IS 694-1990	:	PVC insulated cables for working voltage upto and including 1100V
d)	IS 2629-1985	:	Recommended practice for Hot Dip Galvanizing of Iron & Steel.
e)	IS 2633-1986	:	Tests for uniformity of zinc coating
f)	IS 5578-1984	:	Guide for marking of insulated conductors
g)	IS 11353-1985	:	Guide for uniform system of marking and identification of conductors and apparatus terminals.
h)	IEC 60060	:	High-voltage test techniques
i)	IEC 61010-1	:	Safety requirement for electrical equipment for measurement and laboratory use.
j)	IEC 62052-11	:	Electricity metering equipment (a.c.) – General requirements, tests and test conditions
k)	IEC 62053-22	:	Static meters for active energy (Class 0.2 S and 0.5 S)
l)	IS 14697	:	AC Static Transformer Operated Watt-hour and Var-hour Meters, Class 0.2S and 0.5 S - Specification
m)	IS 12063 / IEC 60529	:	Classification of degrees of protection provided by enclosures of electrical equipment
n)	IS 8623	:	Specification for Low-Voltage Switchgear and Control gear Assemblies
o)	IEC 60664	:	Insulation co-ordination within low voltage systems including clearances & creepage distances for equipment.
p)	IS 14772-2000	:	General requirements for enclosures for accessories for household and similar fixed electrical installation.

3.0 CLIMATIC CONDITIONS OF THE INSTALLATION:

The material shall be suitable for following 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	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 up to 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

Sl no	Description	Requirement
4.1	Switchgear Panel	
4.1.1	Architecture	Metal-clad air insulated
4.1.2	Normal Service condition	Indoor
4.1.3	No of phases	Three
4.1.4	Rated Voltage	415
4.1.5	Rated Frequency	50 hz
4.1.6	Rated Impulse withstand Voltage	8 kVP
4.1.7	Rated insulation voltage	690 V
4.1.8	Main Bus Bar Continuous rated current	400A
4.1.9	Busbar Material & Current Density	Aluminium, 1.0A/Sqmm
4.1.10	Degree of protection for enclosure for meters	IP 54
4.1.11	Temperature Rise	The maximum permissible temperature rise for bus bar and terminals shall be 45 deg C & 65 deg C at an ambient temperature not exceeding 40 deg C

Sl no	Description	Requirement					
4.2	Item/ Panel Reference	Incomer	Bus-Coupler	Outgoing			
4.2.1	Circuit Breaker Type/ Rating (A)	MCCB 250A	MCCB 250A	TPN MCB			
				100A	63A	32A	16A
4.2.2	Quantity (Nos.)	2	1	1	2	4	16

4.2.3	Nos of Poles	3	3	3	3	3	2
4.2.4	Type of release	Micro processor based	Thermal Magnetic release (TMD)				Only Magnetic
4.2.5	O/L Releases Setting	80%-100%					
4.2.6	Rated Voltage	400 V					230V
4.2.7	Rated Ultimate Short circuit breaking Capacity (Icu)	50KA	10KA			10KA	
4.2.8	Rated Service short circuit breaking capacity (Icu)	100% of Icu	NA			NA	
4.2.9	Utilization Category	C					
4.2.10	Rated Insulation Voltage	690V					500V
4.2.11	Rated Impulse withstand voltage	8kVp					6kVP
4.2.12	1.1KV Al, XLPE cables (sqmm)	4CX300/150	-	4CX50	4CX25	4CX25	2CX10
4.2.13	Cast Resin type CT(3Nos)-ratio, Burden	250/5A 15VA, CI-0.5S	-	-	-	-	-
4.2.14	Auxiliary Voltages						
a)	For spring charging motor	230V AC	230V AC	Not Applicable			
b)	For closing & trip coil						
c)	For anti-condensation heaters	230V AC					
4.2.15	Remote Control	Required	Required	Not required			
4.2.16	Metering	Multi-function meter	Not required				
4.2.17	Panel illumination and space heating	To be provided by the bidder in each cable alley					
4.2.18	Feeder Description Name plate	To be provided by the bidder for each feeder.					
4.2.19	Make	MCCB- Siemens, L&T, ABB, C&S, Schneider MCB- Siemens, ABB, Legrand, Schneider, Havells					

5.0 GENERAL CONSTRUCTION

5.1 SWITCHGEAR

The switchgear panel shall be of sheet steel construction and shall be dust and vermin proof and shall be suitable for indoor installation. The panels shall be of Metal Clad compartmentalized, free standing, continuous from rear, modular type. The switchgear panels shall be rigid without using any external bracing. The switchboard panels should comply with relevant IS/IEC and revision thereof and shall be designed for easy operation maintenance and further extension. Bus bar, metering, circuit breaker chamber, cables and cable box chamber should have proper access for maintenance, proper interlocks should be provided. Metal enclosed switchgear shall be so designed that normal service, inspection and maintenance operations including visual checking of phase sequence, earthing of connected cables, locating of cable faults, voltage tests on connected cables can be carried out safely.

Panels shall have structural steel frame-work enclosed on all sides by CRCA sheet steel of minimum thickness as specified below:

Frame: 2 mm

Doors & Covers: 2 mm

Removable gland plate: 3 mm

Panels shall consist of a front portion with equipment mounted on it and wiring access from rear. All doors, cut-outs and removable covers shall be gasketed all round by neoprene cork gaskets. Each panel section shall be provided with thermostat-controlled space heater with ON/OFF switch. CFL Lamp shall be provided with door switch for each panel for cubicle interior illumination.

Panels shall be mounted and bolted to a common base channel of height 75mm. The channel in turn shall be fixed to the foundation bolts at site. All foundation equipment, anchor bolts etc. including the supporting channel shall be furnished by successful bidder in advance for completion of Civil Works prior to dispatch of panels. The bottom plates of the panels shall be fitted with removable gland plates of not less than 3mm in thickness, for fixing the cable glands, the size of which shall suit the purchaser's external cables to the panels.

Height of the panel should be limited to 2100mm. Each Indicating instruments and meters shall be at a suitable height so that the lettering on the dials can be easily read. Control switches/push buttons shall be conveniently located for ease of operation. The centre lines of the switches, push buttons and indicating lamps shall not be at a height more than 1800mm also shall not be less than 300mm that of the lowest unit. MCB with neutral link shall be provided at the panel for incoming AC supplies. Push buttons shall be made of non-hygroscopic material. All other insulators shall also be made of non-hygroscopic material.

All components of the same rating and construction which may be needed to be replaced shall be interchangeable. If there are removable parts with different ratings and if parts are interchangeable within the assembly of metal enclosed switchgear and control gear, any possible combination of removable and fixed parts shall withstand the rated insulation level specified for fixed parts concerned. While making the general arrangement, consideration will be given to the place of sectionalizing to select the location where the minimum electrical connections are transferred from one section to other section.

All the components of a module will be mounted on a component plate using machine screws and taped holes (except the components mounted on the door) to ensure vibration free operation. Circuit breakers shall be mounted such that they are accessible from the front of the panel. These components plates should be fixed with bolts for easy replacements. Standardization will be adopted while making these plates so that the component plates of the same size modules. can be changed from one module to other.

Auto Changeover facility shall be implemented and provided in ACDB between two incomers (Between Local Transformer Supply source and Duplicate supply source), bus coupler. Local transformer supply shall be considered as default supply. If local transformer supply gets failed then Duplicate supply source MCCB shall switched ON automatically i.e. auto changeover. But when Local transformer supply gets restored, then auto changeover to local transformer source shall operates i.e. default source shall be of local transformer. Necessary delay timer to be provided for such kind of auto changeover to enhance safety factor. SCADA operations shall not intervene in the Auto operations and shall be separately provided. ACDB shall have provision for SCADA compatibility.

Interlocks between different components shall be provided for safety and ease of operation. The withdrawal or engagement of only incomer and bus coupler circuit breaker shall be impossible unless it is in open position. All instruments shall be non-draw-out type and safeguard in every respect from damages. The operation of a circuit breaker shall be impossible when it is in closed position. It shall be impossible to close the incoming and bus coupler circuit breaker in service position unless it is connected to auxiliary circuit.

The rear of the ACDB shall have bolted covers in sections except cable chamber. Single line diagram for power distribution and wiring diagram for power and control shall be provided inside the panel. All retaining catches, screws and bolts for doors and covers shall be hot dip galvanized screws and bolts shall be captive. All hardware for the complete equipment including foundation bolts, lifting lugs & cable termination lugs etc. shall be supplied along with the panels.

All LT design shall ensure conformity to IEC-60947. The supplier shall submit Type Test report from CPRI/ERDA to prove the above. Auxiliary and control equipment installed on the panel shall be suitably protected against disruptive discharge from main circuit. Buses shall be insulated with insulating sleeves, wherever bare conductor is employed. The switchgear panel shall withstand 50KA for 1 sec.

Degree of Protection for the enclosure shall be IP54 and that of partitions shall be IP4X. Compartment shall have its own front located, outward opening lockable hinged door with concealed hinges and bolted back cover. The door shall have interlocking facility with the MCCB or its handle such that the door can be opened only if the MCCB is in 'OFF' position. De- interlocking arrangement shall also be provided. Partitions of metal-clad switchgear and control gear shall be metallic and earthed.

Control supply in individual bay shall to be distributed through MCBS of suitable rating for individual control function like:

Trip Circuit (Only for U/CS & B/C)

Close Circuit (Only for I/Cs & B/C)

Spring charging circuit (Only for I/Cs & B/C)

Heating and Lighting Circuit

MCB shall be rated for 10kA short circuit rating. It shall be quick make, quick break, and independent manual type with trip free feature. MCB shall have the following:

Over current protection

ON/OFF Trip position Indicators Auxiliary contact block (Wherever required)

Wherever CB contacts are to be multiplied, latch type relay shall be used for contact multiplication. Auxiliary contact multiplier relays shall be reputed make and selected on the basis of continuous current carrying capacity and rated voltage. The fluctuation in voltage level shall be accounted for (+/-) 10% continuously.

Each switchgear panel shall have 20% spare terminals. All equipment mounted on front side of panel, shall have Individual nameplates with equipment designation engraved. The termination links for cables shall be segregated in vertical plane. The bidder shall deliver to site completely assembled, wired, tested panels and only the interconnecting cables shall be connected at site.

Cable entry arrangement shall be from bottom and suitable for 1.1KV XLPE armored external cables of sizes as mentioned in the specification. Removable CRCA gland plate of 3mm with cable holes to suit the cable sizes and with 2mm neoprene type gasket of non-inflammable and insulating vermin proof material shall be provided. A minimum distance of 250mm will be provided between the gland plate and the nearest terminal for proper dressing and termination of the cable.

5.2 Circuit Breaker

a) The circuit breaker shall be MCCB. The I/Cs and B/C MCCBS shall be strictly withdraw able type, rest MCCBs/MCBS shall be fixed type and Electrical & Mechanical interlocks shall be provided for only incomers & bus couplers. Detail scheme shall be finalized during engineering. Comprehensive interlocking system to prevent any dangerous or inadvertent operation shall be provided. The spare contact of breakers, Local/ Remote switches to be wired up to the terminals.

b) The CB shall be spring operated, motor charged, and manually released spring closing mechanism with three pole simultaneous operations. The speed of closing operation shall be independent of the hand-operating lever. The indicating device shall show the OPEN and CLOSE position of breaker visible from front of the cubicle. The spring charging time of the motor shall not exceed 15 seconds.

5.3 BUSBAR

a) Bus bars and all other electrical connections between various components shall be made of Aluminium of rectangular cross-section with current density of 1 A/mm², shall be suitable for 3 phase, 4 wire, 400 volts 50 Hz AC supply and have a fault withstanding capacity of 50 KA for 1 second. The bus bars shall be insulated with heat shrinkable and colour coded insulating sleeves, except at the points of connections. The Main bus bar shall be of ample capacity to carry the rated current of 400A continuously without excessive heating and for adequately meeting the thermal and dynamic stresses in the case of short circuit in the system. Neutral Bus bar shall have a rating of not less than that of the associated phase bus bars. All bus bars shall be rigidly and firmly mounted and shall be capable of withstanding short circuit stresses and vibrations. The bus bars shall be extensible on both sides depending upon layout.

b) Minimum electrical clearances shall be maintained between phases, neutral and body as per relevant IS however the minimum clearance between phase to phase and phase to ground shall be 25.4mm & 19.4mm respectively.

c) The Bus bars shall run in a separate bus bar chamber using suitable Bus bar support of non-hygroscopic, non-combustible, material such as DMC/ SMC at sufficiently close intervals to prevent bus bar sag. All bus bar joints, shall be provided with high tensile steel bolts (electro plated with suitable metal such as Nickel Cadmium), spring washer and nuts so as to ensure good contact. Alternatively, electroplated/ tinned brass bolts shall be used. The joints shall be formed with fish-plates on either side of bus bar to provide adequate contact area. Bus supports shall be provided on either side of joints. Max. Unsupported distance from the joints and between two supports shall not exceed 450mm.

5.4 CURRENT TRANSFORMER

The Current transformer shall be Epoxy Cast resin type and rated for 50KA (1 Sec) with details as given in GTP. The CT control wiring shall be of 4 mm² multi stranded copper wire with 1.1KV insulation grade. All CTS shall be designed to carry continuously a current of 120% of the rated current.

5.5 METERING, INSTRUMENTATION AND CONTROL DEVICES

5.5.1 MEASURING INSTRUMENTS

3-phase, 4-wire LT CT operated static multifunction meter with associated CT's (400/5 A, Class 0.5S, 15 VA) shall be provided for only incomers to record Current reading (Range -400A), voltage reading (Range 0-500V) and energy consumption. The multifunction meter shall necessarily have RS 485 Modbus serial port for communication with Purchaser SCADA. All meters shall be of flush mounting type with 96x96 sq. mm. The meter shall be enclosed in a dust tight housing providing IP5X or an equivalent provision to completely protect it against dust ingress, and shall protect in a way that performance doesn't get effected due to small dust also The design and manufacture of the meters shall ensure the preventing of fogging of instrument glass. Instrument meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible. Inbuilt selector switches shall be provided to be used on three phase supply The make of Energy meter & CT shall be duly approved by the Purchaser.

5.5.2 INDICATING LAMPS

The indicating lamps used in the panel will be pleasant looking, LED type indicating lamps in round shape and suitable for continuous operation at 85% to 110% of their rated voltage. They shall be provided with suitable series resistor and the bulb shall be replaceable from the front of the panel.

The selection of the colours of the indicating lamps will be as follows:

Red - MCCB ON

Green MCCB OFF

Amber MCCB TRIP

Red, Yellow and Blue for incoming 3-ph supply indication.

The various feeders shall be assigned the indicating lamps as mentioned:

I/Cs – ON ,OFF,TRIP and 3-ph supply indications

B/C – ON, and OFF indications only

O/Gs- ON indication only

All color caps shall be similar and interchangeable and all LEDs shall be of same type and ratings. The LED lamps shall be furnished 20% in excess of actual numbers required and color caps shall be furnished 10% in excess of actual numbers used for each.

5.5.3 SELECTOR SWITCHES

Selector switches shall be of non-hygroscopic rotary type with enclosed contacts adequately rated for the purpose intended (min. acceptable rating is 10A continuous at 240V AC).

It shall be provided with escutcheon plates clearly marked to show the following three positions first one for 'LOCAL' second 'REMOTE' and the third being the 'OFF' position. Selector switches shall be provided with pistol grip type handles and shall be of the maintained contact stay put type.

5.6 PANEL WIRING

a) Panels shall be supplied completely wired internally to equipment and! terminal blocks and ready for the Purchaser's external cable connections at: the terminal blocks. The control wiring will be done with PVC single core flexible copper wires and properly dressing all the wires either in a PVC duct of liberal size or bunched together by PVC strapping taps and thereafter fastened to steel members of the panel. When panels are arranged to be mounted adjacent to each other all inter-panel wiring and connections between panels shall be provided by the Bidder.

b) All wiring shall be carried out with 1100 V grade, single core stranded copper conductor wires with PVC insulation. Extra flexible wires shall be used for wiring of devices mounted on moving parts such as swinging panels and doors. The minimum size of the stranded copper conductor used for panel wiring shall be as follows:

CT circuits: 4mm² per lead

All circuits except CT circuits: 2.5mm² per lead

c) Interconnections to adjacent panels shall be brought out to a separate set of terminal blocks located near the slots or holes meant for taking the interconnecting wires. Arrangements shall permit easy inter-connections to adjacent panels at site and wires for this purpose shall be provided by the bidder looped and bunched properly inside the panels. The unused instrument space on the front or rear of the panels shall be kept clear of wiring, to facilitate addition of devices without rewiring associated portion of the panels.

d) Wire terminations shall be made with solder less crimping type of (ring type lugs for all CT and pin type lugs for other circuits) tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Printed type PVC ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of all the control, instrumentation, and protection wiring. Ferrules shall fit tightly on the wires and shall not fall off when the wire is disconnected.

e) Internal wiring to be connected to external equipment shall terminate on terminal blocks. The terminal blocks for CTS shall be provided with test links and isolating facilities. The CT terminal blocks shall be provided with short circuiting and earthing facilities Switchgear shall have 20% terminals as spare terminals in each panel & should be uniformly distributed in all the blocks.

f) The Power interconnections shall be carried out by means of bolted connections with washers. The wiring shall be terminated by using crimping sockets. Under no circumstances the wiring should be under any kind of stress for which sufficient length of control wiring should be provided.

5.7 TERMINAL BLOCKS

a) The terminal blocks shall be 1100 V grade, 10 Amps rated, one piece. moulded, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts and identification strips. Markings on the terminal strips shall correspond to wire numbers on the wiring diagrams. The terminal blocks shall be fully enclosed with easily removable covers and made of moulded non-inflammable plastic material.

b) All spare contacts of the panel mounted equipment and devices shall be wired up to terminal blocks. All the TB's shall be of single Decker type. ASB shall be provided with potential free contacts for Mains ON, I/C 1 ON, I/C 1 OFF, I/C 2 ON, I/C 2 OFF, B/C ON & B/C OFF etc. for Purchaser's SCADA. Supplier will provide wiring of these contacts up to terminal block in ASB.

5.8 Space Heaters

a) Strip type space heaters of adequate capacity shall be provided inside each panel to prevent moisture condensation on the wiring and panel mounted equipment. Space heaters shall be rated for 240V, 1Phase 50hz supply. Heaters inside the panels shall not be mounted close to the wiring or any panel mounted equipment. Heaters shall be complete with miniature circuit breaker on the phase and link on the neutral of the heater supply.

b) An adjustable type thermostat shall be provided in the heater control circuit with temperature range of 0-90 deg C.

5.9 Interior Lighting

Each Panel shall be provided with a 8W, 230, 1ph, 50hz CFL for the illumination of the panel during maintenance. The fitting shall be complete with switch-fuse unit and the switching of the fitting shall be controlled by the respective panel door switch.

5.10 Power & Control Supplies

The ASB shall be provided with necessary arrangement for receiving, distributing, isolating and fusing of AC supply for various control, Signaling, lighting and space heater circuits.

5.12 CABLE TERMINATION ACCESSORIES

The Purchaser's external cable connections will be terminated on the terminal blocks provided in the control panel. All necessary cable terminating accessories such as gland plates, cable glands, crimp type tinned copper lugs, supporting clamps and brackets, wiring troughs and gutters etc for cables shall be included in the bidder's scope of supply.

5.13 Labels

- a) All equipment mounted on the front and rear side as well as equipment mounted inside the panels shall be provided with individual labels equipment designation. Also on the top of each bay on front as well as rear side , large and bold nameplates shall be provided for bay designation.
- b) All front mounted equipment feeders shall be provided, at the rear also with individual labels engraved with tag numbers corresponding to the ones shown in the panel internal wiring to facilitate easy tracing of the wiring.
- c) Labels both external & internal shall be made on non-rusting metal preferably Aluminium anodized one. Labels shall have white letters on black background. The lettering size shall be 6 mm for panel designation shall be subject to the purchaser's approval.
- d) Each switch shall bear clear inscription identifying it's function e.g. 'BREAKER' 52A' etc. Similar inscription shall be also be provided on each device whose function is not otherwise defined. If any switch device doesn't 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. 'Local-Remote-OFF', 'ON-OFF', 'R-Y-B-OFF' etc. Each IED and meter shall be prominently marked.
- e) Description of the feeder name plates shall be as follows:
 16A DP: for Lighting & 1-Ph supply loads.
 32A TP: for battery charger, Sump Pump, Station lightings, C & R panels etc.
 63A TP: for transformer cooler supply, Yard lighting etc.
 100A TP: for Oil filter machine etc.

5.14 EARTHING

- a) All panels shall be equipped with a separate earth bus securely fixed along with the inside base of panels. When several panels are mounted adjoining each other, the earthy bus shall be made continuous. Provision shall be made on the earth bus bars of the end panels for connecting the same to the earthing grid.
- b) An earthing conductor of 50X6 mm² Al. (minimum) shall be provide extending the whole length of switchgear and control gear to sustain the rated short time withstand current. Every equipment mounted in the panel shall be directly earthed to this earth bus by distinct connections.
- c) The earth bus shall be located at sufficient height from the gland plate and shall not be removable from the outside of cubicle. Door earthing shall also be provided with bolted lugs. The earth bus shall be identified by means of the sign I marked on the outer surface of ASB in a legible and indelible manner on the both side.

5.15 GALVANISING

- a) All galvanizing shall be carried out by the hot dip process, in accordance with Specification ISO: 1460 or IS: 2629 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 additives to the galvanic bath, which could have a detrimental effect on the durability of the zinc coating.
- b) After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment except that nuts may be threaded after galvanization.
- c) 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 test as per IS-2633 and BS:729 amended to date.

5.16 REMOTE MOITORING AND CONTROL PHILOSOPHY

- a) The multi function meter shall necessarily have RS485, MODBUS protocol for communication with purchaser's SCADA such that remote monitoring of it's parameter is possible.
- b) Contacts of O/G breaker for ON/OFF/TRIP indication status shall be wired up to the terminals.

6.0 NAME PLATE AND MARKING

The identifying markings which shall be indelibly marked on fuse-base are given below:
On Fuse Base:

1. Manufacturer's name
2. Rated voltage
3. Rated current
4. Serial No
5. Property of "TPSODL/TPCODL/TPNODL/TPWODL"
6. Month & year of Manufacturing
7. Guarantee period
8. Po No & date.

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 TPSODL/TPCODL/TPNODL/TPWODL authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the equipment and its components as specified in IEC 62271 standards.

7.1 TYPE TESTS

Test to prove the capability of the main & earthing circuits to be subjected to be the rated peak and the rated short-time withstand currents.

- a) Dielectric tests
- b) Temperature rise test
- c) Degree of protection test
- d) Short circuit making & breaking capacities

7.2 ROUTINE TESTS

- a) Dimensional and visual check for damages.
- b) All main/auxiliary bus bars joints, wire terminations, nuts & bolts shall be checked and tightened
- c) Mechanical operational tests
- d) Test of auxiliary electrical devices
- e) Dielectric tests
- f) Measurement of resistance of main circuit
- g) Verification of clearance & creepage distances
- h) Verification of correct wiring continuity of protective circuit
- i) Suitable injection tests for all measuring instruments to establish accuracy of calibration.
- j) Tests after erection on site.

8.0 TYPE TEST CERTIFICATE

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 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 TPSODL/TPCODL/TPNODL/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.

Following documents shall be sent along with material:

- a) Test reports
- b) PO copy
- c) MDCC issued by TPCODL/TPNODL /TPSODL/TPWODL
- d) TPCODL/TPNODL /TPSODL/TPWODL Invoice in duplicate
- e) Packing list
- f) Inspection report
- 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 Engineering and Contracts 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 12 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 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

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.

13.0 TENDER SAMPLE

NA

14.0 TRAINING

Not Applicable

15.0 QUALITY CONTROL

The bidder shall submit 'Quality Assurance Plan' followed in respect of bought out Items manufactured by him

- a) Raw materials in process
- b) Final inspection
- c) Packaging
- d) Marking.

As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPCODL/TPNODL /TPSODL/TPWODL reserves the sole rights for the type test of 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. TPCODL/TPNODL /TPSODL/TPWODL's nominated representative shall have free access to the bidder's works to carry out inspections.

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, 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.

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. In case of supply by the channel partner, the manufacturer shall have the in-house testing facilities to carry out the routine and acceptance tests.

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.

The successful bidder will have to submit (after placement of RC/ PO) technical compliance document and drawing of Kit Kat Fuse as per RC line items for getting approval before mass manufacturing. Manufacturing mass quantity to start only after getting CAT-B/CAT-A approved drawings or as per intimation from TPCODL/TPNODL /TPSODL/TPWODL.

18.0 SPARES, ACCESSORIES AND TOOLS

Not applicable

19.0 DRAWINGS AND DOCUMENTS

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:

- a) General description of the equipment and all components including brochures.
- b) Type test Certificates
- c) Experience List.
- d) Completely filled-in clause wise compliance of the specification.
- e) Cross sectional drawing of the Kit kat Fuse.

FOLLOWING DOCUMENTS SHALL BE SUBMITTED AFTER THE PLACEMENT OF RC/PO

- a. Completely filled in clause wise compliance of the Specification.
- b. Type Test Certificates for each specified test if not submit during Technical Evaluation.
- c. Drawing of Fuse.
- d. Compliances of undertaking submitted during Technical Evaluation.

S.No	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	Manual/Catalogues/drawings for all components.		√	
3	Technical details of fuse wire.		√	√
4	Cross sectional area of the Kit kat fuse		√	√
5	Installation Instructions		√	√
6	Instructions for use		√	√
7	Transport/shipping dimensions		√	√
8	QA & QC Plan	√	√	√
9	Routine, Acceptance and Type test Certificates	√	√	√

All the Documents and Drawings shall be in English Language.

20.0 GUARANTEED TECHNICAL PARTICULARS

Bidder to submit clause wise compliance of the Technical Specification.

SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS: To be Furnished by Bidder

S.N o.	PARTICULARS	UNITS	AS FURNISHED BY BIDDER
1	SWITCHBOARD		
a)	Design Architecture		
b)	Dimensions - WXDXH	mm	
c)	Rated Voltage	V	
d)	Rated Frequency	Hz	
e)	Rated impuse withstand voltage	kVP	
f)	Rated Insulation Voltage	V	
g)	System Earthing		
h)	Material of sheet		
i)	Thickness of enclosure sheet	mm	
j)	Thickness of doors/covers sheet	mm	
k)	Thickness of gland plate	mm	
l)	Paint shade		
m)	Degree of protection		
n)	Total weight	kg	
o)	Cable entry		
p)	Max. operating height from ground level	mm	
q)	Min. operating height from ground level	mm	

2	CIRCUIT BREAKER		
a)	Standard		
b)	Rated Voltage	V	
c)	Rated Current	A	
d)	Rated Ultimate Short circuit breaking capacity (Icu)	kA	
e)	Rated Service Short circuit breaking capacity (Ics)	% of Icu	
f)	Rated Insulation voltage	V	
g)	Rated Impulse withstand voltage	kV	
h)	Temperature rise	deg C	
3	CURRENT TRANSFORMER		
a)	Type		
b)	Short circuit withstand capacity	kA	
c)	Make of CT's		
4	BUSBAR		
a)	Material of bus bar		
b)	Bus bar insulation		
c)	Max current Density of bus bar	A/sqmm	
d)	Current rating of phase bus bars	A	
e)	Current rating of neutral bus bar	A	
f)	Temperature Rise	Deg C	
g)	Short Circuit withstand current	kA	
5	CONTROL & METERING		
a)	Multifunction Meter		
b)	Current rating	A	
c)	Voltage rating	V	
d)	Energy measurement provision		
e)	RS 485 modbus serial port provision		
f)	Remote control provision of I/Cs & B/Cs		
6	OTHERS		
a)	Auxiliary voltage for coils and motors	V	
b)	Local / Remote switch		

c)	Indication Lamps for CBs status		
d)	MCB for AC		
e)	MCB for Space heating		
f)	Panel anti-condensation heater with thermostat		
g)	Panel illumination CFL with limit switch		
7	MAKES		
a)	MCCB		
b)	MCB		
c)	Multifunction Meters		
d)	CTs		
e)	Indication Lamps		

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

TECHNICAL SPECIFICATION

EHT Tower

TECHNICAL SPECIFICATION

PART- I

Design, Supply & Erection of EHT Tower along with all fabrication & civil related work

1.0 SCOPE

The Bidder has to design, supply & erect the tower as per wind zone -V with sustaining wind speed up to 300Kmph .The Bidder will carry out the necessary site visit & will assess the span length, soil investigation, Tower position afterward will submit the necessary engineering calculation for selection of suitable Tower type & civil foundation design to TPCODL team for approval before installation. It has been proposed bidder shall supply EHT for 33KV line crossing over River . Both the towers will be designed to carry double circuit line with conductor size 232sqmm..Bidder will do the necessary arrangement for transporting of these tower from factory to site, will carry out the necessary civil work for installation of Tower. Bidder will also arrange necessary ROW permission at his own Cost.

Firms shall quote their rates for their own design of towers as well as the TPCODL design towers as per the enclosed schedule. The tower design shall be for Multi circuit tower with Special EHT type Towers and its extensions, for which TPCODL shall provide bill of materials and out line drawings.

2.1.1 This specification also provides relevant data for design, proto fabrication, galvanizing and delivery FOR (destination) of transmission line towers including super-structure stubs, tower extensions, stub-templates, tower accessories (Hangers, U-bolts, bird guards, anti-climbing devices), bolts and nuts, step bolts, flat and spring washers etc. for utilization in TPCODL's transmission network. General: Preliminary route alignment in respect of the proposed transmission lines has been fixed by the employer (TPCODL) subject to alteration of places due to way leave or other unavoidable constraints. The Right of way shall be solved by the contractor and all expenses there of shall be borne by him. However, TPCODL shall render all helps in co- ordination with law and order department for solving the same. Statutory clearance if any shall be arranged by **Vendor**.

2.1.2 Provisional quantities/numbers of different types of towers have been estimated and indicated in the BOQ Schedule given. However final quantities for work shall be as determined by the contractor, on completion of the detail survey, preparation of route profile drawing and designing of the appropriate types of towers as elaborated sin the specification and scope of work.

2.1.2.1 The contractor shall undertake detailed survey on the basis of the tentative alignment fixed by the employer. The said preliminary alignment may, however, change in the interest of economy to avoid forest and hazards in work. While surveying the alternative route the following points shall be taken care by the contractor.

- (a) The line is as near as possible to the available roads in the area.
- (b) The route is straight and short as far as possible.
- (c) Good farming areas, religious places, forest, civil and defence installations, aerodromes, public and private premises, ponds, tanks, lakes, gardens, and plantations are avoided as far as practicable.
- (d) The line is far away from telecommunication lines as reasonably possible. Parallelism with these lines shall be avoided as far as practicable.

- (e) Crossing with permanent objects are minimum but where unavoidable preferably at right angles.
- (f) Difficult and unsafe approaches are avoided.
- (g) The survey shall be conducted along the approved alignment only in accordance with IS: 5613 (Part-II/Section-2), 1985.
- (h) For river crossing/ Crossing of Nallas: Taking levels at 20 metre interval on bank of river and at 40 metre interval at bed of river so far as to show the true profile of the ground and river bed. The levels may be taken with respect to the nearest existing towers, pile foundation of towers, base or railway/road bridge, road culvert etc. The levels shall be taken at least 100 m. on either side of the crossing alignment. Both longitudinal and cross sectional shall be drawn preferably to a scale of 1:2000 at horizontal and 1:200 vertical.

After completing the detailed survey, the contractor shall submit the final profile and tower schedule for final approval of the employer. The final profile and tower schedule shall incorporate position of appropriate type of towers. To facilitate checking of the alignment, suitable reference marks shall be provided. For this purpose, concrete pillars of suitable sizes shall be planted at all angle locations and suitable wooden/iron pegs shall be driven firmly at the intermediate points. The contractor shall quote the rate covering all the scope including supply of material, Survey, Soil profiling, Installation & testing required for the project.

Only approved sag template shall be used for tower spotting and the final profiles by the contractor.

2.1.2.2 PROFILE PLOTTING AND TOWER SPOTTING

The profile shall be plotted and prepared to the scale 1 in 2,000 for horizontal and 1 in 200 for vertical on squared (mm) paper. If somewhere the difference in levels be too high, the chart may be broken up according to the requirements. A 10 mm overlap shall be shown on each following sheet. The chart shall progress from left to right for convenience in handling. The sheet size may be conveniently chosen.

With the help of sag template, final tower location shall be marked on the profiles and while locating the tower on survey chart, the following shall be kept in mind:

[The contractor shall also submit the land schedule on revenue (if required) maps indicating alignment therein duly authenticated by Revenue Inspector & Tahasildar, enumeration of trees with the help of Forest officer and other prominent features required for alignment of the proposed line. Final route to be plotted on 1:50000 topo sheet for approval. Detail GIS (Geographical Information System) of towers to be included.]

- (a) The number of consecutive span between the section points shall not exceed 10 in case of straight run on a more or less plain stretch.
- (b) Individual span shall be as near as to the normal design ruling span.

In different crossing the contractor shall take into consideration the prevailing regulations of the respective authorities before finalizing type and location of the towers. While carrying out survey work, the contractor has to collect all relevant data, prepare and submit drawings in requisite number for obtaining clearance from the PTCC, road, aviation, railways, river and forest authorities.

The contractor shall remain fully responsible for the exact alignment of the line. If after erection, any tower is found to be out of alignment, the same shall have to be dismantled

and re- erected after correction by the contractor at his own cost, risk and responsibility, including installation of fresh foundation, if belt necessary by the employer.

After peg marking of the angle tower or tension towers, the contractor shall obtain approval from the employer and thereafter pegging of suspension type tower shall be done by the contractor and pegging of all the four legs of each type of towers at all the locations shall be done.

a) Wind effects:

Tower shall be designed for reliability Level-I, Terrain category-I & Wind Zone-V Design wind pressure on towers, conductors, earth wire and insulator string in the range of 30.45 mt. And above 45 mt. Height shall be computed as per IS-802(Part/Sec-I) 1995 Bidder shall furnish the maximum wind pressure adopted in their design against each component mentioned above.

b) Design Temperatures:

The following temperature range for the power conductor and ground wires shall be adopted for the line design:

(i)	Minimum temperature:	5 deg. C
(ii)	Everyday temperature of conductor	32 deg. C
(iii)	Maximum temperature of Conductor	
1.	75 deg. C for ACSR/Zebra/Panther	90 deg. C for AAAC Moose.
2.	Ground wire exposed to sun	53 deg. C

The above values are subject to latest revision if any made in IS-802 (part-I/Sec-I) 1995

c) Maximum Tension:

Maximum tension shall be based on either:

i)	at 5 deg. C with 2/3 rd . full wind pressure	or Conform to IS 802-1995
ii)	At 32 deg. C with full wind pressure whichever is more stringent.	Part-I/Sec-I-Clause No.10.3

d) Factors of Safety & Span details:

i)	Factor of Safety	Should conform to IS-802 Part-I-1995
ii)	Normal span:	The normal span of the line shall be 350 meters of 220KV and 320 meters for 132 KV.
iii)	Wind & Weight Span	The wind and weight span to be adopted in the design of the structures shall be as follows
iv)	Wind span:	The wind span is the sum of the two half spans adjacent to the support under consideration. In case of towers located on a perfectly horizontal terrain, this shall be the normal span. For design purpose the wind on conductor shall be calculated on a wind span of at least 1.1 times the normal span
v)	Weight Span	The weight span is the horizontal distance between the lowest point of the conductors on the two spans adjacent to the tower. All C and D type towers shall be designed for uplift spans (minimum weight spans in the following table) also. These are applicable both for pointed and square cross arms.

For details of cross arms and towers, the span limits given below shall prevail.

Tower type.	220 KV				132 KV			
	Normal condition.		Broken wire condition.		Normal condition.		Broken wire condition.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
A/DA & B/DB	525	100	315	100	500	100	300	100
C/DC & D/DD	600	100	360	100	500	100	300	100

1.2 The design of towers and their extensions shall be done conforming to the design parameters specified herein, the scope of design also includes supply of design calculation for towers and extensions including detailed structural/shop drawings of towers extensions and stub setting templates. The bidder, who has already type tested the various tower viz: 0-2°, +3, +6; 0-15°, +3, +6; 0-30°, +3, +6; 0-60°, +3, +6 (220 KV) in any nationally or internationally recognized laboratories, and conforming to our specification, may also offer the same.

1.3 Standards:

Except as modified in this specification, the material and work covered under this specification shall conform to the latest revision with amendments thereof of the following of Indian Standards and equivalent International Standards whenever indicated below.

Sl No	Bureau of Indian standards (BIS)	Title	International & Internationally recognized standard
1	IS:209	Specification for Zinc	ISO/R/752

2	IS: 2062	Structural steel (Standard quality)	ISO/R/660
3	IS: 432	Mild steel and medium tensile bars and for concrete reinforcement	BS-785CSA-G-30
4	IS: 802	Code of practice for use of structural steel in overhead transmission line Part-I/Section-I & Section2: Load and permissible stresses Part-II: Fabrication Galvanizing Inspection and Packing	
		PART-III: TESTING	
5	IS: 136	Technical supply conditions for threaded fasteners	
6	IS: 1893	Criteria of Earthquake resistant design structures	
7	IS: 2016	Plain washers	ISO/R/987
8	IS: 2551	Danger Notice Plates	
9	IS: 2629	Recommended practice for hot dip galvanizing of iron and steel	
10	IS: 2633	Method of testing uniformity of casting of zinc coated articles	
11	IS: 3063	Single coil rectangular section spring washers for bolts, bolts, screws	DIN-127
12	IS: 5358	Hot dip galvanized coatings on Fasteners	
13	IS:5613 Part-1 & 2 Of Section-I	Code of Practices for design installation & maintenance of, overhead power line	
14	IS: 6610	Specification for heavy washers for steel structures	
15	IS: 6745	Methods of determination of weight of zinc coating of zinc coated iron and steel articles	

1.4 The standards mentioned above are available from

Reference/ Abbreviation	Name and Address from which the Standards are available
IS	BUREAU OF INDIAN STANDARDS Manak Bhavan, 9, Bahadur Shah Zafar Marg, NEW DELHI(India)
ISO	INTERNATIONAL ORGANISATION FOR STANDARDISATION, Danish Board Standardisation, Danish Standardising Street, Aurehoegbvej-12, DK-2900, Hellestrup, DENMARK
CSA	CANADIAN STANDARD ASSOCIATION 178, Rexdale Boulevard, Rexdale, Ontario, CANADA M9W 1R7
BS	BRITISH STANDARDS British Standard Institution, 101, Pentonville Road, N-19-ND-UK
DIN	DEUTSCHES INSTITUT FÜR NORMUNG Gurggrafenstrasse 5-10, Post Fach 1107 D-1000, Berlin – 30

Indian Electricity Rules 1956, Regulation for Electrical crossing of Railway tracks.	KITAB MAHAL , Baba Kharak Singh Marg, NEW DELHI – 110 001(INDIA)
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2.0 PRINCIPAL PARAMETERS

2.1 Electrical System Data:

a)	System voltage (kV rms)	220	132
b)	Max. voltage (kV rms)	245	145
c)	Lightning impulse withstand voltage (dry & wet) (kVp)	1050 to 1250	650 to 750
d)	One min. Power frequency withstand voltage (wet) (KV rms)	460	275
e)	Short circuit level (KA for 1 sec.)	40	31.5

2.2 Line data

2.2.1 Conductor

a)	Name	ACSR Zebra	AAAC Moose
b)	Strength & wire dia		
i)	Aluminium	54/3.18	61/3.55
ii)	Steel	7/3.18	---
c)	Conductors per	Single	Single
d)	Spacing between the conductors of same phase (sub-conductor spacing) (mm)	----	-----
e)	Inter-phase spacing (mm)	8,400	8,400
f)	Configuration		
i)	Single circuit	Delta	Delta
ii)	Double circuit	Vertical	Vertical
g)	Nominal Aluminium area (mm ²)	420	520(Alu. Alloy)
h)	Section area of Aluminium (mm ²)	428.90	603.7 (Alu. Alloy)
i)	Total sectional area (mm ²)	484.50	603.7
j)	Calculated resistance at 200 c (Max.) ohm/km per conductor	0.06915	0.05502
k)	Approx. calculated breaking load (KN)	130.32	159.8
l)	Modulus of elasticity (GN/M ²)	69	54
m)	Co-efficient of linear exp. Per degree cent.	19.3X10	23X10
n)	Mass of zinc in gms/sqm		
o)	Overall diameter (mm)	28.62	31.95
p)	Weight (kg/km)	1621	1666
q)	Minimum ultimate tensile strength (KN)	130.32	159.8
r)	Conductor tension at 32° C without external load		
i)	Initial unloaded tension		
ii)	Final unloaded tension		

2.2.2 Galvanized Steel Ground Wire

a)	Size (no. of strands/strand dia)7/3.15.....
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b)	Overall diameter (mm)9.45.....
c)	Standard weight (Kg/km)432.....
d)	Location of ground wire	One continuous ground wire to run horizontally on the top of the towers.
e)	Tensile load in each ground wire	
i)	At min. temp. of 5° C and in still air (kgs)	
ii)	At every day temp. of 32° C and still air (kgs)	
iii)	At 5° C and 2/3 rd of full wind (kgs)	

2.2.2.1 Towers

a)	Span lengths in meters	220 KV ACSR Zebra/Moose	220 KV AAAC Zebra	132 KV ACSR Panthor	132 KV AAAC panthor
i)	Ruling design span	300,335,350,375	300,335,350	300,315,325, 335	300,315,325
b)	Wind load (kg/sqm) on conductor	52	52	52	52
c)	Shielding angle with vertical	20°	20°	20°	20°
d)	Towers to be designed for heavy wind zone				

2.2.2.2 Insulator Strings

Sl. No	Particulars	Single Suspension string/ Single Tension string/	Double suspension string/ Double Tension string	Single Suspension string/ Single Tension string	Double suspension string/ Double Tension string
1.	No. of standard Discs (Nos) (220kV)	1X14/1X15	2X14/2X15	1X10/1X11	2X10/2X11
2.	Size of Disc	280	280	305	305
3.	Electromechanical strength (kg)	90/120 KN	90/120 KN	90/160 KN	90/160 KN

The towers should be also designed for Double circuit both for ACSR and AAAC Zebra for 220 KV and Double circuit ACSR and AAAC Panther for 132KV System of TPCODL .All the towers should be suitable for Double circuit. However, the tower should be designed in such a way that in case of single Circuit stringing, there should not be any unbalance. The towers should also be designed taking into consideration of other type of earth wires, insulators of highest tensile strength.

2.0 GENERAL TECHNICAL REQUIREMENTS

2.1 Tower Design – General

The employer is looking for a structurally safe design of transmission line towers to be installed on EHV lines keeping the loadings and line parameters detailed in this specification and in compliance with IS: 802 (Part-1/Sec-1)-1995, IS: 802(Part-1/Sec-2)-1992.

The Bidder may offer economical designs with rational sections or offer towers of recent design, proven in service and accepted by other reputed Central and State Sector Utilities and by TPCODL (Previously ODISHA POWER TRANSMISSION CORPORATION) confirming to this technical specification. The Bidder in the latter case shall forward documentation

of proto type tests conducted and acceptance given by the user authorities as also performance report for such towers in service.

2.2 Transmission Towers

2.2.1 General Description: The towers shall be of the following types.

- (a) Double Circuit (A, B& C) and their extensions of +3 mtr,6 mtr,+9 mts,+15mtrs and +24mtrs
- (b) Double Circuit (A, B, C & D) and their extensions of +3 mtr,6 mtr,+9 mts,+15mtrs and +24mtrs
- (c) Special Towers (River Crossing, Railway Track Crossing, Power Line Crossing etc.)
- (d) Multi circuit Towers for 220 KV System

2.2.2 The towers shall be of the self-supporting type, built up of lattice steel sections or members and designed to carry the power conductors with necessary insulators. Ground wires and all fittings under all loading conditions. Outline diagrams of the towers required are to be furnished by the Bidder.

2.2.3 The towers shall be fully galvanized structures built up of structural mild steel sections. All members shall be connected with bolts, nuts and spring washers.

2.2.4 Stubs and Superstructures:

(i) **Stub:** shall mean a set of four stub angles fully galvanized and shall include cleats, gussets, bolts and nuts, etc. the black portion of the stub being cast in foundation footings. Stub length shall correspond to foundation depth of 3-0 metres from ground level.

(ii) **Superstructure:** shall mean the galvanized tower assembly above the stubs which includes structural members like angle sections, cross arms, ground wire peaks, accessories and fittings such as gusset plates, pack washers, spring, washers, ladders, step bolts, anti climbing devices and such other items which are required for completing the towers in all respect. Steel and zinc required for manufacturing these items will be arranged by the supplier.

(iii) **Bolts, nuts, spring washers, D shackles, U bolts:** Supply of bolts and nuts and spring washers, hangers/D-shackles for attaching suspension strings and 'U' bolts for attaching ground wire suspension assemblies are included in the supply of tower.

The Bidder shall make his own arrangement for procurement of required Bolt- Nuts, accessories, attachments like 'D' shackles. 'U' bolts, anchor bolts, step bolts etc from the following approved vendor of TPCODL well in advance and supply as per scheduled completion period along with the inspection at sub vendor's premises.

Sl No	Name of the approved vendor of TPCODL
1	NEXO/GKW / ASP / MAHESWARI(P) FASTNERS & BRIGHT PVT LTD / REMAX

The bolt nuts shall be procured from the above manufacturer's approved by TPCODL. For any other make of bolt nuts, the Bidder will have to take prior approval of the TPCODL. For such approval the Bidder has to submit the following in respect of prospective bolt- nut supplier.

- (1) Plant Capacity per annum.
- (2) Type test reports for bolt nuts to be supplied (not older than 5 years).
- (3) List of orders executed / under execution.
- (4) However, TPCODL reserves right to test the samples of Bolts & nuts of the proposed Bolt-nut supplier before approving the make. TPCODL is at liberty to have samples of steel, zinc etc. to be used, test, check in any Laboratory recognized by the Government at the cost of Bidder and reject the material if found below standard.

(5) The zinc used for galvanizing of fabricated materials shall be electrolytic high grade zinc (99.95% Purity).

(iv) **Procurement of Steel and Zinc:** The following provisions shall apply in connection with the procurement of steel and zinc by the supplier.

(a) The steel used for fabrication of tower parts extensions, templates etc. shall be of mild steel of tested quality as per IS: 2062 GRA.

(b) The Bidder shall take into account the fabrication wastage while quoting the rates. The employer will not accept any liability in connection with the wastage of steel during fabrication or otherwise.

(c) The Bidder shall indicate in his offer the sizes of steel sections which are proposed to be used by him in the design of towers.

(d) Substitutions, if any, of steel sections of the tower parts by higher sizes, due to non-availability or otherwise shall be to the supplier's account. The employer will not accept any liability on this account.

(e) The contractor shall procure all structural steel members i.e. Angles, tees, Plates, nuts & bolts etc. conforming to relevant I.S. Codes from main producers as approved by the Ministry of Steel namely SAIL, TISCO, ISCO and RINL. All MS angles, Tees and Plates shall be of grade 'A' as per IS: 2062-1999 and IS: 8500-1991. Samples shall also be taken and got tested by the Engineer-in-charge as per the provisions in this regard in the relevant I.S. Codes. In case the test results indicate that the steel arranged by the contractor does not conform to I.S. Codes, the same shall stand rejected. The proof of manufacturer of structural steel members from virgin billets purchased from main steel producers is to be furnished by him before tower member / templates are cut.

(f) Structural steel section not available from main producers can be procured from secondary producers/re-rollers subject to production of proof of manufacture of structural steel members from virgin billets produced from main steel producers before starting fabrication work. In case of sections not rolled by main producers, can be procured from re-rollers provided.

Production of proof of manufacture of structural steel members from virgin billets produced from main steel producers before starting fabrication work.

- Re-rolling of structural steel sections is done from billets/ingots of tested quality.
- Re-rolled sections are duly tested as per relevant standard.

(g) The zinc used for galvanizing fabricated material shall be of High Grade Electrolytic zinc.

2.2.5 Extensions:

a) The towers shall be designed so as to be suitable for adding 3 metres, 6 metres, 9 metres extensions for maintaining adequate ground clearances without reducing the specified factor of safety in any manner.

b) The Bidder shall have to design leg extensions for all types of towers ranging from minus 3 metres to plus 9 metres at intervals of 1.5 metres and such leg extensions shall be suitable for being fitted to a normal tower as well as a tower with extensions. This is to enable tower spotting in hilly terrain.

2.2.6 Stub setting Templates:

Stub templates shall be designed and supplied by the supplier as per requirement for all types of towers with or without extensions. Stub templates for standard towers and towers with extension shall be fixed type. The stub templates shall be painted with anti-corrosive paints.

2.2.7 Fasteners: Bolts, Nuts & Washers to be used for the towers

2.2.8 All bolts shall be of property class 5.6 and nuts of property class 5.0 IS: 1367 (Part -3) 1991 and IS: 6639-1972 shall conform to IS: 12427, they shall be galvanized and shall have hexagonal heads and nuts, the heads being forged out of solid steel rods and shall be truly concentric and square with the shank. The shank shall be perfectly straight.

2.2.9 Manually threaded bolts shall not be used, the length of bolts should be such that the threaded portion shall not extend into the place of contact of the members.

2.2.10 (i) The bolts shall be threaded to take the full depth of the nut and threaded far enough to permit VARIABLE gripping of the members, but not any further. It shall be ensured that the threaded portion of each bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit hand tight to the point where the shank of the bolt connects to the head.

(ii) Flat and tapered washers shall be provided wherever necessary. Spring washers shall be provided for insertion under all nuts. These washers shall be of electro-galvanized steel and of the positive lock type. Their thickness shall be 2.5 mm for 12 mm dia bolts, 3.5 mm for 16 mm dia bolts and 4.5 mm for 20 mm dia bolts.

(iii) The Bidder shall furnish bolt schedules giving thickness of members connected, size of bolts and nuts, the length of the shank, the length of the threaded portion of bolts, sizes of bolt holes, thickness of washers and any other special details of this nature.

(iv) To obviate bending stress in bolts or to reduce it to a minimum, no bolt shall connect aggregate thickness of more than three (3) times its dia.

(v) The bolt positions in assembled towers shall be as per IS: 5613 (Part-I/Section-I) (Part-II/Section-2)-1985.

(vi) Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.

3.0 TOWER ACCESSORIES

3.1 Step Bolt Ladders: These bolts shall be of property class 4.6 conform to IS: 6639-1972. Each tower shall be provided with step bolts on one of the main legs, of not less than 16 mm diameter and 175 mm long, spaced not more than 400 mm apart and extending from about 2.5 metres above the ground level to the top of the tower. Each step bolt shall be provided with two nuts on one end to fasten the bolt security to the tower and button head at the other end to prevent the feet from slipping away. The step bolts shall be capable of withstanding a vertical load not less than 1.5 KN and shall be used as a ladder for climbing.

3.2 Anti-climbing devices: This shall conform to IS: 5613 (Part-I/Sec -I), 19085.

Fully galvanized barbed wire type anti-climbing device shall be provided at a height of approximately 3 metres as an anti-climbing measure. Four layers of barbed wires will be provided each inside and outside the tower in horizontal plane, spacing between the layers being 140 to 150 mm. The towers to be designed by the supplier shall have provision to fix the barbed wire as indicated above. Thus the angle pieces with notches for accommodating barbed wire shall be designed and supplied with the towers along with provision for suitable bolt holes on leg members for fitting bolt holes on leg member for fitting the angles. The scheme of the anti-climbing device shall be submitted along with the tower drawing. Barbed wire shall be included in the scope of bidder.

3.3 Insulator strings and ground wire clamp attachments: For the attachment of suspension insulator strings a suitable swinging hanger on the tower shall be provided so as to obtain requisite clearance under extreme swinging conditions and free swinging of the string. The hanger shall be designed to withstand an ultimate tensile strength of 11.500 kg.

(a) For ground wires at suspension towers suitable 'U' Bolts strong enough to withstand the full designed loads shall be provided to accommodate the hook of the ground wire suspension clamps.

(b) At tension towers, horizontal strain plates of suitable dimensions on the underside of each power cross-arm tip and at the top ground wire peak shall be provided for taking the 'D' Shackles of the tension insulator strings or ground wire tension clamps, as the case may be. Full details of the attachments shall be submitted by the supplier for the employer's approval before commencing with mass fabrication.

3.4 Phase Plate: Phase plate shall be of mild steel of 16 gauge vitreous enameled at back and front, circular in shape and diameter 75 mm. One set of phase plate shall be consisting of 3 plates red, yellow and blue coloured accordingly to indicate the phase of the conductor. There shall be one fixing bolt on the plate. This shall conform to IS: 5613 (Part-II/Section01) of latest edition.

3.5 Number Plate: The number plate shall be mild steel vitreous enameled at back and front, 200 mm x 150 mm, rectangular shape and inscribed thereon shall be the number of the tower location preceded by letter corresponding to the short name of the line and the type of towers. There shall be two fixing bolts on both end of the plates. The dimension and details of the number plate shall be as per IS: 5613 (Part-II/Section1 & Section-2), 1985.

3.6 Danger Plate: These shall be of mild steel vitreous enameled at back and front 250 x 200 mm rectangular shape and inscribed thereon shall be in signal red the work 'DANGER' with its Oriya and Hindi translation and also with the inscription of Bone and Skull and voltage of the line. There shall be two holes on the plates for fixing. This shall conform to IS: 2551 (latest edition).

4.0 DETAILS TO TOWER FABRICATION WORKMANSHIP

4.1 Except where hereinafter modified details of fabrications shall conform to IS: 802 (Part-II)-1978.

4.2 But splices shall generally be used such that the inside cleat angle and outside plates are designed to transmit load. The inside cleat angle shall not be less than half the thickness of the connected heaviest member plus 2 mm. Lap splices may also be used for connecting members of unequal size in such a manner that the inside angle of the lap splice shall be rounded at the heel to fit the fillet of the outside angle. All splices shall develop full stress in the members connected through bolts. But as well as lap splice shall be made as above and as close to and above the main panel point as far as possible.

4.3 Joints shall be so designed so as to avoid eccentricity. The use of gusset plates for joining tower members shall be avoided as far as possible. However, where connections are such that the elimination of the gusset plates would result in eccentric joints then gusset plates and spacer plates may be used in conformity with modern practices. The thickness of the gusset plate, required to transmit stress, shall not be less than that of the thinnest of connected member but not less than 5 mm in any case.

The use of filler in connection shall be avoided as far as possible. The diagonal web members in tension may be connected entirely to the gusset plate where necessary so as to avoid the use of filler and it shall be connected at the point of inter-section by one or more bolts.

4.4 The tower structures shall be accurately fabricated to bolt together easily at site without any strain on the bolts.

4.4 No angle member shall have the two leg flanges brought together by closing the angle.

4.5 The diameter of the hole shall be equal to the diameter of bolt plus 1.5 mm.

4.6 The structure shall be designed such that all parts are accessible for inspection and cleaning. Drain holes shall be provided at all points where pockets of depressions are likely to hold water.

All similar parts shall be made strictly interchangeable. All steel sections before any work is done on them, shall be carefully leveled, straightened and made true to detailed drawings by methods which shall not injure the materials so that when assembled, the different matching surfaces are in close contact throughout. No rough edges shall be permitted anywhere in the structure.

5.0 DRILLING AND PUNCHING

(a) Before any cutting work is started, all steel sections shall be carefully straightened and trued by pressure and not by hammering. They shall again be trued after being punched and drilled.

(b) Holes for bolts shall be drilled or punched with a jig but drilled holes are preferred. The following maximum tolerance of accuracy of punched holes is permissible.

(i) Holes must be perfectly circular and no tolerance in this respect is permissible.

(ii) The maximum allowable difference in diameter of the holes on the two sides of plates or angle is 0.8 mm i.e. the allowable taper in punched holes should not exceed 0.8 mm on diameter.

(iii) Holes must be square with the plates or angles and have their walls parallel.

(c) All burrs left by drills or punches shall be removed completely when the tower members are truly opposite to each other. Drilling or reaming to enlarge defective holes is not permitted.

6.0 ERECTION MARK:

Each individual member shall have an erection mark conforming to the component number given to it in the fabrication drawings. This mark shall be done with marking dies of 16 mm size before galvanizing and shall be legible after galvanising. The erection mark shall be A-BB-CC-DDD where:

A: Employer code assigned to the supplied (alphabet)

BB: Supplier's mark (Numerical)

CC: Tower type (Alphabet)

DDD: Number mark to be assigned by the supplier (Numerical)

7.0 GALVANIZING

The super structure of all towers and stubs upto 150 mm below plinth level (Top of concrete pedestal) shall be galvanized. Galvanizing of tower members and stub shall be in conformity with IS: 4759-1984 and shall be done after all fabrication work has been completed except that the nuts may be tapped or return after galvanizing. Threads of bolts and nuts after galvanizing shall have a neat fit and shall be such that they can be turned with fingers throughout the length of the threads of bolts and they shall be capable of developing the full strength of the bolts. Spring washers shall be electro-galvanized as per Grade - 4 of IS: 1573 - 1986. Galvanizing for fasteners shall conform to IS: 1367 (Part-XIII) - 1978.

8.0 QUANTITIES AND WEIGHTS

8.1 The quantities stated in Annexure-I are only provisional. Final quantities will be informed by the employer to the supplier on completion of detailed survey. However, bid shall be evaluated based on quantities indicated in the Annexure - I.

8.2 The employer reserves the right to order for the final quantities at the rates quoted in the bid, which shall be valid throughout the pendency of the contract.

8.3 The unit weight of each type of tower stubs, super structure and extension be furnished by the Bidder. The weight of tower shall mean the weight of tower calculated by using the black section (non galvanized) weight of steel members including stubs, of the sizes indicated in the approved fabrication drawings and bills of materials, without taking into consideration the reduction in weights due to holes, notches, cuts, etc. but taking into consideration the weight of special fittings.

9.0 TOWER DESIGNS SUPERSTRUCTURE

9.1 Wind Pressure

The wind pressure on towers, power conductors and earth wire shall be as per IS: 802 (Part-I/Sec-I) - 1995. 280

9.2 Design Temperatures

The following temperature range for the power conductor and ground wires shall be adopted for the line design conforming to IS: 802 (Part -I/Sec - I) - 1995.

- i) Minimum temperature: 50°C.
- ii) Every day temperature: 32°C
- iii) Maximum temperature of Conductor: 75°C [For ACSR Zebra/Panther]
90°C [For AAAC Moose equivalent]
- iv) Ground wire- 53°C (exposed to Sun)

9.3 Factors of Safety & Span details

(a) **Factory of safety:** The factor of safety based on crippling strength of struts and elastic limit of tension members shall not be less than 2 (two) under normal condition and 1.5 (one and a half) under broken wire conditions for all the members of the towers and their cross arms.

(b) **Normal Span:** The normal span of the line shall be 300 metres for 220 kV and 250 metres for 132 kV.

(c) **Wind and weight spans:** The wind and weight spans to be adopted in the design of the structures shall be as follows:

(i) **Wind Span:** The wind span is the sum of the two half spans adjacent to the support under consideration. In case of towers located on a perfectly horizontal terrain, this shall be the normal span. For design purposes the wind on conductor shall be calculated on at least 1.1 times the normal.

(ii) **Weight Span:** The weight span is the horizontal distance between the lowest point of the conductors on the two spans adjacent to the tower. All C and D type towers shall be designed for uplift spans (minimum) weight spans in the following table also. These are applicable both for pointed and square cross arms.

For details of cross arms and towers, the span limits given below shall prevail.

WEIGHT SPANS

Tower Type	Normal Condition		Broken wire condition		Normal Condition		Broken wire condition	
	Max	Min	Max	Min	Max	Min	Max	Min
A & B	525	100	300	100	488	100	195	100
C & D	600	100	300	100	576	100	195	100

9.4 Conductor and Ground wire Configuration: For single circuit towers the three phases shall be Delta formation. One number of ACSR/AAAC conductor shall be used for each phase. One galvanized steel wire shall be used as ground wire. The ground wire shall be continuous and shall be provided above the conductors at suitable elevation to offer effective shielding and safe clearances. For double circuit towers the phases shall be in vertical formation with phase to phase horizontal spacing of not less than 8.4 meters and vertical 4.9 meters for 220 kV.

9.5 Loads on Towers

(i) **Transverse Loads:** Transverse load due to wind on towers conductors and under broken wire earth wire shall be calculated in accordance with IS: 802(Part-I/Sec-I)-1995.

(ii) **Longitudinal Loads:** Longitudinal loads due to wind on towers conductors and shield shall be calculated as per IS: 802 (Part-I/Sec-I)-1995.

(iii) **Vertical Loads:** The vertical load due to conductors and ground wire shall also include 150 kg ss weight of a Lineman with tools. These loads are in addition to the vertical loads due to insulator fittings and the dead weight of the structure. The weight of a Lineman with tool should not be considered in minimum vertical load calculation. An additional erection load of 3.5 KN shall also be considered for the design of the tower. The stringing procedure shall ensure that the above vertical loads are not exceeded. For calculating vertical loads the following insulator weights may be considered.

Type string	220 KV	132 KV
Each single suspension insulator string	160 kg	120 Kg
Each double suspension insulator string	320 kg	240 Kg
Each double tension insulator string	420 kg	320 Kg
Pilot string for 60° tower	160 kg	120 Kg

iv) Broken Wire condition

a) **Suspension Tower Type A/DA:** Breaking of any one power conductor in one phase only, resulting in instantaneous unbalance tension of 50% of conductor tension at 32°C without wind or breaking of one earth wire resulting in an unbalance tension equal to the maximum tension of the ground wire whichever is more stringent is to be considered for design along with appropriate impact factor.

b) Tower Type B & C

Breakage of two phases on the same side and on the same span or breakage of any one phase and any one ground wire on the same span whichever combination is more stringent along with appropriate impact factor for a particular member.

c) Tower Type D/DD

Breakage of all the three phases on the same side and on the same span or breakage of two phases and any one ground wire on the same span, whichever combination is more stringent along with appropriate impact factor for a particular member. Cross arms for angle tower shall be of equal length for both sides.

v) Design Load

Employer's requirement for design longitudinal and transverse loads shall confirm to IS: 802(Part-I/Sec-I)-1995. The Bidder shall furnish the details of design loads proposed to be adopted in the tower design in accordance with this specification. The design criteria and other special requirements as stipulated for special towers shall be applicable for river crossing/special towers.

9.6 Tower Steel Sections:

i) **Tower steel sections:** Steel sections of tested quality in conformity with IS: 2062 GRA are to be used in towers, extensions and stub setting templates. No individual members shall be longer than 6000 mm. For designing of towers only rationalized steel sections shall be used. During execution of the project, if any particular section is not available, the same shall be substituted by higher section at no extra cost. However, design approval for such substitution shall be obtained from the employer.

ii) **Thickness of Members:** The minimum thickness of angle sections used in the design of towers, shall be kept not less than the following values:

- a) Main corner leg members excluding the ground wire peak and main cross arm 6 mm.
- b) For all other main members 5 mm.
- c) Redundant members 4 mm.

iii) **Bolt Arrangement:** The minimum bolt spacing and rolled edge distance and sheared edge distances of sections from the centers of the bolt holes shall be provided as furnished in Table below.

Dia of Bolts (mm)	Hole Dia (mm)	Min. bolt Spacing (mm)	Min. rolled Distance (mm)	Min. Sheared Edge distance (mm)
12	13.5	30	16	19
16	17.5	40	20	23
20	21.5	50	25	27

Bolts sizes mentioned above shall only be used. The minimum width of flanges without bolt holes shall be 30 mm. For the purpose of calculating stress and bearing stress for bolts refer clause 14.4 and 14.5 of IS: 802 (Part-I/Sec-2)-1992.

iv) **Allowable Stress:** Structural steel angle section manufactured according to the latest ISL: 808(Part-V & VI) and tested according to the latest edition of IS:2062 and having its yield strength not less than 255 N/mm. sq. shall be used in the fabrication of tower members.

v) **Axial Stress in tension:** The estimated tensile stress in various members multiplied by the appropriate factors of safety shall not exceed the value given by the formula specified in Clause 9.2.1 of IS:802(Part-I/Sec-2)-1992.

vi) Axial Stress in Compression: The estimated compressive stress in various members multiplied by the appropriate factors of safety shall not exceed the value given by the formula specified in Clause 9.2.1 of IS:802(Part-I/Sec-2)-1992.

vii) Slenderness ratio: Slenderness ratio for members shall be computed in accordance with IS:802(Part-I/Sec-2)-1992. Slenderness ratio for compression and tension members shall not exceed the values specified therein. The following maximum limits of the slenderness ratio shall be adopted i.e. the ratio of unsupported length of the section in any place to the appropriate radius of gyration.

a)	For main corner leg member including the corner members of earth wire peak and the lower corner members of the arms...	150
b)	For other members having calculated stresses....	200
c)	For redundant members....	250
d)	For members having tensile stress only....	375

viii) Erection Stress: Where erection stresses combined with other permissible co-existent stresses could produce a working stress in any member appreciably above the specified working stress, then additional materials shall be added to the member or such other provision made so as to bring the working stress within the specified limit. For the purpose of this clause the specified working stress shall be the ultimate stress divided by the factor of safety of 2.0.

ix) Design calculation and Drawings: The following design calculations and drawings are required to be furnished to the employer.

- a) **Along with the Bid:** Detailed design calculations and drawing for each type of tower.
- b) **On award of Contract:** The supplier shall submit design of tower extension, stub templates and loading/rigging arrangement of tower testing to enable the employer to make preliminary check regarding structural stability of tower tests. Upon successful testing of tower and subsequent approval of designs, drawings and bill of materials, the supplier shall furnish Photostat copies of the following in 6(six) copies to the employer for necessary distribution along with one copy of reproducible print.
 - a) Detailed design calculations along with drawings of towers and foundations.
 - b) Detailed structural drawings indicating section size, length of member. Sizes of plate along with hole to hole distances, joint details etc.
 - c) Bill of materials indicating cutting and bending details against each member.
 - d) Shop drawings showing all details relevant to fabrication.
 - e) All drawings for the tower accessories.

The supplier is required to submit four copies of the drawings with Photostat copies mentioned above for approval by the employer while submitting the designs, structural drawings, bill of materials & any other drawings pertaining to the subject transmission line. The supplier shall clearly indicate in each drawing the project code number, if any, specification no, name of transmission line, letter reference no. and date on which the submissions are made. The said procedure is to be followed while submitting the distribution copies.

9.7 Statutory Clearances: This should be as per ISS.

(i) Ground Clearances: The minimum ground clearance from the bottom conductor shall not be less than 7.00 meters for 220 kV at the maximum sag conditions i.e. at maximum temperature and in still air. However, to achieve the above clearance the height of the tower shall be increased in the following manner:

- (a) An allowance of 4% of the maximum sag shall be provided to account for errors in stringing.
- (b) Conductor creep shall be compensated by over tensioning the conductor for a temperature of 26°C lower than the stringing temperature. In case of rail track crossings the minimum height above rail level of the lowest portion of any conductor under conditions of maximum sag, in accordance with the regulations for Electrical Crossing of Railway Tracks are given in Table below.

Sl No	Type of work	Inside stn. Limits (mm)	Outside stn. Limits (mm)
a)	For un-electrified track and tracks electrified on 1500 V.DC		
	i) For metre/narrow gauge	10,000/17,600	
	ii) For broad gauge	11,200	8,800
b)	Tracks electrified on 25 kV AC for meter, narrow and broad gauge	15,400	13,400

Minimum clearance between the subject power line and any other power line crossing shall not be less than 7000 mm.

(ii) Live Metal Clearance: The minimum live metal clearance to be provided between the live parts and steel work of superstructure shall be as given in IS:5613 (Part-2/Sec-I). The Bidder may adopt separate cross arm design and length for 'D' type towers under dead end conditions provided adequate live metal clearance is available with at least 15° angle and also provided that all the other specified conditions of this specifications are fulfilled. In case pilot insulator strings are proposed to be used, the angle of swing to be considered shall be minimum of 15°. In computing live metal clearances, the dimensions of suspension and tension string shall be taken as given in drawings attached herewith. The design of the towers shall be such that it should satisfy all the above conditions when clearances are measured from any live point of the insulator strings.

(iii) Angle Shielding: The angle shielding, defined as the angle formed by the line joining the center lines of the ground wire and outer conductor in still air, at tower supports, to the vertical line through the center line of the ground wire shall not be more than 30°. The drop of the ground wire clamp which is employer supplied item should be considered while calculating the minimum angle of protection. For estimating the minimum angle of protection the drop of ground wire suspension clamp along with U-bolt may be taken as 150 mm.

(iv) Midspan Clearance: The minimum vertical span clearance between any of the earth wire and the nearest power conductor under all temperatures and in still air condition in the normal ruling span shall be 8.10 meters for 220 kV. Further the tensions of the earth wires and power conductors shall be so co-ordinated that the sag of earth wires shall be at least 10% less than that of the power conductors under all temperatures and loading conditions.

9.8 Packing: Angle sections shall be wire bundled, cleat angles, gusset plates, blackets, filler plates, hanger and similar other loose items shall be netted and bolted together in multiples or securely wired together through holes. Bolts, nuts, washers and other attachments shall be packed in double gunny bags, accurately tagged, in accordance with the contents. The packing shall be properly done to avoid losses/damages during transit. Each bundle or package shall be appropriately marked.

9.9 Special Towers:

(i) Special towers are to be used for Major River crossing requiring very long spans. These towers shall form part of the Bidder's scope. Unit rates for design, fabrication, galvanizing, testing and supply for such towers shall be quoted in the appropriate schedule of Volume IB. Anchoring of Major River crossing towers, shall be with 'D' or DD type towers. All the requirements as meant for standard towers shall apply for such special towers except those noted in the following clauses.

(ii) **Shielding Angle:** The shielding angle shall not be greater than 30°.

(iii) **Clearances:** The minimum clearance of lowest point of power conductor from the highest flood level in navigable rivers for crossing towers shall be obtained from the navigation authority. The minimum electrical clearances between live parts and tower body and cross arm member shall be the same as for normal towers.

(iv) **Stub location:** The approximate height of foundation on which stub for river cross towers are to be set, over the highest flood level of the river shall be fixed only after employer's approval.

(v) **Angle of Deviation:** The minimum angle of deviation to be considered for special towers is 2° and all live material clearances are to be computed considering double suspension insulator strings as per drawing enclosed.

(vi) **Factors of Safety:**

(1) **Towers:**

The minimum factors of safety for towers shall be:

- a) Under normal conditions 2.0
- b) Under broken wire conditions 1.5

(2) **Conductor and Earth wire:** The minimum factor of safety for conductors and ground wire shall be 2.5 maximum tension corresponding to 2/3rd full wind pressure at minimum temperature or full wind pressure at the mean annual temperature such that the initial unloaded tension at the mean annual temperature do not exceed 30% of the ultimate strength of conductor and ground wire respectively.

(vii) **Wind Loads:** The procedure for wind load calculation on conductor and ground wire shall be the same as for normal structures.

(a) The wind pressure values on tower shall be based on IS:802(Part-I/Sec-I)-1995.

(viii) **Longitudinal Loads:**

a) The longitudinal loads due to power conductors and earth wires for suspension towers shall be nil under normal conditions and 100% of the maximum tension of bundled conductors or earth wire under broken wire conditions.

b) Under normal conditions, unbalanced longitudinal pull due to difference in tension in ruling span for river crossing towers on one side and span of the line on the other wise shall also be considered for the design of anchor towers.

10.0 TESTS

10.1 General

(a) All standard tests including quality control tests in accordance with IS:802 (Part-III)-1978 shall be carried out.

(b) A galvanized tower of each type complete with 6 meters extension shall be subjected to design and destruction test. The tower shall be tested with nuts and bolts of the same make and type which are proposed to be used on the line. The supplier shall submit to

the employer for approval, a detailed programme and proposal for testing the towers showing the method of carrying out the tests and the manner of applying the loads. The supplier on receipt of such approval shall intimate the employer about carrying out of the tests at least 30 days in advance of the scheduled date of tests during which time the employer will arrange to depute his representatives to witness the tests. Six copies of the test reports thereof shall be submitted to the employer for approval.

(c) In case of premature failure, the tower shall be retested and steel already used in the earlier test shall not be used again. The supplier shall provide facilities to the employer for inspection of materials during manufacturing stage and also during testing of the same.

(d) No part of any tower subject to test shall be allowed to be used in the work. The prices to be quoted for such type tests shall be after allowing rebate for the scrap value of the tested tower which is to be retained by the supplier.

(e) The supplier shall ensure that the specification of materials and workmanship of all towers actually supplied conform strictly to the towers which have successfully undergone the tests. In case any deviation is detected the supplier shall replace such defective towers free of cost of the employer. All expenditure incurred in erection, to and fro transportation, any other expenditure or losses incurred on this account shall be fully borne by the supplier. No extension in delivery time shall be allowed on this account. The employer, however, reserves the right to waive off the testing of the towers, provided the supplier had earlier successfully tested, erected and commissioned similar towers and certificates for such tests carried out earlier are furnished duly certified by the employer and is found acceptable.

(f) Each type of tower to be tested shall be a full scale prototype galvanized tower and shall be erected vertically on rigid foundation with the stub protruding above ground level as provided in the design/drawing between ground level and concrete level.

(g) The suspension tower to be tested shall be with hanger and 'U' Bolt as per approved design/drawings. The tension tower to be tested shall similarly be with the strain plate as per approved design/drawings.

(h) In case of any premature failure even during waiting period, the tower shall be retested with rectified members. However, if the failures are major in nature and considerable portion of tower is to be re-erected then in such cases all the tests which have been carried out earlier are to be re-conducted to the entire satisfaction of the employer.

(i) The sequence of testing shall be at the discretion of the employer.

10.2 Test for Galvanization: Galvanization of the members of the tower shall withstand tests as per IS: 2633.

10.3 Inspection:

10.3.1 The supplier shall keep the employer informed well in advance of the commencement of manufacture, progress of manufacture thereof and fabrication of various tower parts at various stages. So that arrangements could be made for inspection by the employer.

10.3.2 The acceptance of any batch of items shall in no way relieve the supplier of any his responsibilities for meeting all the requirements and intent of this specification and shall not prevent subsequent rejection if any item of that batch is later found defective.

10.3.3 The employer or his authorized representatives shall have free access at all reasonable time to all parts of the supplier's works connected with the fabrication of the material covered under the contract for satisfying them that the fabrication is being done in accordance with the provisions of this specification.

10.3.4 Unless specified otherwise, inspection shall be made at the place of manufacture prior to dispatch and shall be conducted so as not to interfere unnecessarily with the operation of the work.

10.3.4 Should any member of the structure be found not to comply with the approved design, it shall be liable for rejection. No member once rejected shall be resubmitted for inspection except in cases where the employer or his authorized representative considers that the defects can be rectified.

10.3.5 Defects which occur during fabrication shall be made good with the consent of and according to the procedure to be laid down by the employer.

10.3.6 All gauges and templates necessary to satisfy the employer for conducting tests shall be made available at the test site by the supplier.

10.3.7 The correct grade and quality of steel shall be used by the supplier. To ascertain the quality of steel the employer may at his discretion get the material tested at an approved laboratory.

10.4 Schedule of requirements:

10.4.1 The present schedule of requirements of different types of towers will be informed to the supplier at the time of placing order. The supplier should be ready to supply the future tower requirement of TPCODL for the rate contract period in very short notice.

10.4.2 The time frame for executing the work is also indicated in this schedule. The supplier has to match the supply and delivery of stubs, tower-parts etc. to complete the work within the time schedule desired by the employer. Generally the supplier should supply @400MT per month as per the requirement.

10.4.3 The supplier shall, as far as possible, despatch the tower material as completed towers in order to enable erection of complete tower structures at site. Payment for the completed towers shall only be released in case running bills are allowed.

10.5 Schedule of prices: The prices for supply of materials shall be furnished in the relevant schedule in the manner specified in annexure-I and Annexure-II.

1.0 ERECTION OF TOWER AND TOWER FOUNDATION

1.1 SCHEDULE OF ERECTION PROGRAMME

After due approval of the detailed and check survey, the contractor shall submit to the employer a complete detailed schedule of erection programme with a Bar-Chart for construction of the lines indicating therein the target date of completion.

1.1.1 DRAWINGS FOR TOWER AND FOUNDATIONS

The same shall be supplied by the contractor.

1.1.2 TAKING OVER

Tower and tower accessories received at site stores are to be stored item-wise and mark-wise to facilitate joint inspection of the materials (with reference to packing list and detailed order).

If the materials/equipment or any part thereof is damaged or lost during the transit, the replacement of such materials shall be effected by the contractor timely so as to maintain programme of work. However, the line under erection shall be taken over by the purchaser only when the entire line is completed in all respect and made ready for commissioning at rated voltage. Partly erected line will not be taken over.

Taking over of the line shall be in no way relieve the contractor from his responsibility for satisfactory operation of the erected line in terms of the guarantee clause of the specification.

1.1.3 MATERIALS HANDLING AND INSURANCE

The contractor shall deliver all equipment/materials against this contract to his site stores under cover of Transit Insurance to be taken in his name. Cost of such insurance is to be borne by the contractor.

Cost of transportation of materials from contractor's store to the site of work shall be borne by the contractor irrespective of mode of transportation and site condition.

The contractor has to bear the cost of premiums for all materials, tower accessories, total erection cost of the line including cement, torsteel for foundation.

It will be the responsibility of the contractor to report to the concerned Police Station about all incidents of thefts and lodge, pursue and settle all claims with Insurance Company in case of damage/loss due to theft, pilferage, flood and fire etc. and the employer of the work shall be kept informed promptly in writing about all such incidents. The loss, if any, on this account shall be recoverable from the contractor if the claims are not lodged and properly pursued in time or if the claims are not settled by the insurance company due to lapses on the part of the contractor. The contractor shall have to replenish promptly damaged, stolen tower members and accessories conductors, earth wire, hardwares etc. and repair/re-erect the damaged lines, free of cost to the employer so

as to maintain the programme of work. The employer will not be responsible in any way for such loss of materials.

1.1.4 EXCAVATION FOR FOUNDATION PITS, DE-WATERING AND SHORING SETS

The contractor shall execute the open excavation job in the foundation pits in all type of soil including latterite and or boulder mixed soil as detailed abelow including removing, spreading and/or stacking the excess spils (as directed by the employer). The item includes the necessary trimming of the sides, leveling, dressing and ramming (as necessary) the bottom of the pits including bailing out water, dewatering by manual and/or mechanical means by emplying water pumps including removing of slushes from foundation pits and nominal open plank shoring with vertical poling boards placed at suitable intervals as directed with required runners, struts, battens for framing as required complete. While quoting the unit rate for foundation as per the activity schedule, the contractor shall include cost of design, all cost of labour, materials, tools, plants, incidentals for earth excavation, dewatering, cement, water, sand, coarse and find aggregates, steel reinforcement, steel angles, forms, mixing, finishing, protection and curing of concrete, back-filling with carried earth, if necessary, disposal of surplus, spoils, stub setting and template. The contractor shall also include in the quoted unit rate for foundation, all charges/costs for preparing the pit marking and foundation layout drawing, grounding of towers including supply of pipe/concrete pipe, earthing, measurement of ground resistance before often growing etc.

1.1.5 CEMENT CONCRETE :

A) Materials

All materials whether to be consumed in the work or used temporarily shall conform to relevant IS specification, unless stated otherwise, and shall be of the best approved quality.

B) Cement

Cement to be used in the work under the contract shall generally conform to IS:269/455-1989. Cement bags shall be stored by the contractor in a water tight well ventilated store sheds on raised wooden platform/dunnage (raised at least 150 mm above ground level) in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter. Sub-standard or partly set cement shallnot be used and shall be removed from the site by the contractor at his cost on receipt of approval from the Engineer.

C) Coarse Aggregates Stone chips or stone ballast

D) Reinforcement : Different size of reinforcement(MS ROD-FE-500) as per latest IS.

Remarks: All foundation of tower shall be of RCC: M20 Grade (1:1.5:3)nominal mix

General Technical Particulars

C. 1 - Span Lengths

		132Kv
Normal span	m	300
Tower design spans:		
Wind spans: Suspension towers		
Tension towers Maximum weight spans:	mm	300
Suspension towers Tension towers		300
Minimum weight spans: Suspension towers Tension towers (uplift net)	mm	450
	mm	450
		100
		-200

C . 2 - Line Conductor (33 kV Construction)

Complete line conductor:		
Actual area (total) per single conductor	mm ²	288.3
Number of conductors per phase	mm	ONE
Horizontal distance between conductor centres of one phase		-
Each single conductor:		
Equivalent to ACSR conductor of code name		ACSR PANTHER
IEC STANDARD No INDIAN STANDARD No		IEC 1089 IS 398 (Pt 4) 1994
Material of conductor		Aluminium
Number and diameter of wires: Aluminium	No./mm	30/3.0
Total area of conductor	mm ²	261.5
Overall diameter of stranded conductor	mm	21
Mass of conductor per kilometre	kg	974
Ultimate strength of conductor	Newton	89670
Assumed equivalent modulus of elasticity of Conductor	N/mm ²	81580
Assumed equivalent coefficient of linear expansion of conductor	per °C	17.8x 10 ⁻⁶
Maximum length of conductor supplied on one Drum	km	2.4+/-5%

****ALL THE CONDUCTORS ARE ACSR CONDUCTORS HAVING 7 STRANDS OF GI
STEEL WIE**

5 - Earth Wire (33KV Constructions)

		GSW
Complete earth conductor:		
Appropriate Indian Standard No		398(Part-2)
Appropriate British Standard No		183
Material of conductor		galvanised steel
Number and diameter of wires	No./m	7/3.15
	m	
Overall diameter of conductor	mm	9.45
Mass of conductor per kilometre	kg	428
Ultimate strength of conductor	Newto	56000
	n	
Lay length	mm	160 +/- 15
Direction of the lay of the outer layer		Right hand
Chemical composition of the steel wire	%	
Carbon		not more than 0.55
Manganese		0.4 to 0.9
Phosphorous		not more than 0.04
Sulphur		not more than 0.04
Silicon		0.15 to 0.35
Purity of Zinc for galvanising	%	99.95
Galvanising after stranding		
a) Minimum weight of Zinc coating per sq. m. of the uncoated wire surface	gms	240
b) Minimum no. of one minute dips that the galvanised wire can withstand in Standard Preece Test		3 and 1/2
Maximum length of conductor on drum #	km	4 +/- 5%
D.C. resistance at 20 °C	ohms/k	3.375
	m	

C . 28 - Foundation Design Particulars

Assumed density of Plain Cement Concrete (PCC) for foundation in dry soil	kg/m ³	2240
Assumed density of Plain Cement Concrete (PCC) for foundation in presence of sub-soil water	kg/m ³	1240
Assumed density of Re-inforced Cement Concrete (RCC) for foundation in dry soil	kg/m ³	2400
Assumed density of Re-inforced Cement Concrete (RCC) for foundation in presence of sub-soil water	kg/m ³	1400
28 day concrete cube strength (characteristic strength for M-20 concrete)	N/mm ²	20
28 day concrete cube strength (characteristic strength for M-15 concrete)	N/mm ²	15
Minimum proportion of stub load to be allowed for in the design of stub cleats	%	100
Density of all type of soils :		
1) under dry conditions	kg/m ³	1440
2) in presence of surface water	kg/m ³	1440
3) in presence of sub-soil water	kg/m ³	840
Ultimate bearing capacity of the soil :		
1) normal soil under dry condition	kN/m ²	214
2) normal soil in presence of surface as well as sub-soil water	kN/m ²	107
3) wet black cotton soil	kN/m ²	107
4) fissured rock (both for dry and wet)	kN/m ²	400
5) hard rock	kN/m ²	750
Angle of repose for :		
1) dry soil	Degree	30
2) wet soil due to presence of surface/ sub-soil	Degree	15
Water		
3) wet black cotton soil	Degree	0
4) dry fissured rock	Degree	20
5) wet fissured rock	Degree	10
Ultimate bond between steel and concrete	kN/m ²	0.147

Note : All the soil parameters furnished above are subject to verification by actual soil investigations. The Contractor shall be required to carry-out field test for each type of foundation, as per the quoted rates in Price Schedules, to prove the design parameters considered.

The foundation classification criteria shall be as given below, depending upon type of soil and sub-soil water level / presence of surface water :

Normal Dry : To be used for locations where normal dry cohesive or non-cohesive soils are met without encountering sub-soil water table within the depth of foundation.

Wet : To be used for locations,

a) where sub-soil water is met at 1.5 m. or more below the ground level;

b) which are in surface water for long periods with water penetration not exceeding one metre below the ground level e.g. , the paddy field.

Partially Submerged : To be used for the locations where sub-soil water table is met between 0.75 to 1.5 m. below the ground level;

Fully Submerged : To be used for locations where sub-soil water table is met at less than 0.75 m. below the ground level;

Black Cotton Type : To be used at locations where soil is clayey type, not necessarily black in colour, which shrinks when dry and swells when wet, resulting in differential movement. For designing the foundation for such locations, the soil is to be considered as fully submerged.

Fissured Rock : To be used at locations where decomposed or fissured rock, hard gravel, kankar, lime-stone, laterite or any other soil of similar nature is met. Under-cut type foundation is to be used for such locations.

In case of fissured rock locations where water table is met at 1.5 m. or more below ground level, wet type fissured rock foundations shall be adopted.

Hard Rock : To be used for the locations where chiselling, drilling or blasting is required for excavation . For these locations rock anchoring is to be provided to resist the uplift forces

PILE FOUNDATION-

- a) **SCOPE-** The work involved is to take up the pile foundation work of including stub setting of special type tower. The detailed survey, soil investigation and the design has to be done bidder and the design is to be approved by **TPCODL**, which shall be strictly followed by the contractor. The contractor shall cast the foundation including stub setting as per the design, the schedule of quantities enclosed and direction of engineer in charge.
- b) 1. The pile foundation shall be of RCC, Cast-in-situ bored piles as per IS:2911 . Pile boring shall be done using Rotary Hydraulic Rigs. Two stage flushing of pile bore shall be ensured by airlift technique duly approved by the Employer
2. Minimum diameters of piles shall be 450/500mm (for under reamed piles)/ 600 mm (for bored cast in situ piles).
3. Only straight shaft piles shall be used. Minimum cast length of pile above cutoff level shall be 1.0 m.
4. The bidder shall furnish design of piles (in terms of rated capacity, length, diameter, termination criteria to locate the founding level for construction of pile in terms of measurable parameter, reinforcement for job as well as test piles, locations of initial test piles etc.) for Engineer's approval.
5. The piling work shall be carried out in accordance with IS:2911 (Relevant part) and accepted construction methodology. The construction methodology shall be submitted by the Contractor for Engineer's approval.
6. Number of initial load tests to be performed for each diameter and rated capacity of pile shall be subject to minimum as under.
- Vertical
Lateral : Minimum of 2 Nos. in each mode
Uplift
7. The initial pile load test shall be conducted with test load upto three times the estimated pile capacity. In case of compression test (initial test) the method of loading shall be cyclic as per IS:2911 (relevant part).
8. Load test shall be conducted at pile cut of level (COL). If the water table is above the COL the test pit shall be kept dry through out the test period by suitable de-watering methods. Alternatively the vertical load test may be conducted at a level higher than COL. In such a case,an annular space shall be created to remove the effect of skin friction above COL by providingan outer casing of suitable diameter larger than the pile diameter
9. Number of routine pile load tests to be performed for each diameter/allowable capacity of pile shall be as under :
- (i) Vertical : 0.5% of the total number of piles provided.
(ii) Lateral : 0.5% of the total number of piles provided.

10. The routine tests on piles shall be conducted upto test load of one and half times the allowable pile capacity. Piles for routine load tests shall be approved by the Employer.
11. In case, routine pile load test shows that the pile has not achieved the desired capacity or pile(s) have been rejected due to any other reason, then the Contractor shall install additional pile(s) as required and the pile cap design shall accordingly be reviewed and modified, if required.
12. Testing of piles and interpretation of pile load test results shall be carried out as per IS:2911 (Part-4). Contractor shall ensure that all the measuring equipment and instruments are properly calibrated at a reputed laboratory / institute prior to their use. Settlement / movement of the pile top shall be made by Linear Variable Differential Transducers (LVDT) having a least count of 0.01mm.

13. The test load on initial test piles shall be applied by means of reaction from anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge.

14. Low Strain Pile Integrity test shall be conducted on all test piles and job piles. This test shall be used to identify the routine load test and not intended to replace the use of static load test. This test is limited to assess the imperfection of the pile shaft and shall be undertaken by an independent specialist agency. The test equipment shall be of TNO or PDI make or equivalent. The process shall confirm to ASTM.

15. Contribution of frictional resistance of filled up soil if any, shall not be considered for computation of frictional resistance of piles.

16. The following shall be adhered to **PILE FOUNDATION**:

i) The pile foundation shall be of under reamed piles as per IS: 2911 part III or bored cast in situ piles as per IS 2911 part I sec2

ii) The minimum diameter of pile shall be 500 mm in case of under reamed piles and 600 mm in case of bored cast in situ piles.

iii) Under reamed piles shall be adopted only in case of clay black cotton soil or medium dense sandy soil is encountered. Design of under reamed shall be done strictly as per IS 2911 part III.

iv) The bidder shall furnish design of piles (in terms of rated capacity, length, diameter, termination criteria to locate the founding level for construction of pile in terms of measurable parameter, reinforcement for job as well as test piles, locations of initial test piles etc.) for Engineer's approval.

v) The piling work shall be carried out in accordance with IS:2911 (Relevant part) and accepted construction methodology. The construction methodology shall be submitted by the Contractor for Engineer's approval.

vi) Number of initial load tests to be performed for each diameter and rated capacity of pile shall be subject to minimum as under.

Vertical

Lateral

Uplift

Minimum of 2 Nos. in each mode.

vii) The initial pile load test shall be conducted with test load upto three times the estimated pile capacity. In case of compression test (initial test) the method of loading shall be cyclic as per IS:2911 (part IV).

viii) Load test shall be conducted at pile cut of level (COL). If the water table is above the COL the test pit shall be kept dry through out the test period by suitable de-watering methods. Alternatively the vertical load test may be conducted at a level higher than COL. In such a case, an annular space shall be created to remove the effect of skin friction above COL by providing an outer casing of suitable diameter larger than the pile diameter.

ix) Number of routine pile load tests to be performed for each diameter/allowable capacity of pile shall be as under :

i) Vertical : 0.5% of the total number of piles provided.

ii) Lateral : 0.5% of the total number of piles provided.

x) The routine tests on piles shall be conducted upto test load of one and half times the allowable pile capacity. Piles for routine load tests shall be approved by the Employer.

xi) In case, routine pile load test shows that the pile has not achieved the desired capacity or pile(s) have been rejected due to any other reason, then the Contractor shall install additional pile(s) as required and the pile cap design shall accordingly be reviewed and modified, if required.

xii) Testing of piles and interpretation of pile load test results shall be carried out as per IS:2911 (Part-4). Contractor shall ensure that all the measuring equipment and instruments are properly calibrated at a reputed laboratory / institute prior to their use. Settlement / movement of the pile top shall be made by Linear Variable Differential Transducers (LVDT) having a least count of 0.01mm.

xiii) The test load on initial test piles shall be applied by means of reaction from anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge.

xiv) Contribution of frictional resistance of filled up soil if any, shall not be considered for computation of frictional resistance of piles.

a) MATERIALS- Contractor shall supply cement, steel rod and stubs and all other materials required. All coarse aggregates, fine aggregates are to be of very good quality and to be approved by the engineer in charge.

b) Watch and Ward- The cost of watch and ward, site store, making of Islanding/platform for the pile boring, stabilization of bore hole and all other activities incidental to successful construction of the pile foundation are to be included in the cost of the tender and no additional cost shall be paid separately on any additional component.

The cement, steel shall be supplied to the contractor at the nearest store and the contractor shall have to receive the same at designated stores and transport to site at his own cost.

The piling shall be done in presence of the engineer in charge and due certification to be done at the spot only.

Standard followed and to be followed-

Indian Standards(IS)	Title	International and Internationally Recognize Standard/Code
IS:1080-1990	Codes of Practice for Design and Construction of Simple Spread Foundations	
IS: 1498-1992	Classification and Identification of Soils for General Engineering Purposes.	ASTM D 2487/ ASTM D 2488
IS: 1892-1992	Code of Practice For Design and Construction of Foundation in Soils : General Requirements.	
IS: 2131-1992	Method of Standard Penetration Soils	ASTM D 1586
IS: 2132-1992	Code of Practice For Thin Walled Sampling of Soils	ASTM D 1587
IS: 2720-1992	Method of Test For Soils (Relevant Parts).	ASTM D 420
IS: 2809-1991	Glossary of Terms And symbols Relating to Soil Engineering	ASTM D 653
Indian Standards(IS)	Title	International and Internationally

		Recognize Standard/Code
IS: 2911-1980	Code of Practice For Design and Construction of Pile Foundations (Relevant Parts).	
IS: 3025	Methods of Sampling And Testing (Physical And Chemical) for Water used in industry.	
IS: 3043-1991	Code or Practice for Indexing and Storage Of Drill Cores.	
IS: 4091-1987	Code of Practice for Design and Construction Of Foundations for Transmission Line Towers and Poles.	
IS: 4434-1992	Code of Practice for in-situ Vane Shear Test for Soils.	ASTM D 2573/ ASTM D 4648
IS: 4453-1992	Code of Practice for Exploration by Pits, Trenches, Drifts and Shafts.	
IS: 4464-1990	Code of Practice for Presentation of Drilling Information and core Description in Foundation Investigation	
IS: 4968 - (Part-II) – 1992	Method for Subsurface sounding for soils, dynamic method using cone and Bentonite slurry	
IS: 5313-1989	Guide for Core Drilling Observations.	
Indian Standards(IS)	Title	International and Internationally Recognize Standard/Code
IS:6403-1990	Code of Practice for	


	Diamond Core Drilling for Site Investigation for River Valley Projects.	
IS: 6935-1989	Method of Determination of water level in a Bore Hole.	
IS: 7422-1990	Symbols and Abbreviations for use in Geological Maps Sections and subsurface Exploratory Logs (Relevant Parts).	
IS:8009 (Part-I)-1993	Code of Practice for Calculation of Settlements of Foundations (Shallow Foundations subjected to symmetrical Vertical Loads).	
IS:8764-1991	Method of Determination of Point Load Strength Index of Rocks.	
IS: 9179-1991	Method of Determination of Unconfined compressive Strength of Rock Materials.	ASTM D 2938
IS: 9179-1991	Method of Preparation of Rock Specimen for Laboratory Testing.	ASTM D 4543
IS: 9259-1992	Specification for Liquid Limit apparatus.	ASTM D 4318
IS: 9640-1992	Specification for Split Spoon Sampler	ASTM D 1586
IS: 10050-1992	Method of Determination of Slake Durability Index of Rocks.	ASTM D 4644
IS: 11315- (Part-II)-1991	Description of Discontinuities in Rock Mass-Core Recovery	

TESTS

Tests as indicated in this specification and as may be requested by the Owner, shall be conducted. There tests shall include but may not be limited to the following :


- a) Tests of undisturbed and disturbed samples
- Visual and engineering classification;
 - Sleeve analysis and hydrometric analysis;

- Liquid, plastic and shrinkage limits;
- Specific gravity;
- Chemical analysis
- Swell pressure and free swell index determination
- Proctor compaction test.
- b) Tests of undisturbed samples:
 - Bulk density and moisture content;
 - Relative density (for sand),
 - Unconfined compression test;
 - Box shear test (for sand);
 - Tri-axial shear tests (depending on the type of soil and field conditions on undisturbed or remoulded samples):
 - i) Unconsolidated untrained;
 - ii) Consolidated drained test;
 - Consolidation.
- c) Tests on rock samples
 - Visual classification:
 - Moisture content, porosity and density:
 - Specific gravity;
 - Hardness
 - Stake durability;
 - Unconfined compression test (both saturated and at in-situ water content);
 - Point load strength index;
 - Deformability test (both saturated and dry samples)

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1. SCOPE:

- I. 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 Oil immersed, hermetically sealed, naturally cooled, Single Phase 11/0.250 kV, 50Hz, double wound, outdoor conventional type, aluminium winding, Distribution Transformer of 16kVA rating. The Transformer Primary shall be connected across Two Phase (11KV) & on the secondary winding is Single phase (Phase & Neutral).
- II. The transformer shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions specified in clause no. 3
- III. Such of the parts that may have not been specifically included, but otherwise form part of the transformer as per standard trade and/or professional practice and/or are necessary for proper operation of transformer, will be deemed also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. notwithstanding the fact that at the time of an initial offer bidder had segregated such items and quoted for them separately.


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.

Sl.No	IEC/IS	Description
1.	IS 1180- 2014(Part- I)	Outdoor Type Oil Immersed Distribution Transformers Up to and Including 2500KVA
2.	IS- 2026:1977(Part 1 to 5)	Specification of Power Transformers
3.	IS 2099	Specification of high voltage porcelain bushing
4.	IS-104	Ready mixed paint, brushing zinc chromate, priming
5.	IS 649:1997	Testing for steel sheets and strips and magnetic circuits

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6.	IS 9335:1997	Specification for Cellulosic Papers for Electrical Purposes
7.	IS 1576: 1992	Solid Pressboard for Electrical Purposes Specification
8.	IS 3347	Specification for Outdoor Bushings
9.	IS 6162	Paper covered aluminum conductor
10.	IS 3024	Grain Oriented Electrical Steel Sheet and Strip
11.	IS-7421: 1988	Specification for Porcelain Bushings for Alternating Voltages including 1000 V
12.	IS-6600:197	Guide for loading of oil immersed Transformers
13.	IS-2362: 1993	Determination of water content in oil by Karl Fischer Method-Test Method
14.	IS-5561: 1970	Specification for Electric Power Connectors
15.	IS-6103:1971	Specification for Testing of specific resistance of electrical insulating liquids
16.	IS-6262:1971	Method for test of Power Factor and dielectric constant of electrical insulating liquids.
17.	IS-6792:1992	Method for Determination of Electric Strength of Insulating Oil
18.	IS-10028:1981	Code of Practice for selection, installation and maintenance of transformers
19.	IS-335:1985	Specification for Transformer Oil
20.	IS-4257	Dimensions for clamping arrangements for bushings
21.	IS-5484	Specification for Aluminum wire rods
22.	IS-6160	Rectangular electrical conductors for electrical machines
23.	IS- 3401	Specification of Silica Gel
24.	IS-5484	Specification for Aluminum wire rods
25.	IS- 3401	Specification of Silica Gel

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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	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 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:


Sl.No	Description	Requirement
1.	Rated voltage HV (kV)	12
2.	Rated voltage LV (V)	250
3.	Service voltage (KV max.)	11
4.	Rated Line current HV (A)	1.45
5.	Rated Line current LV (A)	64
6.	Frequency (Hz)	50
7.	No. of Phases	Single
8.	Energy Efficiency Level as per IS-1180 (Part-1) 2014; As per Amendment No.4 March 2021	Level-2
9.	Connection HV	Two phase
10.	Connection LV	Single phase (Phase & Neutral)

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11.	Type of cooling	ONAN
12.	Noise level at rated voltage and frequency	48 DB
13.	Winding Material	Aluminium
14.	Insulation Class	A
15.	Capable of Withstanding Pressure	100 Kpa and a Vacuum of 760mm of mercury
16.	Permissible temperature rise over ambient:	
17.	Of top oil measured by thermometer	35° C
18.	Of winding measured by resistance	40° C
19.	Maximum current density (A/mm ²)	1.6
20.	OFF Circuit Tap Changer	No Taps required
21.	Max. Total Losses at 50% loading at 75°C (watts)	63
22.	Max. Total Losses at 100% loading) at 75°C (Watts)	190
23.	Short circuit impedance voltage at 75°C (±10% tolerance)	4%
24.	Bushing Voltage Grade	
25.	(a) HV Bushing	17.5 KV
26.	(b) LV Bushing	1.1 KV
27.	(c) Neutral Bushing at LV Side	1.1 KV
28.	Normal Flux Density (at rated voltage and frequency)	1.6 T
29.	Maximum flux density (Increase of +12.5% combined voltage and frequency variation from rated voltage and frequency)	1.9 T (Max.)
30.	No Load Current at Rated Voltage	2%
31.	No Load Current at 112.5 % Rated Voltage	5%
32.	Impulse withstand voltage	75 kVp
33.	Power frequency withstand voltage	28 kV
34.	Voltage fluctuations permissible	(+12.5% to -12.5%)
35.	Neutral terminal	As per Specification
36.	Minimum clearances in air (mm)	
37.	HV phase to phase/ phase to earth	255 / 140
38.	LV phase to phase/ phase to earth	75 / 40
39.	Minimum clearances in Cable Box (mm)	
40.	HV phase to phase/ phase to earth (Min.)	130 / 80
41.	LV phase to phase/ phase to earth (Min.)	25 / 20
42.	Wheels	NA. These are pole mounted DTs. To be mounted on ISMC

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43.	Efficiency at 75 °C Unity PF	
44.	125% Load	Bidders to Submit
45.	100% Load	Bidders to Submit
46.	75% Load	Bidders to Submit
47.	50% Load	Bidders to Submit
48.	25% Load	Bidders to Submit
49.	Efficiency at 75 °C 0.8 PF	
50.	125% Load	Bidders to Submit
51.	100% Load	Bidders to Submit
52.	75% Load	Bidders to Submit
53.	50% Load	Bidders to Submit
54.	25% Load	Bidders to Submit
55.	Regulation at 75 °C (In %)	
56.	Unity P.F. at 75 deg. C	Bidders to Submit
57.	0.8 P.F. at 75 deg. C	Bidders to Submit
58.	% Impedance at 75 deg. C	
59.	Insulating Material	
60.	HV winding Insulation	Double Paper Covered with min 25% overlap per layer of Paper
61.	LV winding Insulation	Double Paper Covered with min 25% overlap per layer of Paper
62.	HV-LV Insulation	Epoxy diamond dotted Kraft Paper and compressed Pressboard
63.	Oil Specification	
64.	Applicable Standard for Oil	IS 335 2018
65.	Oil Qty	Bidders to Submit
66.	Oil Type	Mineral Oil
67.	Oil Breakdown Voltage	60KV
68.	Buchholz Relay	NO
69.	Tank Thickness	
70.	Top and Bottom	5 mm (Minimum)
71.	Side	3.15 mm (Minimum)
72.	Overall Dimensions of Transformer in mm	
73.	Length	Bidders to Submit
74.	Breadth	Bidders to Submit
75.	Height	Bidders to Submit
76.	Sealing Arrangement	<u>Sealing Provision of transformer:</u> To prevent unauthorized access to Transformer Core and Winding , A hole in exposed threaded part of Transformer Top Cover Bolt on opposite corners to be made. Tamper Seals to be put after Acceptance Test.

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5. GENERAL CONSTRUCTION:

- I. The transformer shall be double wound, aluminium coil, oil immersed, naturally cooled (ONAN) and hermetically sealed type. The Tank construction shall be round type.
- II. The transformer shall be suitable for service with fluctuations in supply voltage up to +12.5% to -12.5%.
- III. The transformer shall be designed suitable for service life of 25 Years.
- IV. The transformer and accessories shall be designed to facilitate trouble free operation, inspection, maintenance and repairs under the various operating and atmospheric conditions specified in clause no. 3. The design shall incorporate every precaution and provision for the safety of the equipment as well as staff engaged in operation and maintenance of the equipment.

All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.


5.1 Core

- I. Transformer core shall be wound type, constructed from high grade cold rolled, non-ageing, grain oriented, silicon steel lamination which shall be properly annealed (under inert atmosphere, if required) to relieve stresses.
- II. The core shall have low loss and good grain properties. It should be coated with hot oil proof insulation, bolted together with frames to prevent vibration and noise.
- III. The core thickness should be 0.23mm. Grade shall be 23HP85 as per IS 3024 or better with Minimum Polarization in Tesla at a Field Strength of 800 A/m.
- IV. All core-clamping bolts (if any) shall be effectively insulated.
- V. Only one grade and one thickness of core shall be accepted and mixing of different grades shall not be allowed.
- VI. The handing of core lamination and stacking should be smooth and uniform.
- VII. The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.
- VIII. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated. The vendor shall submit the calculations in support of the same.
- IX. The transformer shall be suitable for continuous service without damage under over fluxing where the ratio of voltage over frequency exceeds the corresponding ratio at rated voltage and rated frequency up to 12.5% and the core shall not be saturated. The BH graph to be submitted for material.

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- X. The **No-load current shall not exceed 3% of the Full Load Current** and will be measured by energizing the transformer at rated voltage and frequency. **Increase of 12.5% of rated voltage shall not increase the no load current by 5% maximum of full load current.**
- XI. The bidder shall be required to submit the following documents in regard to procurement of core material during stage inspection:
- Invoice of supplier
 - Mill's test certificate
 - Packing list
 - Bill of landing
 - Bill of entry certificate by custom (if required)
 - Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.
- XII. The bidder shall offer the core for inspection and approval of TPCODL during manufacturing stage. Heavy penalty or black listing shall be imposed on the bidders using seconds/defective CRGO sheets i.e. in case of nonconformance w.r.t TPCODL Specifications.
- XIII. The core coil assembly shall have four enclosed (no hook) lifting lugs.


Sr. No.	Magnetizing (no load) current at:	Unit	To be furnished by bidder
1	90% Voltage	%	
2	100 % Voltage	%	
3	112.5% voltage	%	
4	Core grade and make		
5	Thickness of core	mm	
6	Core Diameter	mm	
7	Gross core area	Sq. cm	
8	Net Core area	Sq. cm	
9	Flux Density (calculated)	Tesla	
10	Overfluxing without saturation (BH curve to be submitted)	Tesla	
11	Mass of core		
12	Loss per Kg. of the core at the above specified flux density	Watt	
13	Core window height	mm	
14	Center to center distance of the core	mm	
15	Mass of:		
15.1	Core Lamination (minimum)	kg	
15.2	Windings with insulation (minimum)	kg	
15.3	Tank and fittings	kg	

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15.4	Oil	kg	
15.5	Oil Quantity (minimum)	Ltr	
15.6	Total Weight	kg	
16	Material and their makes offered		Source of material (make and factory location)
16.1	Core laminations		
16.2	Press Boards		
16.3	Kraft paper		


5.2 WINDING

- I. Primary and secondary windings shall be constructed from high- conductivity (aluminium conductors), Double Paper Covered (DPC) aluminium conductor of grade 2 (Al 99.6%) as per IS 5484 with min. **25%** overlap per layer of paper. **Epoxy diamond dotted Kraft paper to be used for DPC conductor all rating.**
- II. The current density for HV and LV winding should not be more than **1.6 Ampere per sq.mm.**
- III. The insulation between core and bolts and core and clamps shall withstand **2.5 kV for one minute.**
- IV. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and pressboard of standard make or any other superior material subject to approval of TPCODL
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard. In case of crossover coil, winding of HV all spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations. Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted as per standards.
- VI. LV winding shall be such that neutral formation is at the top.
- VII. All turns of windings shall be adequately supported to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- VIII. The joints in the winding shall be avoided but if it is necessary then, these shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.

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IX. Provide the conductor size and material grade in below table.

SNo	Insulation materials provided	Unit	To be furnished by bidder
1	For conductors		
1.1	HV		
1.2	LV		
1.3	Core		
2	Material and size of the wire used		
3	HV Conductor Grade		
3.1	Size of HV conductor bare/covered	mm	
3.2	Area of cross section	Sq.mm	
3.3	Conductivity & Purity		
4	LV Conductor Grade		
4.1	Size of LV conductor bare/covered	mm	
4.2	No. of conductors in parallel	Nos.	
4.3	Total area of cross section	Sq.mm	
4.4	Conductivity & Purity		
5	Resistance of windings at 20 deg. C		
5.1	HV windings	Ohms/phase	
5.2	LV windings	Ohms/phase	
5.3	No. of LV Turns		
5.4	No. of HV Turns		
5.5	No. of parallels		
5.6	Current density of LV winding(calculated)	A/sq.mm	
5.7	Current density of HV winding(calculated)	A/sq.mm	
5.8	Wt. of the LV winding copper without insulation	Kg	
5.9	Wt. of the HV winding copper without insulation	Kg	
5.10	No. of LV coils/phase		
5.11	No. of HV coils/phase		
5.12	Height of LV winding	mm	
5.13	Height of HV winding	mm	
5.14	ID/OD of HV winding	mm	
5.15	ID/OD of LV winding	mm	
5.16	Thickness of the duct in LV winding	mm	
5.17	Thickness of the duct in HV winding	mm	
5.18	Thickness of the duct between HV and LV	mm	

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6	Material and their makes offered		Source of Material (Make and factory location)
6.1	Aluminium Conductor		
6.2	Insulating winding wires		

5.3 LOSSES

- I. The bidder shall also guarantee the total loss at 50% and 100% load condition (at rated voltage and frequency and these should be within the limits of maximum total losses declared by TPCODL for both 50% and 100% loading values (as per table below) :


Description	Units	16 KVA
Max. Total Losses at 50% loading at 75°C	Watts	63
Max. Total Losses at 100% loading) at 75°C	Watts	190

No positive tolerance shall be allowed on the losses as mentioned above. However, bidder can offer losses less than specified but no consideration in cost will be given for the same.

- I. The successful bidder shall guarantee the quoted losses for at least five years. If at any point of time during operation if it is found that the total losses at 50% and 100% load are more than the values given in specifications, then bidder shall be liable to pay a fine of Rs 250 per watt to the amount by which losses at 50% loading and 100% loading increase with respect to the values given in specifications.
- II. During testing at Bidder's works if it is found that the actual measured losses are more than the values quoted by the Bidder, TPCODL shall have the right to reject the complete lot.
- III. During testing at Bidder's works, if the temperature rise exceeds the specified values, the entire lot shall be rejected by TPCODL.
- IV. During testing at Bidder's works, if the impedance values differ from the guaranteed values including tolerance, the entire lot shall be rejected by TPCODL.
- V. Transformer losses shall be checked on any one of DT from supplied lot at TPCODL workshop.
- VI. The core of coil assembly shall be provided with four lifting hooks.

5.4 WINDINGS

- 1) Primary and secondary windings shall be constructed from high- conductivity(aluminium conductors), Double Paper Covered (DPC) aluminium conductor of grade 2(Al 99.6%) as per IS 5484 with min. **25% overlap per layer of paper. Epoxy diamond dotted Kraft paper to be used for DPC conductor all rating.**

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- 2) The current density for HV and LV winding should not be more than **1.6 Ampere per sq.mm.**
- 3) The insulation between core and bolts and core and clamps shall withstand **2.5 kV for one minute.**
- 4) Inter layer insulation both for HV and LV windings shall be Epoxy dotted diamond Kraft paper and pressboard of standard make or any other superior material subject to approval of TPCODL
- 5) All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard. In case of cross-over coil winding of HV all spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations. Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted as per standards.
- 6) LV winding shall be such that neutral formation is at the top.
- 7) All turns of windings shall be adequately supported to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- 8) The joints in the winding shall be avoided but if it is necessary then, these shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.
- 9) **Provide the conductor size and material grade in below table.**


Sl.No	Insulation materials provided	Unit	To be furnished by bidder
1	For conductors		
1.1	HV		
1.2	LV		
1.3	Core		
2	Material and size of the wire used		
3	HV Conductor Grade		
3.1	Size of HV conductor bare/covered	mm	
3.2	Area of cross section	Sq.mm	
3.3	Conductivity & Purity		
4	LV Conductor Grade		
4.1	Size of LV conductor bare/covered	mm	
4.2	No. of conductors in parallel	Nos.	
4.3	Total area of cross section	Sq.mm	
4.4	Conductivity & Purity		
5	Resistance of windings at 20		
5.1	HV windings	Ohms/phase	
5.2	LV windings	Ohms/phase	
5.3	No. of LV Turns		
5.4	No. of HV Turns		
5.5	No. of parallels		
5.6	Current density of LV winding(calculated)	A/sq.mm	

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5.7	Current density of HV winding(calculated)	A/sq.mm	
5.8	Wt. of the LV winding copper without insulation	Kg	
5.9	Wt. of the HV winding copper without insulation	Kg	
5.10	No. of LV coils/phase		
5.11	No. of HV coils/phase		
5.12	Height of LV winding	mm	
5.13	Height of HV winding	mm	
5.14	ID/OD of HV winding	mm	
5.15	ID/OD of LV winding	mm	
5.16	Thickness of the duct in LV winding	mm	
5.17	Thickness of the duct in HV winding	mm	
5.18	Thickness of the duct between HV and LV	mm	
6	Material and their makes offered		Source of Material (Make and factory location)
6.1	Aluminium Conductor		
6.2	Insulating winding wires		

5.5 TRANSFORMER TANK AND TANK CONSTRUCTION

I. The transformer tank shall be hermetically sealed, round type and shall be built up of electrically tested welded mild steel plates of thickness 5 mm (min.) for bottom, top, and 3.15 mm (min) for the sides for all the three ratings of distribution transformers. The tolerances as per IS 1852 shall be applicable. The tank shall be fabricated by welding at corners. No horizontal or vertical joints in tank side walls and its bottom or top cover shall be allowed. In addition the cover of the main tank shall be provided with an air release plug. The tank plates shall be of such strength that the complete transformer when filled with oil may be lifted bodily by means of the lifting lugs provided. The top cover shall have no cut at point of lifting lug. The transformer tank covers shall be bolted/clamped alternatively welded with tank rim so as to make a leak proof joint. The transformer tank shall be of adequate mechanical strength to withstand positive and negative pressure built up inside the tank while the transformer is in operation. The tank design shall be such that the core and windings can be


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lifted freely. There shall be no joint at corners and not more than 2 joints in total. Under operating conditions, the pressure generated inside the tank should not exceed 0.4 kg/sq.cm positive or negative. The tank shall be reinforced by welded flats on all the outside walls on the edge of the tank. The permanent deflection when the tank without oil is subjected to a vacuum of 250 mm of mercury for rectangular tank shall not be more than 5mm up to 750mm horizontal length of flat plate and 6.5mm up to 1250mm horizontal length of flat pia . Pressure test shall be performed carefully at the time of 1st stage inspection only to confirm the adequacy of reinforcement angle & gauge of the tank. The tank shall be further capable of withstanding a pressure of 100Kpa and a Vacuum of 760MM of Mercury without any deformation.

- II. The internal clearance of tank shall be such, that it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings. All joints of tank and fittings shall be oil tight and no bulging shall occur during service. Inside of tank shall be painted with hot oil resistant paint. The top cover of the tank shall be slightly sloping to drain rain water approximately 5° to 10° towards HV bushing. The tank cover shall be provided with suitable insulating shrouds on bushing terminals. The tank plate and the lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle. Bidder shall carry out all welding operations as per relevant ASME standards and submit a copy of the welding procedure and welder performance qualification certificates to the Purchaser.
- III. All matching faces of joints be made oil tight with a smooth surface finish to ensure that the gasket material makes a satisfactory joint. Bolts shall be spaced at sufficiently close intervals to avoid buckling of either flange or covers and provide reasonably uniform compression of the gasket. The transformer shall be provided with a minimum of two welded heavy duty closed lifting lugs of MS plate of 8mm thickness suitably reinforced by vertical supporting flat welded edgewise below the lug on the side walls up to reinforcing angle. They shall be so extended that cutting bend plate is not required. The lifting lugs shall be capable of withstanding the total weight of the transformer, fully filled with oil. The transformer shall be provided with four pulling lugs of MS plate of 8mm thick to pull the transformer horizontally.

IV. Bidder shall provide the transformer size and clearances in below table

SNo	Transformer:	Unit	To be furnished by
1	Overall length x Breadth x Height	mm X mm X mm	
2	Only Tank length x breadth x height	mm X mm X mm	
3	Clearances		
3.1	Core and LV	mm	
3.2	LV and HV	mm	
3.3	HV Phase to phase	mm	
3.4	Between HV winding and	mm	
3.5	Between LV winding and	mm	
3.6	Between yoke and inside of tank to cover	mm	

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3.7	Between yoke and bottom	mm	
3.8	Any point of winding to tank	mm	
4	Calculated Impedance	%	
4.1	HV to earth creep age distance in oil	mm	
4.2	LV to earth creep age distance in oil	mm	
5	Material and their makes offered		Source of Material (Make and factory location)
5.1	Tank material		
5.2	Gaskets		
5.3	Paint		

5.6 Lifting Lugs & Mounting Lugs

- 1) The Transformer shall be provided with two permanent lifting lugs (enclosed type) of M S Plate for transformer body.
- 2) The location of the lifting lug such that clearance between lifting chain & nearest part shall be at least 100mm.
- 3) There shall be facilities for lifting the core coil assembly separately.
- 4) The lifting lug shall be capable of withstanding two times weight of the Transformer.
- 5) Calculation sheet for lifting lug design to be submitted by bidder.
- 6) Thickness of MS Plate for lifting lugs shall be minimum 5mm or more as per calculation.
- 7) The Transformer shall be provided with two mounting lugs (made of steel of 5mm thickness) suitable for fixing the transformer to a single pole by means of 2 bolts of 20mm dia. as per the calculation.
- 8) The mounting lug faces should be in one plane.
- 9) Calculation sheet for mounting lug design to be submitted by bidder.

5.7 GASKET

- I. **Cork rubber gaskets** conforming to Type C , grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing & water ingress resistant requirements for components like HV & LV bushings bottom gasket, HV & LV terminal box, Top Cover, Valves etc.
- II. **Nitrile/Neoprene rubber gaskets** conforming to Type IV – 4C (heat and oil resistant) as per IS 11149 shall be provided for bushing O ring (oil gaskets).

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5.8 BUSHING & TERMINAL CONNECTORS

1. HT Bushing (17.5KV/250A)

1. Pole mounted transformers; Outdoor Bushings on Top.


- i. The bushings shall be outdoor type external part shall be made of porcelain material and rods and nuts shall be made of tinned brass material.
- ii. The metal portion of the internal HV & LV bushing inside the tank shall remain dipped in oil in all operating condition.
- iii. IS to be followed: IS 8603(Part- I) and IS 2099 (latest amendment of IS).
- iv. Multiple insulation paper shall be wrapped on multi-strand copper wire which is used inside the bushing. Insulation paper shall withstand for 11 kV class.
- v. The HV Bushings shall be fixed on the top covers.
- vi. The HV Bushing shall have Arcing Horns.
- vii. Connectors shall be provided connected on HV Bushing rods suitable upto Bare conductor in Horizontal / Vertical direction

2. LT Bushing (1KV/250A)

1. The Bushings shall be outdoor type external part shall be made of porcelain material and rods and nuts (Tightening Nut along with check Nut) shall be made of Tinned brass material.
2. IS to be followed IS 3347(Part-1) & IS 7421(latest amendment of IS)
3. LV Bushing shall be provided with Cable Box.

5.9 LV BOX with MCCB

1. LV Box should have made of Mild steel of 2.2mm thickness with suitable handle and front cover shall have anti-theft hinge arrangement with side opening angle of 150degree (min).
Epoxy Insulators shall be provided from top side in LV box to support LV busbar
2. The Box cover shall be with bend edges such that it shall protect the gasket on three sides.
3. Door in Door system to be provided. Small Door shall be designed for MCCB operation only. Both Door shall have rain shed and Magnetic Latch arrangement with Key –locking arrangement.
4. The Single phase MCCB Shall be provided with suitable size of Al bus bar w.r.t minimum current density (calculated) of 1A/ sq. mm inside for further distribution of supply.
5. LV Box shall be IP55 and proper slope shall be provided so that water does not accumulate on cable box and ensure drainage of water.

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6. LV Box shall be fixed on the Tank with minimum 06 nuts & bolts with rubberized cork sheet placed in between them, in such a way that they can be completely removed whenever required.

7. The approved make MCCB's are L&T, Havells, ABB, Siemens, Schneider, Eaton.

8. Arrangement in the BOX shall be N-Ph from left to right when viewed from front.

9. Neutral Bus bar should be extended and taken out (at least 40mm) of box on a bolt of M10, size and it should be insulated from body. Nuts with bimetallic washers shall be provided on it for earthing.

A) 16KVA – 63A, 20KA – 4No's Outgoing.

Gland plate shall be mounted separately with nut bolt arrangement and Gasket in-between them. Gland plate to be provided with half punched / knock out type holes for connecting outgoing cables. Each outgoing cable dia. is 20.5mm. Epoxy insulator shall be provided in the LV Box to support LV Bus bar. Painting of the box should be done as per clause 5.14. Insulated flexible Cu wire with Cu lugs to be used to connect MCCB with both Terminals i.e. phase & neutral.


Nominal size of the cable is as below

- 1) 25Sqmm multi strand Cu cable for 16KVA DT

5.10 Make of the Major component & Material

Sl.no	Raw material/ Equipment	Make
1	MCCB	ABB, Schneider, GE,L&T, Siemens, Havells, C&S
2	Transformer Raw materials	
A.	Copper	M/S Sterlite, M/S Hindustan Copper, M/S Hindalco
B.	Core	M/S A K Steels, M/S POSCO, M/S Kawasaki, M/S JFE, M/S Nippon Steel
C.	Insulation Paper	M/s Raman Boards- Mysore M/s Senapathy Whiteley Pvt Ltd- Bangalore
D.	Transformer Oil	Savita/Apar/Gandhar
E.	Gasket & Corks	Nu Cork, Anchor Corks
F.	Steel for Tank	M/S Tisco, M/S Sail, M/S Bhusan Steel, M/S ISSCO, M/S RINL, M/S Jindal Steel
G.	Bushings HV & LV	GE, Rashtriya Electricals,Hindustan Chemicals, LAMCO


Bidder has to provide all test certificates from original manufacturers & relevant sourcing documents. BA shall also have shot blasting facility.

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5.11 INSULATING PAPER AND INSULATING PRESSBOARD

- I. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and compressed pressboard of make (refer Clause no.5.32) subject to approval of TPCODL
- II. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 25% overlap per layer of paper.
- III. Kraft paper and Pressboard should be made of pure Cellulose from soft wood pulp manufactured from sulphate process. No additive, adhesive or coloring matter shall be present.
- IV. Kraft paper and Pressboard should be of class A (105°C) insulation material.
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard.
- VI. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.
- VII. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr, sharp edges and dimensional variations.
- VIII. Kraft paper self-adhesive tape to be used for bonding of insulating paper layer, spanner and paperboards that are immersed in the oil filled transformer.
- IX. **Below required values could be verified if required at any stage of the inspection and it should fulfill the requirement as per below table:**


Characteristics	Kraft Paper	Pressboard (all Sizes)
1. Dimension	As specified by bidder with $\pm 5\%$ tolerance.	As specified by bidder with tolerance as per IS1576.
2. Apparent Density	$>0.80 \text{ g/cm}^3$	as per IS 1576 w.r.t Thickness
3. pH of Aqueous extract	6-8%	6-8%
4. Electrical strength i) in air ii) In Oil	7KV/mm -----	12KV/mm 35KV/mm
5. Ash content	Maximum 1%	Maximum 0.7
6. Moisture content	Maximum 8%	Maximum 8%
7. Oil absorption	-----	Minimum 9%
8. Heat stability	As per IS 9335-part 3	As per IS 1576
9. Tear index	As per IS 9335-part 3	As per IS 1576

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Bidder has to submit the test certificates as per IS-9335, IS-1576 for all type of insulating materials covering above stated parameters along with **below parameters during stage inspection:**

- a. Substance (Grammage) (g/m³)
- b. Compressibility
- c. Tensile strength
- d. Conductivity of water extract
- e. Shrinkage in air
- f. Flexibility
- g. Cohesion between plies¹.
- h. Elongation
- i. Air permeability
- j. Bidder shall provide the below details in below table**

Sl. No.	Description	Unit	As furnished by bidder
1.	DPC Paper for HV and LV conductors :		
	Type of DPC Paper		
	Make of DPC Paper		
	Thickness DPC Paper	mm	
	Percentage Overlapping (not less than 60%)	%	
2.	Type of Paper for Interlayer Insulation		
	Make of Paper for Interlayer Insulation		
	Thickness of Paper for Interlayer Insulation	mm	
3.	Type of Paper for Insulation Between HV and LV winding		
	Make of Paper for Insulation Between HV and LV winding		
	Thickness of Paper for Insulation Between HV and LV winding (for all sizes)	mm	

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4.	Type of Pressboards used for Insulation Between HV and LV winding		
	Make of Pressboards used for Insulation Between HV and LV winding		
	Thickness of Pressboards for Insulation Between HV and LV winding (all size)	mm	
5.	Type of Paper used for insulation between core and LV		
	Make of Paper used for insulation between core and LV		
	Thickness of Paper used for insulation between core and LV (All sizes)		
6.	Type of Pressboard used for insulation between core and LV		
	Make of Pressboard used for insulation between core and LV		
	Thickness of Pressboard used for insulation between core and LV (All sizes)		
7.	Material used for top and bottom yoke insulation		
	Make of material used for top and bottom yoke insulation		
	Thickness of material used for top and bottom yoke insulation	mm	
8.	Type of material used for Spanner, wedge and Axial for insulation		
	Make of material used for Spanner, wedge and Axial for insulation		
	Thickness of material used for Spanner, wedge and Axial for	mm	

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	insulation (all sizes)		
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5.12 Equalizing / Equipotential Strip

- I. The Transformer top cover shall be connected at two places (diagonally opposite with each other) with the tank by **tinned copper strip (30mm wide, 0.7mm thick)**.
- II. The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip.

5.13 Earthing Connections

The provision for earthing connection shall be provided for 25x6 mm GI strip with insulated mounting support. The bolts shall be located on the lower side of the transformer and be of M12 size for Body earthing. LV neutral bushing provided shall be used for neutral earthing. Transformer top cover shall be connected at two diagonal places with the tank by tinned copper strip.

DRAIN VALVE AND FILTER VALVE

The drain valve & Filter valve shall be of mild steel (M.S.) with Gate Type of Valve.

The drain valve and filter valve shall be provided with embossed nameplate stating drain valve and filter valve. The valves shall be covered with a MS box by welding on tank. Locking rod shall be provided to stop movement of hand wheel.

5.14 Pressure Release Device


1. The Transformer shall be equipped with a self-sealing Pressure Release Device designed to operate at a minimum pressure of 8 PSI (0.564Kg/Sq.cm).
2. The Pressure Release Device shall be provided in the low voltage terminating portion of the tank above top oil level.

5.15 FASTENERS

1. All bolts, studs, screw threads, pipe threads, bolt heads and nut bolts shall comply within the appropriate Indian standards for metric threads. Bolts or studs shall not be less than 6mm in diameter except when used for small wiring terminals.

2. All Nuts/Bolts/Washers exposed to atmosphere shall be as follows:

Size 12MM (or below)	Stainless Steel
Above 12MMS	Steel with antirust coating, Hot Dip Galvanized

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3. All ferrous Bolts, Nuts, Washers placed in outdoor positions shall be Hot Dip Galvanized to prevent corrosion (except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals).
4. In case the galvanization is removed due to welding or manufacturing , the parts should be properly cleaned and painted to avoid exposure to atmosphere.
5. Tapper washers shall be provided where necessary. Protective washers of suitable material shall be provided on front & back of the securing screws.
6. Each bolt shall project atleast one thread but more than three threads through the nut . If Nuts & Bolts are placed so that they are inaccessible by means of ordinary spanners . Special Spanners shall be provided. The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.

5.16 Overloading capacity

The Transformer shall be suitable for loading as per IS:6600

5.17 Oil

All transformers shall be filled to the required level with new, unused, clean, standard mineral oil in compliance with IS 335/ IEC 296 and shall be free from all traces of polychlorinated biphenyl (PCB) compounds. The use of recycled oil is not acceptable. The specific resistance of the oil shall not be less than 2.5×10^{12} ohm-cm at 27°C


When tested as per IS 6103. Oil shall be filtered and tested for break down Voltage (BDV) and moisture content before filling. Oil shall be filled under vacuum. The design and all materials and processes used in the manufacture of the transformer, shall be such as to reduce to a minimum the risk of the development of acidity in the oil.

The Dielectric strength and water content shall meet with given below requirement:

Break Down Voltage (min.)	Water content ppm, (max.)
60	30

5.18 Radio Interference

When operated at voltages up to 12.5% in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.

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5.19 SURFACE PREPARATION AND PAINTING

- I. The paint shall be applied by airless spray.
- II. Steel surfaces shall be prepared by **shot blast cleaning** (IS-9954) to grade Sq.2.5 of ISO 8501-1 or **chemical cleaning** including phosphating of the appropriate quality (IS 3618).
- III. **Heat resistant (Hot oil proof) paint** shall be used for the **inside surface** and whereas for **external surface one coat of thermosetting powder paint or one coat of epoxy primer (zinc chromate) followed by two coats of polyurethane (P.U.) base paint.** as per table given below:

Sl. No	Paint Type	Area to be painted	No. of Coats	Total dry film thickness (min.) (microns)
1.	Thermosetting powder paint	Inside outside	01 01	30 60
2.	Liquid paint a)Epoxy (primer) b)P.U. Paint (Finish coat) c)Hot oil resistant	Outside Outside Inside	01 02 01	30 25 each 35

The two coats shall be of oil and weather-resistant nature with final coat as glossy and non-fading paint of shade 631 as per IS 5.


- IV. The dry film thickness shall not exceed the specified minimum dry film thickness by more than 25%.
- V. Any damaged part shall be cleaned to bare metal with an area extending 25 mm around its boundary. A priming coat shall be immediately applied followed by full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage. The repainted surface shall present a smooth surface which shall be obtained by carefully chamfering the paint edges before and after priming.

Painting shall not be affected by weather changes & performance against pilling out or fading etc. to be guaranteed for 5 Years.

5.20 FITTINGS

The following standard fittings shall be provided:

- a) Two Earthing terminals with the earthing symbol \perp and with lugs
- b) Lifting lugs for complete Transformer.
- c) LV Side earthing arrangement.
- d) HV Bushing with arcing Horns - 17.5KV/250A
- e) LV bushing
- f) Pressure Release Device.
- g) Top cover-fixing clamp

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h) Mounting lugs (2No's) & mounting provision for Transformer.

i) MCCB with Distribution Box

j) Terminal connector for HT & Palm connector for LT Side

6.0 MARKING:

6.1 Marking Plates

1. Name Plate (Rating) Plate:

A rating plate shall be fitted to each transformer in a visible position and shall carry all the information as **specified in clause no. 6.2**

2. Terminal Marking Plate:

- The terminal marking plate shall be provided which shall be strictly in accordance with **figure 4 of IS 1180-Part 1: 2014**. This plate may be combined with the rating plate or can be provided separately.
- Value of short circuit impedance on extreme tapping and on principal tapping and indication of winding to which impedance is related has to be displayed additionally.

3. Details Plate :

A separate plate of **size 125 mm x 125 mm** shall be provided having following details:

- Name of the firm.
- Serial No.
- Rating of transformer
- Order No. and date
- Date of dispatch

4. Guarantee Plate :

A separate warranty plate made of **Stainless Steel** with following clause written on it.


“THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE OF COMMISSIONING OR 60 MONTHS FROM THE DATE OF LAST SUPPLY”

All the plates described above (clause 1 to 4) should be as followings:

Material	Stainless Steel
Thickness	1 mm
Engraving	The letters on the rating plate shall be engraved black on the white/silver back ground
Fixing	Fixing screws shall be of stainless steel.

5. Danger Plate:

Danger notice shall have red lettering on a white background on a plate as specified in **IS: 2551**

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6. BIS Certification Mark:

The Bidder is required to get approval from BIS and display BIS mark on the name plate.

7. BEE LABEL:


A label shall be affixed on the front of the distribution transformer near the name plate, so as to be prominently visible. The label shall be non-detachable weather proof type with the following particulars shall be displayed on its label, namely:

1. the logo of the Bureau of Energy Efficiency
2. that the equipment is a distribution transformer
3. that it is an oil filled, naturally cooled type
4. name of the manufacturer and brand
5. Capacity in KVA as tested
6. Voltage is up to 11 KV
7. Total losses at 50% loading in watts
8. Total losses at 100% loading in watts
9. Star level
10. Model and year of manufacturing.
11. Bureau's authorisation number

6.2 Name Plate Details

The name plate shall be strictly as per **IS 1180: 2014 (figure 1)**. Additionally, following points shall be displayed :

1. Actual no load losses of transformer.
2. Actual total losses of transformer at 50% load and 100% load.
3. Standard mark (BIS certification).
4. "TPCODL" shall be written in bold letters.
5. PO number with date has to be mentioned.
6. Overall dimensions of the transformer.

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7.0 TESTS:

- I. All routine, acceptance & type tests shall be carried out in accordance with the IS 2026 and IS 1180: Part-1 (2014).
- II. All routine tests/ type test shall be witnessed by the TPCODL/his authorized representative as required.
- III. All the components shall also be type tested as per the relevant standards.

Following tests shall be necessarily conducted on the Distribution Transformers in addition to others specified in IS/IEC standards.

7.1 TYPE TESTS

1. Lightning Impulse Test [As per IS 2026 (Part 3) Clause no. 12].
2. Temperature Rise Test [As per IS 2026 (Part 2) Clause no.4]


NOTE: Maximum measured total loss (No load at Rated excitation load loss at maximum current tap converted to 75°C reference temperature) at 100 percent loading shall be supplied during temperature rise test.
3. Short Circuit Withstand test upto 200kVA rating [As per IS 2026 (Part 1) clause no. 16.11 & 2026 part 5].

NOTE: Routine tests before and after short circuit test shall be conducted as per IS 2026(Part 1).
4. Pressure Test [As per IS 1180: Part 1 (2014) clause no. 21.5.1.1].
5. Determination of sound levels at No load [IS 2026 (part 10)].
6. Test to verify IP 55 for cable box. (As per IS 60529 clause 11 to 15)

Note: - Out of the above mention type test, the tests under sl. No. 1, 2 ,3 and 4 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at TPCODL recommended NABL lab.**In-house test labs are accepted if in-house lab is NABL accredited for these tests.**

7.2 ROUTINE TESTS

SI.No	Test to be done	Reference BIS	Clause no.
1	Measurement of Winding Resistance at each tap	IS 2026 (Part 1)	16.2.1 & 16.2.3
2	Measurement of voltage ratio, check of voltage displacement, polarity, phase sequence and vector group	IS 2026 (Part 1)	16.3
3	Measurement of short circuit impedance and load loss at 50% and 100% load	IS 2026 (Part 1)	16.4

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4	Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 112.5% of rated voltage	IS 2026 (Part 1)	16.5
5	Measurement of insulation resistance	IS 2026 (Part 1)	16.6
6	Induced over voltage withstand test	IS 2026 (Part 3)	11
7	Separate Source voltage withstand test	IS 2026 (Part 3)	10
8	Pressure test	IS 1180 (Part 1)	21.5.1.2
9	Oil leakage test	IS 1180 (Part 1)	21.5.1.3
10	BDV and moisture content of oil in transformer (Type-2 oil)	IS 335 (2018)	Table 2

7.3 ACCEPTANCE TESTS

- Temperature Rise Test (on one unit of every release order / PO for each rating) [As per IS 2026 (Part 2) Clause no.4]
- Oil leakage test for acceptance shall be conducted at pressure of 0.35kg/sq.cm for one hour. (IS 1180 (Part 1) clause 21.5.1.3)
- The painted surface shall pass the Cross Adhesion Test (IS1180 part 1 clause no. 21.4.d).
- At stage inspection -Checking of weight, dimensions, fitting and accessories, tank sheet thickness, oil quantity, material finish and workmanship, physical verification of core coil assembly and measurement of flux density on one unit of each rating of the offered lot with reference to the GTP and contract drawings. Oil BDV of all offered lot.
- At least 10% transformer of the offered lot (minimum of one) shall be subjected to all the tests mentioned under the section 'ROUTINE in presence of TPCODL's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS: 1180 and IS: 2026.
- Magnetic Balance Test on HV & LV side, with magnetizing current HV and LV side as per CBIP manual publication no. 317

8.0 TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the Transformer for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI / ERDA** or as defined in 7.1 as per the relevant standards. 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 type tests, if any) not carried out, it shall be carried out without any cost implication to TPCODL.


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9.0 PRE-DISPATCH INSPECTION:


1. Equipment shall be subject to inspection by a duly authorized representative of the TPCODL. 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.
2. 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 supplier of his obligation of furnishing equipment in accordance with the specifications.
3. The BA shall arrange for complete dispatch ready transformer at least 10% of lot during inspection.
4. 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) TPCODL Invoice in duplicate
 - d) Packing list
 - e) Drawings & catalogue
 - f) Guarantee / Warrantee card
 - g) Delivery Challan
 - h) Other Documents (as applicable).
5. To ascertain the quality of the transformer oil, the original manufacturer's tests report shall be submitted at the time of inspection. Arrangements shall also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of TPCODL's representative. In respect of raw material such as core stampings, winding conductors, insulating paper and oil, bidder shall use materials manufactured/supplied_by_standard manufacturers and furnish the nmanufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the purchaser. The bidder shall furnish following documents along with their offer in respect of the raw materials:
 - a) Invoice of supplier
 - b) Mill's certificate
 - c) Packing List
 - d) Bill of Landing
 - e) Bill of entry certificate by custom.
 6. To ensure about the quality of transformers, the inspection shall be carried out by the purchaser's representative at following two stages :-

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- a) Online anytime during receipt of raw material and manufacture/assembly whenever the purchaser desires.
- b) At finished stage, i.e. transformers are fully assembled and are ready for dispatch.
7. Advance intimation of 7 days for Odisha /12 day outside outside Odisha is required for both stage and final inspections.
8. After the main raw material i.e. core and coil material and tanks are arranged and transformers are taken for production on the shop floor and a few assembly have been completed, the Bidder shall intimate the purchaser in this regard, so that an officer for carrying out such inspection could be deputed, as far as possible within seven days from the date of intimation. During the inspection the bidder shall also furnish the information regarding various components used to manufacture the DTs.
9. During the stage inspection a few assembled core shall be dismantled (only in case of CRGO material) to ensure that the CRGO laminations used are of good quality. Further, about the readiness of the transformers, for final inspection for carrying out tests as per relevant IS/IECs shall be sent by the Bidder along with routine test certificates. The inspection shall normally be arranged by the purchaser at the earliest after receipt of offer for pre-delivery inspection.
10. All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer the inspector representing the Purchaser all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage inspection during manufacturing stage as well as Active Inspection during Acceptance Tests.
11. The bidder shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-contractors to ensure the mechanical / electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 90.00.
12. The Purchaser has the right to have the test carried out at his own by an independent agency wherever there is a dispute regarding the quality supplied. Purchaser has right to test 1 % of the supply selected either from the stores or field to check the quality of the product. In case of any deviation purchaser have every right to reject the entire lot or penalize the bidder, which may lead to blacklisting, among other things.
13. TPCODL also reserves the right to inspect the tank of transformer before surface preparation and painting. The same shall be informed to TPCODL accordingly.
14. At the time of inspection the material should be ready as specified, In case of material non readiness or material failure in acceptance, cost of re-inspection shall be borne by bidder.


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10.0 INSPECTION AFTER RECEIPT AT STORE:

1. The material received at the TPCODL store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection.
2. In case the transformers proposed for supply against the order are not exactly as per the tested design, the Bidder shall be required to carry out the short circuit test and impulse voltage withstand test at its own cost in the presence of the representative of TPCODL.
3. The supply shall be accepted only after such test is done successfully, as it confirms on successful withstand of short circuit and healthiness of the active parts thereafter on un-tanking after a short circuit test.
4. Apart from dynamic ability test, the transformers shall also be required to withstand thermal ability test or thermal withstand ability will have to be established by way of calculations
5. TPCODL reserves the right to conduct all tests on Transformer after arrival at site / stores and the manufacturer shall guarantee test certificate figures under actual service conditions.
6. TPCODL reserves the right to conduct short circuit test and impulse voltage withstand test in accordance to IS, afresh on each ordered rating at purchaser cost, even if the transformer of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by TPCODL either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies already made to TPCODL stores. The findings and conclusions of these tests shall be binding on the bidder.

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. In the event any defect is found by the Purchaser 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.
2. 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 TPCODL, failing which the TPCODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPCODL's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.
3. In case of Distribution transformer fails within the guarantee period TPCODL will immediately inform the Bidder who shall take back the failed Distribution Transformer within 15 days from the date of intimation at his own cost and replace / repair the transformer within forty five days of date of

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intimation with a roll over guarantee. The outage period i.e. period from the date of failure till unit is repaired / replaced shall not be counted for arriving at the guarantee period.

4. 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 AND TRANSPORT:

1. Bidder shall ensure that all 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.

Note: One use plastic not to be used for packing of the material. Packing shall be done with environment friendly recyclable materials.

13.0 TENDER SAMPLE:


All offered transformer detailed documents to be submitted as per clause no.18. The sample shall be not applicable

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's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

The following information shall necessarily be submitted with the bid:

- I.
 1. List of important raw materials, names of sub-suppliers for raw materials, standards to which raw material is tested and the copies of test reports of the tests carried out on raw materials in presence of Bidder's representatives.
 2. List of manufacturing facilities available, level of automation achieved and the areas where manual process exists.
 3. List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of these tests and inspections

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4. List of testing equipment for final testing with valid calibration reports. Manufacturer shall possess 0.1 class instruments for measurement of losses.

15.0 TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests, acceptance tests and pre-dispatch inspection as per relevant International / Indian standards.

16.0 MANUFACTURING FACILITIES:

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

- Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document.
- Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment, which shall be 25 years minimum. However, the Purchaser shall be given a minimum of 12 months' notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.
- Any spare 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.

18.0 DRAWINGS AND DOCUMENTS:

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

- Completely filled in compliance to each clause of Technical Specification and any Additional Details and Fittings.
- Description of the transformer and all components drawings.
- General arrangement for Transformer.

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- d. LV terminal box drawing along with CT if applicable and cleat arrangement and gland plate drawing.
- e. Bill of material.
- f. Foundation plans
- g. Experience Certificate and list
- h. Type test certificates.
- i. List of makes of major components as listed above.

Drawings / documents to be submitted for approval after the award of the order within 7 days before mass manufacturing are as under:


List of Drawings/Parameters to be submitted:

1. Clause wise Compliance of the specification
2. General Arrangement Drawing of the Transformer (Front view, Top view and both sides view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
3. Internal Core arrangement drawing.
4. Internal Core-coil assembly drawing.
5. Marking plates and Markings (as mentioned in clause 6)
6. Foundation Plan drawing.
7. HV and LV bushings drawing (with internal view and metal parts)
8. HT connector / LT connector (palm connector), Aluminium Busbar
9. LV Box drawing.
10. BH curve of core material offered
11. Gland Plate for LV box.
12. Prismatic oil level gauge drawing.
13. LV Terminal Box drawing with internal wiring arrangement of bus bar etc.
14. Gland plate
15. Cable cleat arrangement
16. Type Test Certificates.
17. Installation Instructions.
18. Quality Assurance plan.

2. List of Calculations to be submitted:

All the calculations shall be step by step showing the use of formulas and other practical considerations.

Concise calculations in table or excel sheet shall not be accepted. Also, the reference (only standard sources as IS, IEC or any such standard is acceptable) of the formulas shall be mentioned.

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1. Resistance Calculation (75 deg. C)
2. Load Losses Calculation (at 75 deg. C)
3. No load Losses.
4. Stray Losses.
5. Weight of Aluminium (Bare and with Insulation also).
6. Weight of Core.
7. Flux Density calculations.
8. Current Density Calculations.
9. Short Circuit withstand.
10. Temperature Rise Calculations.
11. Cooling Calculations showing cooling with tank and radiators separately with no. of radiators and fins mentioned specifically.


Additional Documents to be Submitted:

- a. List of raw materials as well as bought out accessories and name 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 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.

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19.0 SCHEDULE- “A” GUARANTEED TECHNICAL PARTICULARS:

All clauses and points in the specification to be complied

20.0 SCHEDULE “B” DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

The Bidders, clause by Clause in this schedule, shall set out all deviations from this specification. 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

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1. SCOPE:

- I. 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 Oil immersed, naturally cooled, Single Phase 11/0.250 kV, 50Hz, double wound, outdoor conventional type, aluminium winding, Distribution Transformer of 25kVA rating.
The Transformer Primary shall be connected across Two Phase (11KV) & on the secondary winding is Single phase (Phase & Neutral).
- II. The transformer shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions specified in clause no. 3
- III. Such of the parts that may have not been specifically included, but otherwise form part of the transformer as per standard trade and/or professional practice and/or are necessary for proper operation of transformer, will be deemed also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. notwithstanding the fact that at the time of an initial offer bidder had segregated such items and quoted for them separately.


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.

Sl.No	IEC/IS	Description
1.	IS 1180- 2014(Part- I)	Outdoor Type Oil Immersed Distribution Transformers Up to and Including 2500KVA
2.	IS- 2026:1977(Part 1 to 5)	Specification of Power Transformers
3.	IS 2099	Specification of high voltage porcelain bushing
4.	IS-104	Ready mixed paint, brushing zinc chromate, priming
5.	IS 649:1997	Testing for steel sheets and strips and magnetic circuits
6.	IS 9335:1997	Specification for Cellulosic Papers for Electrical Purposes

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7.	IS 1576: 1992	Solid Pressboard for Electrical Purposes Specification
8.	IS 3347	Specification for Outdoor Bushings
9.	IS 6162	Paper covered aluminum conductor
10.	IS 3024	Grain Oriented Electrical Steel Sheet and Strip
11.	IS-7421: 1988	Specification for Porcelain Bushings for Alternating Voltages including 1000 V
12.	IS-6600:197	Guide for loading of oil immersed Transformers
13.	IS-2362: 1993	Determination of water content in oil by Karl Fischer Method-Test Method
14.	IS-5561: 1970	Specification for Electric Power Connectors
15.	IS-6103:1971	Specification for Testing of specific resistance of electrical insulating liquids
16.	IS-6262:1971	Method for test of Power Factor and dielectric constant of electrical insulating liquids.
17.	IS-6792:1992	Method for Determination of Electric Strength of Insulating Oil
18.	IS-10028:1981	Code of Practice for selection, installation and maintenance of transformers
19.	IS-335:1985	Specification for Transformer Oil
20.	IS-4257	Dimensions for clamping arrangements for bushings
21.	IS-5484	Specification for Aluminum wire rods
22.	IS-6160	Rectangular electrical conductors for electrical machines
23.	IS- 3401	Specification of Silica Gel
24.	IS-5484	Specification for Aluminum wire rods
25.	IS- 3401	Specification of Silica Gel

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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 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:


Sl.No	Description	Requirement
1.	Rated voltage HV (kV)	12
2.	Rated voltage LV (V)	250
3.	Service voltage (KV max.)	11
4.	Rated Line current HV (A)	2.27
5.	Rated Line current LV (A)	100
6.	Frequency (Hz)	50
7.	No. of Phases	Single
8.	Energy Efficiency Level as per IS-1180 (Part-1) 2014; As per Amendment No.4 March 2021	Level-2
9.	Connection HV	Two phase
10.	Connection LV	Single phase (Phase & Neutral)

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11.	Type of cooling	ONAN
12.	Noise level at rated voltage and frequency	48 DB
13.	Winding Material	Aluminium
14.	Insulation Class	A
15.	Capable of Withstanding Pressure	100 Kpa and a Vacuum of 760mm of mercury
16.	Permissible temperature rise over ambient:	
17.	Of top oil measured by thermometer	35° C
18.	Of winding measured by resistance	40° C
19.	Maximum current density (A/mm ²)	1.6
20.	OFF Circuit Tap Changer	No Taps required
21.	Max. Total Losses at 50% loading at 75°C (watts)	95
22.	Max. Total Losses at 100% loading) at 75°C (Watts)	260
23.	Short circuit impedance voltage at 75°C (±10% tolerance)	4%
24.	Bushing Voltage Grade	
25.	(a) HV Bushing	17.5 KV
26.	(b) LV Bushing	1.1 KV
27.	(c) Neutral Bushing at LV Side	1.1 KV
28.	Normal Flux Density (at rated voltage and frequency)	1.6T
29.	Maximum flux density (Increase of +12.5% combined voltage and frequency variation from rated voltage and frequency)	1.9 T (Max.)
30.	No Load Current at Rated Voltage	2%
31.	No Load Current at 112.5 % Rated Voltage	5%
32.	Impulse withstand voltage	75 kVp
33.	Power frequency withstand voltage	28 kV
34.	Voltage fluctuations permissible	(+12.5% to -12.5%)
35.	Neutral terminal	As per Specification
36.	Minimum clearances in air (mm)	
37.	HV phase to phase/ phase to earth	255 / 140
38.	LV phase to phase/ phase to earth	75 / 40
39.	Minimum clearances in Cable Box (mm)	
40.	HV phase to phase/ phase to earth (Min.)	130 / 80
41.	LV phase to phase/ phase to earth (Min.)	25 / 20
42.	Wheels	NA. These are pole mounted DTs. To be mounted on ISMC

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43.	Efficiency at 75 °C Unity PF	
44.	125% Load	Bidders to Submit
45.	100% Load	Bidders to Submit
46.	75% Load	Bidders to Submit
47.	50% Load	Bidders to Submit
48.	25% Load	Bidders to Submit
49.	Efficiency at 75 °C 0.8 PF	
50.	125% Load	Bidders to Submit
51.	100% Load	Bidders to Submit
52.	75% Load	Bidders to Submit
53.	50% Load	Bidders to Submit
54.	25% Load	Bidders to Submit
55.	Regulation at 75 °C (In %)	
56.	Unity P.F. at 75 deg. C	Bidders to Submit
57.	0.8 P.F. at 75 deg. C	Bidders to Submit
58.	% Impedance at 75 deg. C	
59.	Insulating Material	
60.	HV winding Insulation	Double Paper Covered with min 25% overlap per layer of Paper
61.	LV winding Insulation	Double Paper Covered with min 25% overlap per layer of Paper
62.	HV-LV Insulation	Epoxy diamond dotted Kraft Paper and compressed Pressboard
63.	Oil Specification	
64.	Applicable Standard for Oil	IS 335 2018
65.	Oil Qty	Bidders to Submit
66.	Oil Type	Mineral Oil
67.	Oil Breakdown Voltage	60KV
68.	Buchholz Relay	NO
69.	Tank Thickness	
70.	Top and Bottom	5 mm (Minimum)
71.	Side	3.15 mm (Minimum)
72.	Overall Dimensions of Transformer in mm	
73.	Length	Bidders to Submit
74.	Breadth	Bidders to Submit
75.	Height	Bidders to Submit
76.	Sealing Arrangement	<u>Sealing Provision of transformer:</u> To prevent unauthorized access to Transformer Core and Winding , A hole in exposed threaded part of Transformer Top Cover Bolt on opposite corners to be made. Tamper Seals to be put after Acceptance Test.

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5. GENERAL CONSTRUCTION:

- I. The transformer shall be double wound, aluminium coil, oil immersed, naturally cooled (ONAN) and non sealed type. The Tank construction shall be round type.
- II. The transformer shall be suitable for service with fluctuations in supply voltage up to +12.5% to -12.5%.
- III. The transformer and accessories shall be designed to facilitate trouble free operation, inspection, maintenance and repairs under the various operating and atmospheric conditions specified in clause no. 3. The design shall incorporate every precaution and provision for the safety of the equipment as well as staff engaged in operation and maintenance of the equipment.

All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.

5.1 Core

- I. Transformer core shall be wound type, constructed from high grade cold rolled, non-ageing, grain oriented, silicon steel lamination which shall be properly annealed (under inert atmosphere, if required) to relieve stresses.
- II. The core shall have low loss and good grain properties. It should be coated with hot oil proof insulation, bolted together with frames to prevent vibration and noise.
- III. The core thickness should be 0.23mm. Grade shall be 23HP85 as per IS 3024 or better with Minimum Polarization in Tesla at a Field Strength of 800 A/m.
- IV. All core-clamping bolts (if any) shall be effectively insulated.
- V. Only one grade and one thickness of core shall be accepted and mixing of different grades shall not be allowed.
- VI. The handing of core lamination and stacking should be smooth and uniform.
- VII. The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.
- VIII. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated. The vendor shall submit the calculations in support of the same.
- IX. The transformer shall be suitable for continuous service without damage under over fluxing where the ratio of voltage over frequency exceeds the corresponding ratio at rated voltage and rated frequency up to 12.5% and the core shall not be saturated. The BH graph to be submitted for material.
- X. The **No-load current shall not exceed 2% of the Full Load Current** and will be measured by

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energizing the transformer at rated voltage and frequency. **Increase of 12.5% of rated voltage shall not increase the no load current by 5% maximum of full load current.**


XI. The bidder shall be required to submit the following documents in regard to procurement of core material during stage inspection:

- a. Invoice of supplier
- b. Mill's test certificate
- c. Packing list
- d. Bill of landing
- e. Bill of entry certificate by custom (if required)
- f. Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.

XII. The bidder shall offer the core for inspection and approval of TPCODL during manufacturing stage. Heavy penalty or black listing shall be imposed on the bidders using seconds/defective CRGO sheets i.e. in case of nonconformance w.r.t TPCODL Specifications.

XIII. The core coil assembly shall have four enclosed (no hook) lifting lugs.


Sr. No.	Magnetizing (no load) current at:	Unit	To be furnished by bidder
1	90% Voltage	%	
2	100 % Voltage	%	
3	112.5% voltage	%	
4	Core grade and make		
5	Thickness of core	mm	
6	Core Diameter	mm	
7	Gross core area	Sq. cm	
8	Net Core area	Sq. cm	
9	Flux Density (calculated)	Tesla	
10	Overfluxing without saturation (BH curve to be submitted)	Tesla	
11	Mass of core		
12	Loss per Kg. of the core at the above specified flux density	Watt	
13	Core window height	mm	
14	Center to center distance of the core	mm	
15	Mass of:		
15.1	Core Lamination (minimum)	kg	
15.2	Windings with insulation (minimum)	kg	
15.3	Tank and fittings	kg	
15.4	Oil	kg	

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15.5	Oil Quantity (minimum)	Ltr	
15.6	Total Weight	kg	
16	Material and their makes offered		Source of material (make and factory location)
16.1	Core laminations		
16.2	Press Boards		
16.3	Kraft paper		


5.2 WINDING

- I. Primary and secondary windings shall be constructed from high- conductivity (aluminium conductors), Double Paper Covered (DPC) aluminium conductor of grade 2(Al 99.6%) as per IS 5484 with min. **25%** overlap per layer of paper. **Epoxy diamond dotted Kraft paper to be used for DPC conductor all rating.**
- II. The current density for HV and LV winding should not be more than **1.6 Ampere per sq.mm.**
- III. The insulation between core and bolts and core and clamps shall withstand **2.5 kV for one minute.**
- IV. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and pressboard of standard make or any other superior material subject to approval of TPCODL
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard. In case of crossover coil, winding of HV all spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations. Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted as per standards.
- VI. LV winding shall be such that neutral formation is at the top.
- VII. All turns of windings shall be adequately supported to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- VIII. The joints in the winding shall be avoided but if it is necessary then, these shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.

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IX. Provide the conductor size and material grade in below table.

SNo	Insulation materials provided	Unit	To be furnished by bidder
1	For conductors		
1.1	HV		
1.2	LV		
1.3	Core		
2	Material and size of the wire used		
3	HV Conductor Grade		
3.1	Size of HV conductor bare/covered	mm	
3.2	Area of cross section	Sq.mm	
3.3	Conductivity & Purity		
4	LV Conductor Grade		
4.1	Size of LV conductor bare/covered	mm	
4.2	No. of conductors in parallel	Nos.	
4.3	Total area of cross section	Sq.mm	
4.4	Conductivity & Purity		
5	Resistance of windings at 20 deg. C		
5.1	HV windings	Ohms/phase	
5.2	LV windings	Ohms/phase	
5.3	No. of LV Turns		
5.4	No. of HV Turns		
5.5	No. of parallels		
5.6	Current density of LV winding(calculated)	A/sq.mm	
5.7	Current density of HV winding(calculated)	A/sq.mm	
5.8	Wt. of the LV winding copper without insulation	Kg	
5.9	Wt. of the HV winding copper without insulation	Kg	
5.10	No. of LV coils/phase		
5.11	No. of HV coils/phase		
5.12	Height of LV winding	mm	
5.13	Height of HV winding	mm	
5.14	ID/OD of HV winding	mm	
5.15	ID/OD of LV winding	mm	
5.16	Thickness of the duct in LV winding	mm	
5.17	Thickness of the duct in HV winding	mm	
5.18	Thickness of the duct between HV and LV	mm	

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6	Material and their makes offered		Source of Material (Make and factory location)
6.1	Aluminium Conductor		
6.2	Insulating winding wires		

5.3 LOSSES

I. The bidder shall also guarantee the total loss at 50% and 100% load condition (at rated voltage and frequency and these should be within the limits of maximum total losses declared by TPCODL for both 50% and 100% loading values (as per table below) :


Description	Units	25 KVA
Max. Total Losses at 50% loading at 75°C	Watts	95
Max. Total Losses at 100% loading) at 75°C	Watts	260

No positive tolerance shall be allowed on the losses as mentioned above. However, bidder can offer losses less than specified but no consideration in cost will be given for the same.

- I. The successful bidder shall guarantee the quoted losses for at least five years. If at any point of time during operation if it is found that the total losses at 50% and 100% load are more than the values given in specifications, then bidder shall be liable to pay a fine of Rs 250 per watt to the amount by which losses at 50% loading and 100% loading increase with respect to the values given in specifications.
- II. During testing at Bidder's works if it is found that the actual measured losses are more than the values quoted by the Bidder, TPCODL shall have the right to reject the complete lot.
- III. During testing at Bidder's works, if the temperature rise exceeds the specified values, the entire lot shall be rejected by TPCODL.
- IV. During testing at Bidder's works, if the impedance values differ from the guaranteed values including tolerance, the entire lot shall be rejected by TPCODL.
- V. Transformer losses shall be checked on any one of DT from supplied lot at TPCODL workshop.
- VI. The core of coil assembly shall be provided with four lifting hooks.


5.4 WINDINGS

- 1) Primary and secondary windings shall be constructed from high- conductivity(aluminium conductors), Double Paper Covered (DPC) aluminium conductor of grade 2(Al 99.6%) as per IS 5484 with min. **25% overlap per layer of paper. Epoxy diamond dotted Kraft paper to be used for DPC conductor all rating.**

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- 2) The current density for HV and LV winding should not be more than **1.6 Ampere per sq.mm.**
- 3) The insulation between core and bolts and core and clamps shall withstand **2.5 kV for one minute.**
- 4) Inter layer insulation both for HV and LV windings shall be Epoxy dotted diamond Kraft paper and pressboard of standard make or any other superior material subject to approval of TPCODL
- 5) All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard. In case of cross-over coil winding of HV all spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations. Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted as per standards.
- 6) LV winding shall be such that neutral formation is at the top.
- 7) All turns of windings shall be adequately supported to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- 8) The joints in the winding shall be avoided but if it is necessary then, these shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.
- 9) **Provide the conductor size and material grade in below table.**


Sl.No	Insulation materials provided	Unit	To be furnished by bidder
1	For conductors		
1.1	HV		
1.2	LV		
1.3	Core		
2	Material and size of the wire used		
3	HV Conductor Grade		
3.1	Size of HV conductor bare/covered	mm	
3.2	Area of cross section	Sq.mm	
3.3	Conductivity & Purity		
4	LV Conductor Grade		
4.1	Size of LV conductor bare/covered	mm	
4.2	No. of conductors in parallel	Nos.	
4.3	Total area of cross section	Sq.mm	
4.4	Conductivity & Purity		
5	Resistance of windings at 20		
5.1	HV windings	Ohms/phase	
5.2	LV windings	Ohms/phase	
5.3	No. of LV Turns		
5.4	No. of HV Turns		
5.5	No. of parallels		
5.6	Current density of LV winding(calculated)	A/sq.mm	

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5.7	Current density of HV winding(calculated)	A/sq.mm	
5.8	Wt. of the LV winding copper without insulation	Kg	
5.9	Wt. of the HV winding copper without insulation	Kg	
5.10	No. of LV coils/phase		
5.11	No. of HV coils/phase		
5.12	Height of LV winding	mm	
5.13	Height of HV winding	mm	
5.14	ID/OD of HV winding	mm	
5.15	ID/OD of LV winding	mm	
5.16	Thickness of the duct in LV winding	mm	
5.17	Thickness of the duct in HV winding	mm	
5.18	Thickness of the duct between HV and LV	mm	
6	Material and their makes offered		Source of Material (Make and factory location)
6.1	Aluminium Conductor		
6.2	Insulating winding wires		

5.5 TRANSFORMER TANK AND TANK CONSTRUCTION

I.The transformer tank shall be hermetically sealed, round type and shall be built up of electrically tested welded mild steel plates of thickness **5 mm (min.) for bottom, top, and 3.15 mm (min)** for the sides. The tolerances as per IS 1852 shall be applicable. The tank shall be fabricated by welding at ends of a round tank. No horizontal or vertical joints in tank side walls and its bottom or top cover shall be allowed. In addition the cover of the main tank shall be provided with an air release plug. The tank plates shall be of such strength that the complete transformer when filled with oil may be lifted bodily by means of the 5MM thickness lifting lugs provided. The top cover shall have no cut at point of lifting lug. The transformer tank covers shall be bolted/clamped alternatively welded with tank rim so as to make a leak proof joint. The transformer tank shall be of adequate mechanical strength to withstand positive' and negative pressure built up inside the tank while the transformer is in operation. The tank design shall be such that the core and windings can be lifted freely.


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There shall be no not more than 2 joints in total. Under operating conditions, the pressure generated inside the tank should not exceed 0.4 kg/sq.cm positive or negative. The tank shall be reinforced by welded flats on all the outside walls on the edge of the tank. The permanent deflection when the tank without oil is subjected to a vacuum of 250 mm of mercury for rectangular tank shall not be more than 5mm up to 750mm horizontal length of flat plate and 6.5mm up to 1250mm horizontal length of flat. Pressure test shall be performed carefully at the time of 1st stage inspection only to confirm the adequacy of reinforcement angle & gauge of the tank. The tank shall be further capable of withstanding a pressure of 100Kpa and a Vacuum of 760MM of Mercury without any deformation.

- II. The internal clearance of tank shall be such, that it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings. All joints of tank and fittings shall be oil tight and no bulging shall occur during service. Inside of tank shall be painted with hot oil resistant paint. The top cover of the tank shall be slightly sloping to drain rain water approximately 5° to 10° towards HV bushing. The tank cover shall be provided with suitable insulating shrouds on bushing terminals. The tank plate and the lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle. Bidder shall carry out all welding operations as per relevant ASME standards and submit a copy of the welding procedure and welder performance qualification certificates to the Purchaser.
- III. All matching faces of joints be made oil tight with a smooth surface finish to ensure that the gasket material makes a satisfactory joint. Bolts shall be spaced at sufficiently close intervals to avoid buckling of either flange or covers and provide reasonably uniform compression of the gasket. The transformer shall be provided with a minimum of two welded heavy duty closed lifting lugs of MS plate of 8mm thickness suitably reinforced by vertical supporting flat welded edgewise below the lug on the side walls up to reinforcing angle. They shall be so extended that cutting bend plate is not required. The lifting lugs shall be capable of withstanding the total weight of the transformer, fully filled with oil. The transformer shall be provided with four pulling lugs of MS plate of 8mm thick to pull the transformer horizontally.

IV. Bidder shall provide the transformer size and clearances in below table

SNo	Transformer:	Unit	To be furnished by
1	Overall length x Breadth x Height	mm X mm X mm	
2	Only Tank length x breadth x height	mm X mm X mm	
3	Clearances		
3.1	Core and LV	mm	
3.2	LV and HV	mm	
3.3	HV Phase to phase	mm	
3.4	Between HV winding and	mm	
3.5	Between LV winding and	mm	
3.6	Between yoke and inside of tank to cover	mm	

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3.7	Between yoke and bottom	mm	
3.8	Any point of winding to tank	mm	
4	Calculated Impedance	%	
4.1	HV to earth creep age distance in oil	mm	
4.2	LV to earth creep age distance in oil	mm	
5	Material and their makes offered		Source of Material (Make and factory location)
5.1	Tank material		
5.2	Gaskets		
5.3	Paint		

5.6 Lifting Lugs & Mounting Lugs

- 1) The Transformer shall be provided with two permanent lifting lugs (enclosed type) of M S Plate for transformer body.
- 2) The location of the lifting lug such that clearance between lifting chain & nearest part shall be at least 100mm.
- 3) There shall be facilities for lifting the core coil assembly separately.
- 4) The lifting lug shall be capable of withstanding two times weight of the Transformer.
- 5) Calculation sheet for lifting lug design to be submitted by bidder.
- 6) Thickness of MS Plate for lifting lugs shall be minimum 5mm or more as per calculation.
- 7) The Transformer shall be provided with two mounting lugs (made of steel of 5mm thickness) suitable for fixing the transformer to a single pole by means of 2 bolts of 20mm dia. as per the calculation.
- 8) The mounting lug faces should be in one plane.
- 9) **Calculation sheet for mounting lug design to be submitted by bidder.**

5.7 GASKET

- I. **Cork rubber gaskets** conforming to Type C , grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing & water ingress resistant requirements for components like HV & LV bushings bottom gasket, HV & LV terminal box, Top Cover, Valves etc.
- II. **Nitrile/Neoprene rubber gaskets** conforming to Type IV – 4C (heat and oil resistant) as per IS 11149 shall be provided for bushing O ring (oil gaskets).

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5.8 BUSHING & TERMINAL CONNECTORS

1. HT Bushing (17.5KV/250A)

1. Pole mounted transformers; Outdoor Bushings on Top.


- i. The bushings shall be outdoor type external part shall be made of porcelain material and rods and nuts shall be made of tinned brass material.
- ii. The metal portion of the internal HV & LV bushing inside the tank shall remain dipped in oil in all operating condition.
- iii. IS to be followed: IS 8603(Part- I) and IS 2099 (latest amendment of IS).
- iv. Multiple insulation paper shall be wrapped on multi-strand copper wire which is used inside the bushing. Insulation paper shall withstand for 11 kV class.
- v. The HV Bushings shall be fixed on the top covers.
- vi. The HV Bushing shall have Arcing Horns.
- vii. Connectors shall be provided connected on HV Bushing rods suitable upto Bare conductor in Horizontal / Vertical direction

2. LT Bushing (1KV/250A)

1. The Bushings shall be outdoor type external part shall be made of porcelain material and rods and nuts (Tightening Nut along with check Nut) shall be made of Tinned brass material.
2. IS to be followed IS 3347(Part-1) & IS 7421(latest amendment of IS)
3. LV Bushing shall be provided with Cable Box.

5.9 LV BOX with MCCB

1. LV Box should have made of Mild steel of 2.2mm thickness with suitable handle and front cover shall have anti-theft hinge arrangement with side opening angle of 150degree (min).
2. The Box cover shall be with bend edges such that it shall protect the gasket on three sides.
3. Door in Door system to be provided. Small Door shall be designed for MCCB operation only. Both Door shall have rain shed and Magnetic Latch arrangement with Key –locking arrangement.
4. The Single phase MCCB Shall be provided with suitable size of Al bus bar w.r.t minimum current density (calculated) of 1A/ sq. mm inside for further distribution of supply.`
5. LV Box shall be IP55 and proper slope shall be provided so that water does not accumulate on cable box and ensure drainage of water.
6. LV Box shall be fixed on the Tank with minimum 06 nuts & bolts with rubberized cork sheet placed in between them, in such a way that they can be completely removed whenever required.

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7. The approved make MCCB's are L&T, Havells, ABB, Siemens, Schneider, EATON.
8. Arrangement in the BOX shall be N-Ph from left to right when viewed from front.
9. Neutral Bus bar should be extended and taken out (at least 40mm) of box on a bolt of M10, size and it should be insulated from body. Nuts with bimetallic washers shall be provided on it for earthing.

A) 25KVA – 125A, 20KA – 8No's Outgoing.

Gland plate shall be mounted separately with nut bolt arrangement and Gasket in-between them. Gland plate to be provided with half punched / knock out type holes for connecting outgoing cables. Each outgoing cable dia. is 20.5mm. Epoxy insulator shall be provided in the LV Box to support LV Bus bar. Painting of the box should be done as per clause 5.14. Insulated flexible Cu wire with Cu lugs to be used to connect MCCB with both Terminals i.e. phase & neutral.


Nominal size of the cable is as below

- 1) 35sqmm multi strand Cu cable for 25KVA DT

5.10 Make of the Major component & Material

Sl.no	Raw material/ Equipment	Make
1	MCCB	ABB, Schneider, GE,L&T, Siemens, Havells, C&S
2	Transformer Raw materials	
A.	Copper	M/S Sterlite, M/S Hindustan Copper, M/S Hindalco
B.	Core	M/S A K Steels, M/S POSCO, M/S Kawasaki, M/S JFE, M/S Nippon Steel
C.	Insulation Paper	M/s Raman Boards- Mysore M/s Senapathy Whiteley Pvt Ltd- Bangalore
D.	Transformer Oil	Savita/Apar/Gandhar
E.	Gasket & Corks	Nu Cork, Anchor Corks
F.	Steel for Tank	M/S Tisco, M/S Sail, M/S Bhusan Steel, M/S ISSCO, M/S RINL, M/S Jindal Steel
G.	Bushings HV & LV	GE, Rashtriya Electricals,Hindustan Chemicals, LAMCO


Bidder has to provide all test certificates from original manufacturers & relevant sourcing documents. BA shall also have shot blasting facility.

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5.11 INSULATING PAPER AND INSULATING PRESSBOARD

- I. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and compressed pressboard of make (refer Clause no.5.32) subject to approval of TPCODL
- II. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 25% overlap per layer of paper.
- III. Kraft paper and Pressboard should be made of pure Cellulose from soft wood pulp manufactured from sulphate process. No additive, adhesive or coloring matter shall be present.
- IV. Kraft paper and Pressboard should be of class A (105°C) insulation material.
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard.
- VI. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.
- VII. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr, sharp edges and dimensional variations.
- VIII. Kraft paper self-adhesive tape to be used for bonding of insulating paper layer, spanner and paperboards that are immersed in the oil filled transformer.
- IX. **Below required values could be verified if required at any stage of the inspection and it should fulfill the requirement as per below table:**


Characteristics	Kraft Paper	Pressboard (all Sizes)
1. Dimension	As specified by bidder with $\pm 5\%$ tolerance.	As specified by bidder with tolerance as per IS1576.
2. Apparent Density	$>0.80 \text{ g/cm}^3$	as per IS 1576 w.r.t Thickness
3. pH of Aqueous extract	6-8%	6-8%
4. Electrical strength i) in air ii) In Oil	7KV/mm -----	12KV/mm 35KV/mm
5. Ash content	Maximum 1%	Maximum 0.7
6. Moisture content	Maximum 8%	Maximum 8%
7. Oil absorption	-----	Minimum 9%
8. Heat stability	As per IS 9335-part 3	As per IS 1576
9. Tear index	As per IS 9335-part 3	As per IS 1576

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Bidder has to submit the test certificates as per IS-9335, IS-1576 for all type of insulating materials covering above stated parameters along with **below parameters during stage inspection:**

- a. Substance (Grammage) (g/m³)
- b. Compressibility
- c. Tensile strength
- d. Conductivity of water extract
- e. Shrinkage in air
- f. Flexibility
- g. Cohesion between plies¹.
- h. Elongation
- i. Air permeability
- j. Bidder shall provide the below details in below table**

Sl. No.	Description	Unit	As furnished by bidder
1.	DPC Paper for HV and LV conductors :		
	Type of DPC Paper		
	Make of DPC Paper		
	Thickness DPC Paper	mm	
	Percentage Overlapping (not less than 60%)	%	
2.	Type of Paper for Interlayer Insulation		
	Make of Paper for Interlayer Insulation		
	Thickness of Paper for Interlayer Insulation	mm	
3.	Type of Paper for Insulation Between HV and LV winding		
	Make of Paper for Insulation Between HV and LV winding		
	Thickness of Paper for Insulation Between HV and LV winding (for all sizes)	mm	
4.	Type of Pressboards used for Insulation Between HV and LV		

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	winding		
	Make of Pressboards used for Insulation Between HV and LV winding		
	Thickness of Pressboards for Insulation Between HV and LV winding (all size)	mm	
5.	Type of Paper used for insulation between core and LV		
	Make of Paper used for insulation between core and LV		
	Thickness of Paper used for insulation between core and LV (All sizes)		
6.	Type of Pressboard used for insulation between core and LV		
	Make of Pressboard used for insulation between core and LV		
	Thickness of Pressboard used for insulation between core and LV (All sizes)		
7.	Material used for top and bottom yoke insulation		
	Make of material used for top and bottom yoke insulation		
	Thickness of material used for top and bottom yoke insulation	mm	
8.	Type of material used for Spanner, wedge and Axial for insulation		
	Make of material used for Spanner, wedge and Axial for insulation		
	Thickness of material used for Spanner, wedge and Axial for insulation (all sizes)	mm	

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5.12 Equalizing / Equipotential Strip

- I. The Transformer top cover shall be connected at two places (diagonally opposite with each other) with the tank by **tinned copper strip (30mm wide, 0.7mm thick)**.
- II. The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip.

5.13 Earthing Connections

The provision for earthing connection shall be provided for 25x6 mm GI strip with insulated mounting support. The bolts shall be located on the lower side of the transformer and be of M12 size for Body earthing. LV neutral bushing provided shall be used for neutral earthing. Transformer top cover shall be connected at two diagonal places with the tank by tinned copper strip.

DRAIN VALVE AND FILTER VALVE

The drain valve & Filter valve shall be of mild steel (M.S.) with Gate Type of Valve.

The drain valve and filter valve shall be provided with embossed nameplate stating drain valve and filter valve. The valves shall be covered with a MS box by welding on tank. Locking rod shall be provided to stop movement of hand wheel.

5.14 Pressure Release Device


1. The Transformer shall be equipped with a self-sealing Pressure Release Device designed to operate at a minimum pressure of 8 PSI (0.564Kg/Sq.cm).
2. The Pressure Release Device shall be provided in the low voltage terminating portion of the tank above top oil level.

5.15 FASTENERS

1. All bolts, studs, screw threads, pipe threads, bolt heads and nut bolts shall comply within the appropriate Indian standards for metric threads. Bolts or studs shall not be less than 6mm in diameter except when used for small wiring terminals.

2. All Nuts/Bolts/Washers exposed to atmosphere shall be as follows:

Size 12MM (or below)	Stainless Steel
Above 12MMS	Steel with antirust coating, Hot Dip Galvanized

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3. All ferrous Bolts, Nuts, Washers placed in outdoor positions shall be Hot Dip Galvanized to prevent corrosion (except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals).
4. In case the galvanization is removed due to welding or manufacturing , the parts should be properly cleaned and painted to avoid exposure to atmosphere.
5. Tapper washers shall be provided where necessary. Protective washers of suitable material shall be provided on front & back of the securing screws.
6. Each bolt shall project atleast one thread but more than three threads through the nut . If Nuts & Bolts are placed so that they are inaccessible by means of ordinary spanners . Special Spanners shall be provided. The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.

5.16 Overloading capacity

The Transformer shall be suitable for loading as per IS:6600

5.17 Oil

All transformers shall be filled to the required level with new, unused, clean, standard mineral oil in compliance with IS 335/ IEC 296 and shall be free from all traces of polychlorinated biphenyl (PCB) compounds. The use of recycled oil is not acceptable. The specific resistance of the oil shall not be less than 2.5×10^{12} ohm-cm at 27°C


When tested as per IS 6103. Oil shall be filtered and tested for break down Voltage (BDV) and moisture content before filling. Oil shall be filled under vacuum. The design and all materials and processes used in the manufacture of the transformer, shall be such as to reduce to a minimum the risk of the development of acidity in the oil.

The Dielectric strength and water content shall meet with given below requirement:

Break Down Voltage (min.)	Water content ppm, (max.)
60	30

5.18 Radio Interference

When operated at voltages up to 12.5% in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.

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5.19 SURFACE PREPARATION AND PAINTING

- I. The paint shall be applied by airless spray.
- II. Steel surfaces shall be prepared by **shot blast cleaning** (IS-9954) to grade Sq.2.5 of ISO 8501-1 or **chemical cleaning** including phosphating of the appropriate quality (IS 3618).
- III. **Heat resistant (Hot oil proof) paint** shall be used for the **inside surface** and whereas for **external surface one coat of thermosetting powder paint or one coat of epoxy primer (zinc chromate) followed by two coats of polyurethane (P.U.) base paint.** as per table given below:

Sl. No	Paint Type	Area to be painted	No. of Coats	Total dry film thickness (min.) (microns)
1.	Thermosetting powder paint	Inside outside	01 01	30 60
2.	Liquid paint a)Epoxy (primer) b)P.U. Paint (Finish coat) c)Hot oil resistant	Outside Outside Inside	01 02 01	30 25 each 35

The two coats shall be of oil and weather-resistant nature with final coat as glossy and non-fading paint of shade 631 as per IS 5.


- IV. The dry film thickness shall not exceed the specified minimum dry film thickness by more than 25%.
- V. Any damaged part shall be cleaned to bare metal with an area extending 25 mm around its boundary. A priming coat shall be immediately applied followed by full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage. The repainted surface shall present a smooth surface which shall be obtained by carefully chamfering the paint edges before and after priming.

Painting shall not be affected by weather changes & performance against pilling out or fading etc. to be guaranteed for 5 Years.

5.20 FITTINGS

The following standard fittings shall be provided:

- a) Two Earthing terminals with the earthing symbol \perp and with lugs
- b) Lifting lugs for complete Transformer.
- c) LV Side earthing arrangement.
- d) HV Bushing with arcing Horns - 17.5KV/250A
- e) LV bushing
- f) Pressure Release Device.
- g) Top cover-fixing clamp

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h) Mounting lugs (2No's) & mounting provision for Transformer.

i) MCCB with Distribution Box

j) Terminal connector for HT & Palm connector for LT Side

6.0 MARKING:

6.1 Marking Plates

1. Name Plate (Rating) Plate:

A rating plate shall be fitted to each transformer in a visible position and shall carry all the information as **specified in clause no. 6.2**

2. Terminal Marking Plate:

- The terminal marking plate shall be provided which shall be strictly in accordance with **figure 4 of IS 1180-Part 1: 2014**. This plate may be combined with the rating plate or can be provided separately.
- Value of short circuit impedance on extreme tapping and on principal tapping and indication of winding to which impedance is related has to be displayed additionally.

3. Details Plate :

A separate plate of **size 125 mm x 125 mm** shall be provided having following details:

- Name of the firm.
- Serial No.
- Rating of transformer
- Order No. and date
- Date of dispatch

4. Guarantee Plate :

A separate warranty plate made of **Stainless Steel** with following clause written on it.


“THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE OF COMMISSIONING OR 60 MONTHS FROM THE DATE OF LAST SUPPLY”

All the plates described above (clause 1 to 4) should be as followings:

Material	Stainless Steel
Thickness	1 mm
Engraving	The letters on the rating plate shall be engraved black on the white/silver back ground
Fixing	Fixing screws shall be of stainless steel.

5. Danger Plate:

Danger notice shall have red lettering on a white background on a plate as specified in **IS: 2551**

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6. BIS Certification Mark:

The Bidder is required to get approval from BIS and display BIS mark on the name plate.

7. BEE LABEL:


A label shall be affixed on the front of the distribution transformer near the name plate, so as to be prominently visible. The label shall be non-detachable weather proof type with the following particulars shall be displayed on its label, namely:

1. the logo of the Bureau of Energy Efficiency
2. that the equipment is a distribution transformer
3. that it is an oil filled, naturally cooled type
4. name of the manufacturer and brand
5. Capacity in KVA as tested
6. Voltage is up to 11 KV
7. Total losses at 50% loading in watts
8. Total losses at 100% loading in watts
9. Star level
10. Model and year of manufacturing.
11. Bureau's authorisation number

6.2 Name Plate Details

The name plate shall be strictly as per **IS 1180: 2014 (figure 1)**. Additionally, following points shall be displayed :

1. Actual no load losses of transformer.
2. Actual total losses of transformer at 50% load and 100% load.
3. Standard mark (BIS certification).
4. "TPCODL" shall be written in bold letters.
5. PO number with date has to be mentioned.
6. Overall dimensions of the transformer.

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7.0 TESTS:

- I. All routine, acceptance & type tests shall be carried out in accordance with the IS 2026 and IS 1180: Part-1 (2014).
- II. All routine tests/ type test shall be witnessed by the TPCODL/his authorized representative as required.
- III. All the components shall also be type tested as per the relevant standards.

Following tests shall be necessarily conducted on the Distribution Transformers in addition to others specified in IS/IEC standards.

7.1 TYPE TESTS

1. Lightning Impulse Test [As per IS 2026 (Part 3) Clause no. 12].
2. Temperature Rise Test [As per IS 2026 (Part 2) Clause no.4]


NOTE: Maximum measured total loss (No load at Rated excitation load loss at maximum current tap converted to 75°C reference temperature) at 100 percent loading shall be supplied during temperature rise test.
3. Short Circuit Withstand test upto 200kVA rating [As per IS 2026 (Part 1) clause no. 16.11 & 2026 part 5].

NOTE: Routine tests before and after short circuit test shall be conducted as per IS 2026(Part 1).
4. Pressure Test [As per IS 1180: Part 1 (2014) clause no. 21.5.1.1].
5. Determination of sound levels at No load [IS 2026 (part 10)].
6. Test to verify IP 55 for cable box. (As per IS 60529 clause 11 to 15)

Note: - Out of the above mention type test, the tests under sl. No. 1, 2 ,3,4 and 6 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at TPCODL recommended NABL lab.**In-house test labs are accepted if in-house lab is NABL accredited for these tests.**

7.2 ROUTINE TESTS

SI.No	Test to be done	Reference BIS	Clause no.
1	Measurement of Winding Resistance at each tap	IS 2026 (Part 1)	16.2.1 & 16.2.3
2	Measurement of voltage ratio, check of voltage displacement, polarity, phase sequence and vector group	IS 2026 (Part 1)	16.3
3	Measurement of short circuit impedance and load loss at 50% and 100% load	IS 2026 (Part 1)	16.4

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4	Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 112.5% of rated voltage	IS 2026 (Part 1)	16.5
5	Measurement of insulation resistance	IS 2026 (Part 1)	16.6
6	Induced over voltage withstand test	IS 2026 (Part 3)	11
7	Separate Source voltage withstand test	IS 2026 (Part 3)	10
8	Pressure test	IS 1180 (Part 1)	21.5.1.2
9	Oil leakage test	IS 1180 (Part 1)	21.5.1.3
10	BDV and moisture content of oil in transformer (Type-2 oil)	IS 335 (2018)	Table 2

7.3 ACCEPTANCE TESTS

- Temperature Rise Test (on one unit of every release order / PO for each rating) [As per IS 2026 (Part 2) Clause no.4]
- Oil leakage test for acceptance shall be conducted at pressure of 0.35kg/sq.cm for one hour. (IS 1180 (Part 1) clause 21.5.1.3)
- The painted surface shall pass the Cross Adhesion Test (IS1180 part 1 clause no. 21.4.d).
- At stage inspection -Checking of weight, dimensions, fitting and accessories, tank sheet thickness, oil quantity, material finish and workmanship, physical verification of core coil assembly and measurement of flux density on one unit of each rating of the offered lot with reference to the GTP and contract drawings. Oil BDV of all offered lot.
- At least 10% transformer of the offered lot (minimum of one) shall be subjected to all the tests mentioned under the section 'ROUTINE in presence of TPCODL's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS: 1180 and IS: 2026.
- Magnetic Balance Test on HV & LV side, with magnetizing current HV and LV side as per CBIP manual publication no. 317

8.0 TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates of the Transformer for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at **CPRI / ERDA** as defined in 7.1 as per the relevant standards. 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 type tests, if any) not carried out, it shall be carried out without any cost implication to TPCODL.


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9.0 PRE-DISPATCH INSPECTION:


- Equipment shall be subject to inspection by a duly authorized representative of the TPCODL. 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 TPCODL's representatives at all times when the work is in progress. Inspection by the TPCODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
- The BA shall arrange for complete dispatch ready transformer at least 10% of lot during inspection.
- Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL .

Following documents shall be sent along with material.

- Test reports
 - MDCC issued by TPCODL
 - TPCODL Invoice in duplicate
 - Packing list
 - Drawings & catalogue
 - Guarantee / Warrantee card
 - Delivery Challan
 - Other Documents (as applicable).
- To ascertain the quality of the transformer oil, the original manufacturer's tests report shall be submitted at the time of inspection. Arrangements shall also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of TPCODL's representative. In respect of raw material such as core stampings, winding conductors, insulating paper and oil, bidder shall use materials manufactured/supplied_by_standard manufacturers and furnish the nmanufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the purchaser. The bidder shall furnish following documents along with their offer in respect of the raw materials:
 - Invoice of supplier
 - Mill's certificate
 - Packing List
 - Bill of Landing
 - Bill of entry certificate by custom.
 - To ensure about the quality of transformers, the inspection shall be carried out by the purchaser's representative at following two stages :-

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- a) Online anytime during receipt of raw material and manufacture/assembly whenever the purchaser desires.
- b) At finished stage, i.e. transformers are fully assembled and are ready for dispatch.
7. Advance intimation of 7 days for Odisha /12 day outside Odisha is required for both stage and final inspections.
8. After the main raw material i.e. core and coil material and tanks are arranged and transformers are taken for production on the shop floor and a few assembly have been completed, the Bidder shall intimate the purchaser in this regard, so that an officer for carrying out such inspection could be deputed, as far as possible within seven days from the date of intimation. During the inspection the bidder shall also furnish the information regarding various components used to manufacture the DTs.
9. During the stage inspection a few assembled core shall be dismantled (only in case of CRGO material) to ensure that the CRGO laminations used are of good quality. Further, about the readiness of the transformers, for final inspection for carrying out tests as per relevant IS/IECs shall be sent by the Bidder along with routine test certificates. The inspection shall normally be arranged by the purchaser at the earliest after receipt of offer for pre-delivery inspection.
10. All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer the inspector representing the Purchaser all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage inspection during manufacturing stage as well as Active Inspection during Acceptance Tests.
11. The bidder shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-contractors to ensure the mechanical / electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 90.00.
12. The Purchaser has the right to have the test carried out at his own by an independent agency wherever there is a dispute regarding the quality supplied. Purchaser has right to test 1 % of the supply selected either from the stores or field to check the quality of the product. In case of any deviation purchaser have every right to reject the entire lot or penalize the bidder, which may lead to blacklisting, among other things.
13. TPCODL also reserves the right to inspect the tank of transformer before surface preparation and painting. The same shall be informed to TPCODL accordingly.
14. At the time of inspection the material should be ready as specified, In case of material non readiness or material failure in acceptance, cost of re-inspection shall be borne by bidder.


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10.0 INSPECTION AFTER RECEIPT AT STORE:

1. The material received at the TPCODL store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection.
2. In case the transformers proposed for supply against the order are not exactly as per the tested design, the Bidder shall be required to carry out the short circuit test and impulse voltage withstand test at its own cost in the presence of the representative of TPCODL.
3. The supply shall be accepted only after such test is done successfully, as it confirms on successful withstand of short circuit and healthiness of the active parts thereafter on un-tanking after a short circuit test.
4. Apart from dynamic ability test, the transformers shall also be required to withstand thermal ability test or thermal withstand ability will have to be established by way of calculations
5. TPCODL reserves the right to conduct all tests on Transformer after arrival at site / stores and the manufacturer shall guarantee test certificate figures under actual service conditions.
6. TPCODL reserves the right to conduct short circuit test and impulse voltage withstand test in accordance to IS, afresh on each ordered rating at purchaser cost, even if the transformer of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by TPCODL either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies already made to TPCODL stores. The findings and conclusions of these tests shall be binding on the bidder.

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. In the event any defect is found by the Purchaser 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.
2. 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 TPCODL, failing which the TPCODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPCODL's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.
3. In case of Distribution transformer fails within the guarantee period TPCODL will immediately inform the Bidder who shall take back the failed Distribution Transformer within 15 days from the date of intimation at his own cost and replace / repair the transformer within forty five days of date of

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intimation with a roll over guarantee. The outage period i.e. period from the date of failure till unit is repaired / replaced shall not be counted for arriving at the guarantee period.

4. 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 AND TRANSPORT:

1. Bidder shall ensure that all 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.

Note: One use plastic not to be used for packing of the material.Packing shall be done with environment friendly recyclable materials.

13.0 TENDER SAMPLE:


All offered transformer detailed documents to be submitted as per clause no.18. The sample shall be not applicable

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's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

The following information shall necessarily be submitted with the bid:

- I.
 1. List of important raw materials, names of sub-suppliers for raw materials, standards to which raw material is tested and the copies of test reports of the tests carried out on raw materials in presence of Bidder's representatives.
 2. List of manufacturing facilities available, level of automation achieved and the areas where manual process exists.
 3. List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of these tests and inspections

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4. List of testing equipment for final testing with valid calibration reports. Manufacturer shall possess 0.1 class instruments for measurement of losses.

15.0 TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests, acceptance tests and pre-dispatch inspection as per relevant International / Indian standards.

16.0 MANUFACTURING FACILITIES:

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

- Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document.
- Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment, which shall be 25 years minimum. However, the Purchaser shall be given a minimum of 12 months' notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.
- Any spare 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.

18.0 DRAWINGS AND DOCUMENTS:

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

- Completely filled in compliance to each clause of Technical Specification and any Additional Details and Fittings.
- Description of the transformer and all components drawings.
- General arrangement for Transformer.

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- d. LV terminal box drawing along with CT if applicable and cleat arrangement and gland plate drawing.
- e. Bill of material.
- f. Foundation plans
- g. Experience Certificate and list
- h. Type test certificates.
- i. List of makes of major components as listed above.

Drawings / documents to be submitted for approval after the award of the order within 7 days before mass manufacturing are as under:


List of Drawings/Parameters to be submitted:

1. Clause wise Compliance of the specification
2. General Arrangement Drawing of the Transformer (Front view, Top view and both sides view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
3. Internal Core arrangement drawing.
4. Internal Core-coil assembly drawing.
5. Marking plates and Markings (as mentioned in clause 6)
6. Foundation Plan drawing.
7. HV and LV bushings drawing (with internal view and metal parts)
8. HT connector / LT connector (palm connector), Aluminium Busbar
9. LV Box drawing.
10. BH curve of core material offered
11. Gland Plate for LV box.
12. Prismatic oil level gauge drawing.
13. LV Terminal Box drawing with internal wiring arrangement of bus bar etc.
14. Gland plate
15. Cable cleat arrangement
16. Type Test Certificates.
17. Installation Instructions.
18. Quality Assurance plan.

2. List of Calculations to be submitted:

All the calculations shall be step by step showing the use of formulas and other practical considerations.

Concise calculations in table or excel sheet shall not be accepted. Also, the reference (only standard sources as IS, IEC or any such standard is acceptable) of the formulas shall be mentioned.

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1. Resistance Calculation (75 deg. C)
2. Load Losses Calculation (at 75 deg. C)
3. No load Losses.
4. Stray Losses.
5. Weight of Aluminium (Bare and with Insulation also).
6. Weight of Core.
7. Flux Density calculations.
8. Current Density Calculations.
9. Short Circuit withstand.
10. Temperature Rise Calculations.
11. Cooling Calculations showing cooling with tank and radiators separately with no. of radiators and fins mentioned specifically.


Additional Documents to be Submitted:

- a. List of raw materials as well as bought out accessories and name 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 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.

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19.0 SCHEDULE- “A” GUARANTEED TECHNICAL PARTICULARS:

All clauses and points in the specification to be complied

20.0 SCHEDULE “B” DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

The Bidders, clause by Clause in this schedule, shall set out all deviations from this specification. 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

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1. SCOPE:

- I. 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 Oil immersed, non-sealed, naturally cooled, three Phase 11/0.433 kV, 50Hz, outdoor conventional type, aluminium winding, Distribution Transformer of 25kVA to 100 KVA ratings.
- II. The transformer shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions specified in clause no. 3
- III. Such of the parts that may have not been specifically included, but otherwise form part of the transformer as per standard trade and/or professional practice and/or are necessary for proper operation of transformer, 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. notwithstanding the fact that at the time of an initial offer bidder had segregated such items and quoted for them separately.

2. APPLICABLE STANDARDS:

The equipment (and the materials used) covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian standards & other relevant standards for components, BEE & CEA guidelines with latest amendment from time to time, thereof, some of which are listed below:

Indian Standards	Title
IS 1180	Outdoor Type Oil Immersed Distribution Transformers Upto and Including 2500 KVA, 33 kV-Specification
IS 2026 (all parts)	Specification for Power Transformers
IS 104	Specification for ready mixed paint, brushing, zinc chrome, priming
IS 335	Specification for new insulating oil.
IS 649	Testing for steel sheets and strips and magnetic circuits.
IS 5	Specification for Colors for ready mixed paints and enamels
IS 1576	Solid Pressboard for Electrical Purposes -Specification
IS 2099	Specification for bushings for alternating voltages above 1000 volts
IS 2362	Determination of water content in oil by Karl in oil Fischer Method – Test

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	Method.
IS 3024	Grain oriented electrical steel sheets and strips
IS3347 (Part I & Part-3)	Dimensions for Porcelain Transformer Bushings for Use in Normal and Lightly Polluted Atmospheres - Part 1 : Up to and including 1 kV
IS 4253: Part II:	Specification for cork composition sheets- Part II : Cork and Rubber
IS 4257 (Part I)	Dimensions for Clamping Arrangements for Porcelain transformer Bushings - Part I: For 12 kV to 36 kV Bushings
IS 5082	Wrought Aluminum and Aluminum Alloy bars, Rods , Tubes, Sections, Plates and Sheets for Electrical Applications
IS 5561	Specification for Electric Power Connectors
IS 6103	Specification for Testing of specific resistance of electrical insulating liquids
IS 6600	Guide for loading of Oil-immersed transformer
IS 6792	Method for Determination of Electric Strength of Insulating Oil
IS 7404 (Part-1)	Paper Covered conductors: Round Conductors
IS 7421	Specification for porcelain bushings for alternating voltages up to and including 1000kv
IS 8603 (Part-1)	Dimensions for Porcelain Transformer Bushings for Use in Heavily Polluted Atmospheres - Part I:12 kV and 17.5 kV Bushings
IS 9335	Specification for Cellulosic Papers for Electrical Purposes
IS 10028	Code of Practice for Selection, Installation and Maintenance of Transformers
IS 11149	Specification for rubber gaskets
IS 12444	Specification for Continuously Cast and Rolled Electrolytic Copper Wire Rods for Electrical Conductors.
IS 4026	Aluminium Ingots
IS 6160	Rectangular electrical conductors for electrical machines

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IS 13964	Methods of measurement of transformer and reactor sound levels
IS 3401	Specification of silica Gel
IS 1897	Copper strip for electrical purposes
IS 60529	Degree of protection provided by enclosure
IS 816	Welding of Mild Steel
CEA	Guidelines for specifications of energy efficient outdoor type single and three phase distribution transformers
IS 6162	Paper covered aluminium conductor
IS 16659	Fluids For Electro technical Applications - Unused Natural Esters For Transformers And Similar Electrical Equipment
IS 16081	Insulating liquids — Specifications for. Unused synthetic organic esters for Electrical purposes
IEC 60156	Method of determination of electric strength of insulating oils.
IEC 60296	Specification for unused mineral insulating oils for transformers and switchgear.
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IS 1852	Rolling and cutting tolerances for hot rolled steel products
IS 504	Methods of chemical analysis of aluminium

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


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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. GENERAL TECHNICAL REQUIREMENTS:


SI No	Description	Standard Sizes as per IS 1180 (Part-1) :2014		
SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE		
1	Continuous Rated Capacity (kVA)	25 kVA	63 kVA	100 kVA
2	Application	Outdoor		
3	System voltage (max.)	12 kV		
4	Rated voltage HV (kV)	11		
5	Rated voltage LV (V)	433-250		
6	Line current HV (A)	1.312 A	3.306 A	5.25 A
7	Line current LV (A)	33.33 A	84.10 A	133.34 A
8	Frequency (Hz)	50 Hz		
9	No. of Phases	Three		
10	Connection HV	Delta		

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11	Connection LV	Star (Neutral Brought out)		
12	Vector group	Dyn11		
13	Type of cooling	ONAN		
14	Noise level at rated voltage and frequency	48 dB	51 dB	51 dB
15	Permissible temperature rise over ambient:			
15.1	Of top oil measured by thermometer	35 °C	35 °C	35 °C
15.2	Of winding measured by resistance	40 °C	40 °C	40 °C
16	Max. Total Losses at 50% loading at 75°C (watts)	175	300	435
17	Max. Total Losses at 100% loading) at 75°C (Watts)	595	1050	1500
18	Short circuit impedance voltage at 75°C (±10% tolerance)	4.50%		
19	Insulation Class	A		
20	Normal Flux Density (at rated voltage and frequency)	1.6 T		

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21	Maximum flux density (Increase of +12.5% combined voltage and frequency variation from rated voltage and frequency)	1.9 T (Max.)
22	Maximum current density (A/mm ²)	1.6
23	Impulse withstand voltage	75 kVp
24	Power frequency withstand voltage	28 kV
25	Voltage fluctuations permissible	+12.5% to -12.5%
26	Neutral Terminal	Two separate brought out neutral from main neutral bus bar, one for taking out the neutral for 4 wire system and other additional neutral for solid earthing outside LV box on side
27	Minimum clearances in air (mm) :	
27.1	HV phase to phase/ phase to earth	255 / 140
27.2	LV phase to phase/ phase to earth	75 / 40
28	Minimum clearances in Cable Box (mm):	
28.1	HV phase to phase/ phase to earth	130 / 80
28.2	LV phase to phase/ phase to	25 / 20

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	earth	
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5. GENERAL CONSTRUCTION:

- I. The transformer shall be double wound, aluminium coil, oil immersed, naturally cooled (ONAN) and non-sealed type with rectangular tank.
- II. The transformer shall be suitable for service with fluctuations in supply voltage up to +12.5% to -12.5%.
- III. The transformer and accessories shall be designed to facilitate trouble free operation, inspection, maintenance and repairs under the various operating and atmospheric conditions specified in clause no. 3. The design shall incorporate every precaution and provision for the safety of the equipment as well as staff engaged in operation and maintenance of the equipment.
- IV. All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.


5.1 CORE:

- I. Transformer core shall be stack type, constructed from high grade cold rolled, non-ageing, grain oriented, silicon steel lamination which shall be properly annealed (under inert atmosphere, if required) to relieve stresses.
- II. The core shall have low loss and good grain properties. It should be coated with hot oil proof insulation, bolted together with frames to prevent vibration and noise.
- III. The core thickness should be 0.23mm. Grade shall be 23HP85 as per IS 3024 or better with Minimum Polarization in Tesla at a Field Strength of 800 A/m.
- IV. All core clamping bolts (if any) shall be effectively insulated.
- V. Only one grade and one thickness of core shall be accepted and mixing of different grades shall not be allowed.
- VI. The handing of core lamination and stacking should be smooth and uniform.
- VII. The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.
- VIII. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated. The vendor shall submit the calculations in support of the same.

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- IX. The transformer shall be suitable for continuous service without damage under over fluxing where the ratio of voltage over frequency exceeds the corresponding ratio at rated voltage and rated frequency up to 12.5% and the core shall not get saturated . The BH graph to be submitted for material.
- X. The **No load current shall not exceed 2% of the Full Load Current** and will be measured by energizing the transformer at rated voltage and frequency. **Increase of 12.5% of rated voltage shall not increase the no load current by 5% maximum of full load current.**
- XI. The bidder shall be required to submit the following documents in regard to procurement of core material during stage inspection:
- Invoice of supplier
 - Mill's test certificate
 - Packing list
 - Bill of landing
 - Bill of entry certificate by custom (if required)
 - Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.
- XII. The bidder shall offer the core for inspection and approval of TPCODL during manufacturing stage. Heavy penalty or black listing shall be imposed on the bidders using seconds/defective CRGO sheets i.e in case of nonconformance w.r.t TPCODL Specifications.
- XIII. The core coil assembly shall have four enclosed (no hook) lifting lugs.


Sr. No.	Magnetizing (no load) current at:	Unit	To be furnished by bidder
1	90% Voltage	%	
2	100 % Voltage	%	
3	112.5% voltage	%	
4	Core grade and make		
5	Thickness of core	mm	
6	Core Diameter	mm	
7	Gross core area	Sq. cm	
8	Net Core area	Sq. cm	
9	Flux Density (calculated)	Tesla	
10	Overfluxing without saturation (BH curve to be submitted)	Tesla	
11	Mass of core		

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12	Loss per Kg. of the core at the above specified flux density	Watt	
13	Core window height	mm	
14	Center to center distance of the core	mm	
15	Mass of:		
15.1	Core Lamination (minimum)	kg	
15.2	Windings with insulation (minimum)	kg	
15.3	Tank and fittings	kg	
15.4	Oil	kg	
15.5	Oil Quantity (minimum)	Ltr	
15.6	Total Weight	kg	
16	Material and their makes offered		Source of material (make and factory location)
16.1	Core laminations		
16.2	Press Boards		
16.3	Kraft paper		

5.2 WINDING CONNECTIONS


- I. Primary and secondary windings shall be constructed from high- conductivity(aluminium conductors), Double Paper Covered (DPC) aluminium conductor of grade 2(AI 99.6%) as per IS 5484 with min. **25%** overlap per layer of paper. **Epoxy diamond dotted Kraft paper to be used for DPC conductor all rating.**
- II. The current density for HV and LV winding should not be more than **1.6 Ampere per sq.mm.**
- III. The insulation between core and bolts and core and clamps shall withstand **2.5 kV for one minute.**
- IV. Inter layer insulation both for HV and LV windings shall be Epoxy dotted diamond Kraft paper and pressboard of standard make or any other superior material subject to approval of TPCODL
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard. In case of cross-over coil winding of HV all spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations. Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted as per standards.
- VI. LV winding shall be such that neutral formation is at the top.

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- VII. All turns of windings shall be adequately supported to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- VIII. The joints in the winding shall be avoided but if it is necessary then, these shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.

IX. Provide the conductor size and material grade in below table.

SNo	Insulation materials provided	Unit	To be furnished by bidder
1	For conductors		
1.1	HV		
1.2	LV		
1.3	Core		
2	Material and size of the wire used		
3	HV Conductor Grade		
3.1	Size of HV conductor bare/covered	mm	
3.2	Area of cross section	Sq.mm	
3.3	Conductivity & Purity		
4	LV Conductor Grade		
4.1	Size of LV conductor bare/covered	mm	
4.2	No. of conductors in parallel	Nos.	
4.3	Total area of cross section	Sq.mm	
4.4	Conductivity & Purity		
5	Resistance of windings at 20		
5.1	HV windings	Ohms/phase	
5.2	LV windings	Ohms/phase	
5.3	No. of LV Turns		
5.4	No. of HV Turns		
5.5	No. of parallels		
5.6	Current density of LV winding(calculated)	A/sq.mm	
5.7	Current density of HV winding(calculated)	A/sq.mm	
5.8	Wt. of the LV winding copper without insulation	Kg	
5.9	Wt. of the HV winding copper without insulation	Kg	
5.10	No. of LV coils/phase		
5.11	No. of HV coils/phase		
5.12	Height of LV winding	mm	
5.13	Height of HV winding	mm	
5.14	ID/OD of HV winding	mm	

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5.15	ID/OD of LV winding	mm	
5.16	Thickness of the duct in LV winding	mm	
5.17	Thickness of the duct in HV winding	mm	
5.18	Thickness of the duct between HV and LV	mm	
6	Material and their makes offered		Source of Material (Make and factory location)
6.1	Aluminium Conductor		
6.2	Insulating winding wires		


5.3 LOSSES

- I. The bidder shall also guarantee the total loss at 50% and 100% load condition (at rated voltage and frequency and these should be within the limits of maximum total losses declared by TPCODL for both 50% and 100% loading values (as per table below) :

Description	Rating (kVA)		
	25	63	100
Maximum total Losses at 50% loading at 75°C (Watts)	175	300	435
Maximum total Losses at 100% loading at 75°C (Watts)	595	1050	1500

No positive tolerance shall be allowed on the losses as mentioned above. However, bidder can offer losses less than specified but no consideration in cost will be given for the same.


- II. The successful bidder shall guarantee the quoted losses for at least five years. If at any point of time during operation if it is found that the total losses at 50% and 100% load are more than the values given in specifications, then bidder shall be liable to pay a fine of Rs 250 per watt to the amount by which losses at 50% loading and 100% loading increase with respect to the values given in specifications.
- III. During testing at Bidder's works if it is found that the actual measured losses are more than the values quoted by the Bidder, TPCODL shall have the right to reject the complete lot.

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- IV. During testing at Bidder's works, if the temperature rise exceeds the specified values, the entire lot shall be rejected by TPCODL.
- V. During testing at Bidder's works, if the impedance values differ from the guaranteed values including tolerance, the entire lot shall be rejected by TPCODL.
- VI. Transformer losses shall be checked on any one of DT from supplied lot at TPCODL workshop.
- VII. The core of coil assembly shall be provided with four lifting hooks.

VIII. Bidder shall provide the below details in below table:


Sl. No.	Description	Unit	As furnished by bidder
1	No Load losses	Watt	
2	Load losses at 50%loading at 75° C	Watt	
3	Load losses at 100% loading at 75° C	Watt	
4	Total losses at 50%load at 75° C	Watt	
5	Total losses at 100% load at 75° C	Watt	
6	Efficiency at 75 deg. C		
7	Efficiency at Unity P.F.		
7.1	125% load	%	
7.2	100% load	%	
7.3	75% load	%	
7.4	50% load	%	
7.5	25% load	%	
8	Efficiency at 0.8 P.F.		
8.1	125% load	%	
8.2	100% load	%	
8.3	75% load	%	
8.4	50% load	%	
8.5	25% load	%	

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9	Regulation at :		
9.1	Unity P.F. at 75 deg. C	%	
9.2	0.8 P.F. at 75 deg. C	%	
9.3	% Impedance at 75 deg. C	%	

5.4 TRANSFORMER TANK AND TANK CONSTRUCTION

- I. The transformer tank shall be of robust construction, rectangular and shall be built up of electrically tested welded mild steel plates of thickness 5 mm (min.) for bottom and top and 3.15 mm (min) for the sides for all the three ratings of distribution transformers. The tolerances as per IS 1852 shall be applicable. The tank shall be fabricated by welding at corners. No horizontal or vertical joints in tank side walls and its bottom or top cover shall be allowed. In addition the cover of the main tank shall be provided with an air release plug. The tank plates shall be of such strength that the complete transformer when filled with oil may be lifted bodily by means of the lifting lugs provided. The top cover shall have no cut at point of lifting lug. The transformer tank covers shall be bolted/clamped alternatively welded with tank rim so as to make a leak proof joint. The transformer tank shall be of adequate mechanical strength to withstand positive' and negative pressure built up inside the tank while the transformer is in operation. The tank design shall be such that the core and windings can be lifted freely. There shall be no joint at corners and not more than 2 joints in total. Under operating conditions, the pressure generated inside the tank should not exceed 0.4 kg/sq.cm positive or negative. The tank shall be reinforced by welded flats on all the outside walls on the edge of the tank. The permanent deflection when the tank without oil is subjected to a vacuum of 250 mm of mercury for rectangular tank shall not be more than 5mm up to 750mm horizontal length of flat plate and 6.5mm up to 1250mm horizontal length of flat pia . Pressure test shall be performed carefully at the time of 1st stage inspection only to confirm the adequacy of reinforcement angle & gauge of the tank. The tank shall be further capable of withstanding a pre_ssure of 0.8 kg/sq.cm (g) for 30 minutes and a vacuum of 0.34 kg/sq.cm (g) without any deformation.
- II. The internal clearance of tank shall be such, that it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings. All joints of tank and fittings shall be oil tight and no bulging shall occur during service. Inside of tank shall be painted with hot oil resistant paint. The top cover of the tank shall be slightly sloping to drain rain water approximately 5° to 10° towards HV bushing. The tank cover shall be provided with suitable insulating shrouds on bushing terminals. The tank plate and the lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle. Bidder shall carry out all welding operations as per relevant ASME standards and submit a copy of the welding procedure

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and welder performance qualification certificates to the Purchaser.


- III. All matching faces of joints be made oil tight with a smooth surface finish to ensure that the gasket material makes a satisfactory joint. Bolts shall be spaced at sufficiently close intervals to avoid buckling of either flange or covers and provide reasonably uniform compression of the gasket. The transformer shall be provided with a minimum of two welded heavy duty closed lifting lugs of MS plate of 8mm thickness suitably reinforced by vertical supporting flat welded edgewise below the lug on the side walls up to reinforcing angle. They shall be so extended that cutting bend plate is not required. The lifting lugs shall be capable of withstanding the total weight of the transformer, fully filled with oil. The transformer shall be provided with four pulling lugs of MS plate of 8mm thick to pull the transformer horizontally.

IV. Bidder shall provide the transformer size and clearances in below table

SNo	Transformer:	Unit	To be furnished by bidder
1	Overall length x Breadth x Height	mm X mm X mm	
2	Only Tank length x breadth x height	mm X mm X mm	
3	Clearances		
3.1	Core and LV	mm	
3.2	LV and HV	mm	
3.3	HV Phase to phase	mm	
3.4	Between HV winding and Yoke	mm	
3.5	Between LV winding and Yoke	mm	
3.6	Between yoke and inside of tank to cover	mm	
3.7	Between yoke and bottom	mm	
3.8	Any point of winding to tank	mm	
4	Calculated Impedance	%	
4.1	HV to earth creep age distance in oil	mm	
4.2	LV to earth creep age distance in oil	mm	
5	Material and their makes offered		Source of Material (Make and factory location)
5.1	Tank material		
5.2	Gaskets		
5.3	Paint		

5.5 RADIATORS

- I. Radiators of pressed steel type conforming to the design requirement shall be used.
- II. The pressed steel type should be used in vertical formation without any bending and should be

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individually tested for leakage and pressure test etc. before welding with main tank.

- III. Thickness of sheet for radiators shall be **1.20 mm** .
- IV. The mounting of the radiators shall be **non detachable**. (i.e they should be welded permanently with the tank.)
- V. The number of cross section/ length / fixing arrangement of radiators shall be indicated in the general assembly drawing.

5.6 GASKET

- I. **Cork rubber gaskets** conforming to Type C , grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing & water ingress resistant requirements for components like HV & LV bushings bottom gasket, HV & LV terminal box, Top Cover, Conservator, Valves etc.
- II. **Nitrile/Neoprene rubber gaskets** conforming to Type IV – 4C (heat and oil resistant) as per IS 11149 shall be provided for bushing O ring (oil gaskets).

5.7 BUSHINGS

Bushing shall be two part bushing & terminal arrangement shall be such that it shall be possible to replace external part without opening cover and without affecting sealing of the transformer,

1. HT Bushings (17.5 kV/250 A):


Pole mounted transformers; Outdoor Bushings on Top.

- I The bushings shall be outdoor type external part shall be made of porcelain material and rods and nuts shall be made of tinned brass material.
- I The metal portion of the internal HV & LV bushing inside the tank shall remain dipped in oil in all operating condition.
- I IS to be followed: IS 8603(Part- I) and IS 2099 (latest amendment of IS).
- M. Multiple insulation paper shall be wrapped on multistrand copper wire which is used inside the bushing. Insulation paper shall withstand for 11 kV class.
- V. Cross section area of multistrand copper wire used in bushing shall be as per below table.

Sl.No.	Rating (kVA)	Minimum cross section area of copper wire (sqmm)
1	25	2.5
2	63	4
3	100	10

- V. The HV bushings shall be mounted on top cover of the tank.

2. LT bushings(1.1 kV/suitable current rating): Side straight mounted in box with

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common box

- I. The bushings shall be of two part and outdoor type; external part shall be made of porcelain material and rods and nuts shall be made of tinned copper material.
- II. The metal portion of the internal HV & LV bushings inside the tank shall remain dipped in oil in all operating condition.
- III. IS to be followed : IS 3347(part-1) and IS 7421 (latest amendment of IS)
- IV. LV bushings shall be provided within cable box.
- V. **Provide HV & LV bushings maker's details.**

Sr.No.	Material and their makes offered	Source of material (make and factory location)
1	Bushing HV/LV	

5.8 CABLE BOXES

- I. Cable boxes made up of Mild Steel with suitable handle and removable front cover shall be bolted type on LV side. The cover shall be with bend edges such that it shall protect the gasket on three sides.
- II. Water should not accumulate on cable boxes and proper slope shall be provided in order to ensure drainage of water.
- III. Cable box protection should be IP 55.
- IV. LV cable boxes shall be fixed on the tank with nuts and bolts (gasket placed in between them) in such a way that they can be completely removed whenever required.
- V. Suitable cable clamping/ wooden cleating arrangements shall be provided on LV side to keep Cable straight and to support cables to avoid tension on bushings/busbar due to cable weight. (As mentioned below in 13 & 14 number point).
- VI. Non-magnetic Gland plates shall be provided for LV cable box drilled with suitable no. of holes required for installation (as mentioned below in 13 & 14 number point).
- VII. Gland plates shall be mounted separately with nut & bolt arrangement and gasket in between them. The gland plate shall be in two parts so that cable can be removed/replaced without cutting of lug/termination etc.
- VIII. Support for GI earth strip size of 50 x 6 mm shall be provided so as to avoid tension on secondary neutral bushing.
- IX. Neutral terminal of LV winding shall be brought out on LV phase terminals to form four wire system.
- X. The LV cable box shall be provided with tinned brass palm connector with aluminium busbar and shall be fitted with brass glands for LV cable .

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- XI. The length of LV bus bar shall be sufficient for terminating 4C x 150 sqmm. Aluminium conductor ,1.1 kV class, XLPE cable.
- XII. The aluminium lugs suitable for terminating the cable of size 4C x 150 sqmm shall also be provided.

5.9 TERMINAL CONNECTORS

HT TERMINAL CONNECTOR:

1. Tinned Brass connector shall be provided connected on HV bushing rods suitable for bare dog conductor connections.

LT TERMINAL CONNECTOR:

2. As per details in clause 5.8.

5.10 EQUILISING/ EQUIPOTENTIAL STRIP

- I. The Transformer top cover shall be connected at two places (diagonally opposite with each other) with the tank by **tinned copper strip (30mm wide, 0.7mm thick)**.
- II. The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip.

5.11 OIL


- I. All transformers shall be filled 'to the required level with new, unused, clean, standard mineral oil in compliance with IS 335/ IEC 296 and shall be free from all traces of polychlorinated biphenyl (PCB) compounds. The use of recycled oil is not acceptable.
- II. Oil shall be filled under vacuum before filling it shall be filtered and tested (as per IS 6103).

Test parameters	Values
Break Down Voltage (min.)	60 kV
Water content ppm(max.)	20 ppm
Specific resistance (min.) (at 27 deg C)	2.5×10^{12} ohm -cm

Bidder has to provide the oil data in below table.

S. No.	Oil data	Unit	To be Furnished by Bidder
1	Quantity for first filling (minimum)	Ltr	
2	Grade of oil used		
3	Marker's name		
4	BDV at the time of filling	KV	
5	Material and their makes offered		Source of material (make and factory location)
5.1	Transformer oil		

5.12 EXPLOSION VENT

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- I. Explosion vent shall be provided on the top cover.
- II. Double diaphragm with oil observation gauge (prismatic Type with red colored background) shall be provided on explosion vent pipe.

5.13 FASTENERS

- I. All the bolts or studs shall be **at least 6 mm in diameter** except when used for small wiring terminals.
- II. All nuts/bolts/washers exposed to atmosphere shall be as follows:


Size 12 mm or below	Stainless Steel
Above 12 mm	Steel with antirust coating, Hot dip galvanized

- III. All ferrous bolts, nuts and washers placed in outdoor positions shall be hot dip galvanized to prevent corrosion (except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals). In case the galvanization is removed due to welding or manufacturing, the parts should be properly cleaned and painted to avoid exposure to atmosphere.
- IV. Each bolt shall project at least one thread but more than three threads through the nut. If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided. The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.
- V. Taper washers shall be provided where necessary. Protective washers of suitable material shall be provided on front and back of the securing screws.

5.14 SURFACE PREPARATION AND PAINTING

- I. The paint shall be applied by airless spray.
- II. Steel surfaces shall be prepared by **shot blast cleaning** (IS-9954) to grade Sq.2.5 of ISO 8501-1 or **chemical cleaning** including phosphating of the appropriate quality (IS 3618).
- III. **Heat resistant (Hot oil proof) paint** shall be used for the **inside surface** and whereas for **external surface one coat of thermosetting powder paint or one coat of epoxy primer (zinc chromate) followed by two coats of polyurethane (P.U.) base paint.** as per table given below:

S.No.	Paint type	Area to be painted	No. of Coats	Total dry film thickness (min.) (microns)

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1.	Thermosetting po paint	Inside outside	01 01	30 60
2.	Liquid paint a)Epoxy (primer) b)P.U. Paint (Finish coat) c)Hot oil resistant	Outside Outside Inside	01 02 01	30 25 each 35

The two coats shall be of oil and weather-resistant nature with final coat as glossy and non-fading paint of shade 631 as per IS 5.

- IV. The dry film thickness shall not exceed the specified minimum dry film thickness by more than 25%.
- V. Any damaged part shall be cleaned to bare metal with an area extending 25 mm around its boundary. A priming coat shall be immediately applied followed by full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage. The repainted surface shall present a smooth surface which shall be obtained by carefully chamfering the paint edges before and after priming.
- VI. Painting shall not affect by weather changes & performance against pilling out or fading etc. to be guaranteed for 5 Years.

5.15 RADIO INTERFERENCE


When operated at voltages up to **12.5%** in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.

5.16 OVERLOAD CAPACITY

The transformer shall be suitable for loading as per IS 6600.

5.17 CONSERVATOR

- I. The- conservator shall be provided on all transformers of ratings 63 kVA and above with plain tank construction.
- II. The oil conservator shall be fitted with oil level indicator with minimum level marked. The oil level gauge shall be prismatic type. The connecting pipe of the conservator shall be so fitted to transformer tank that the pipe can be detached from the tank. The conservator shall be supported / fixed on the main body of the transformer tank. The conservator shall be provided with oil gauge and the plain or dehydrating breathing device shall be fixed to the conservator which shall also be provided with a drain plug and a fitting hole with cover.
- III. The conservator shall be provided with detachable end plate on one side, preferably on the side on which the gauge glass is fitted, to enable the maintenance staff to periodically clean the inside of the conservator tank. The oil gauge glass shall be removable and so embodied

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in the end plate so as to prevent oil leakage.

- IV. In addition, the cover of the main tank shall be provided with an air release plug. Conservator shall be provided with drain and oil filling hole with plugs. The diameter of the oil filling hole shall be 32mm. The capacity of the conservator tank shall be designed keeping in view the total quantity of oil and its contraction and expansion due to temperature variations. The total volume of conservator shall be such as to contain 10% quantity of the oil. Normally 3% quantity of the oil shall be contained in the conservator.
- V. The cover of the main tank shall be provided with an air release plug to enable air trapped within to be released, unless the conservator is so located as to eliminate the possibility of air being trapped within the main tank: The inside diameter of the pipe connecting the conservator to the main tank shall be within 25 to 50 mm and it shall project into the conservator so that its end is approximately 20mm above the bottom of the conservator so as to create a sump for collection of impurities. The minimum oil level corresponding to -5°C should be above the sump level.

5.18 TERMINAL CONNECTIONS

All transformers shall have the primary and secondary terminal markings plainly and indelibly marked on the transformer adjacent to the relevant terminal. High voltage phase windings shall be marked both in the terminal boards inside the tank and on the outside with capital letter 1 U, 1V, 1W and low voltage winding for the same phase marked by corresponding small letter 2u, 2v, 2w. The neutral point terminal shall be indicated by the letter 2n. Neutral terminal shall be brought out and connected to local grounding terminal by the earthing strip.

5.19 EARTHING CONNECTIONS


The HV bushing stems shall be provided with tinned brass connectors suitable for the specified cable sizes and current, as per IS 5082 so as to connect the jumper without disturbing the bushing stem. Connectors shall be with eyebolts so as to receive conductor for HV. Terminal connectors shall be type tested as per IS 5561.

5.20 DRAIN VALVE AND FILTER VALVE

The drain valve & Filter valve shall be of mild steel (M.S.) with gate type of valve. The drain valve and filter valve shall be provided with embossed name plate stating drain valve and filter valve. The valves shall be covered with a MS box by welding on tank. Locking rod shall be provided to stop movement of hand wheel.

5.21 DEHYDRATING BREATHER

The volume of breather shall be suitable for 250 gms of silica gel for 25; 500gm of silica gel for 63 kVA & 100 kVA ratings conforming to IS 3401. The breather pipe shall enter the conservator

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from the upper side of the conservator.

The silica gel shall be blue colored and shall be as per IS: 3401 — 1992. The silica gel shall be 3-4 Mesh size. The body of the breather shall be UV protected seamless acrylic tube(Transparent).The top cover shall be of die cast aluminum and powder coated or polyurethane painted. The oil cup shall be of UV protected acrylic or polycarbonate.

5.22 FITTINGS


The following standard fittings shall be provided:

1. Two earthing terminals with earthing symbol \perp for body earthing.
2. Air Release Device.
3. Double diaphragm Explosion vent with oil window
4. LV cable Boxes.
5. LV cable cleats arrangement
6. HV and LV Bushings.
7. Terminal Connectors for HV/LV side (palm connector, suitable bimetallic washer, Al busbar).
8. LV Gland plates (Non-Magnetic) with glands.
9. Prismatic Oil level Gauge with red color background
10. Closed type Lifting 4 no. lugs for complete transformer,
11. 2 Base channels.
12. Marking Plates as asked in clause 6.1
13. Two GI strip for neutral earthing with minimum GI coating thickness of 86 microns. Size of GI strip shall be, 50x6 mm
14. Conservator

5.23 MAKE OF MAJOR COMPONENTS & RAW MATERIALS

The BA shall procure the following constituent items from the designated vendors as follows:

SNo	Raw Material/Equipment	Make
a)	Aluminium	M/S Sterlite, M/S Hindustan Aluminium, M/S Hindalco or equivalent on approval of bidder.
b)	Core	M/S AK Steels, POSCO, Kawasaki/ JFE, Nippon Steel or equivalent on approval of bidder.
c)	Insulation paper	Raman Boards- Mysore, Senapathy Whiteley Bangalore, ITC paper, ABB approval of bidder.
d)	Transformer Oil	Savita, Apar, Gandhar or equivalent on approval of bidder.
e)	Gaskets & Corks	Nu Cork, Anchor Corks or equivalent on approval of bidder.

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f)	Steel For Tank	M/S TISCO, M/S SAIL, M/S Bhushan Steel, M/S ISSCO, M/S RINL, M/S Jindal Steel.
g)	Bushings HV & LV	GE, Rashtriya Electricals, Hindustan Chemicals, LAMCO
h)	Bucholz, PRD, SPR, OTI, WTI, and other devices	Reputed make to be approved by TPCODL during detailed engineering.
i)	Dehydrating Breather	Yogya, Anushree, Electrical engineers

Bidder has to provide all test certificates from original manufacturers & relevant sourcing documents. BA shall also have shot blasting facility.


5.24 INSULATING PAPER AND INSULATING PRESSBOARD

- I. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and compressed pressboard of make (refer Clause no.5.32) subject to approval of TPCODL
- II. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 25% overlap per layer of paper.
- III. Kraft paper and Pressboard should be made of pure Cellulose from soft wood pulp manufactured from sulphate process. No additive, adhesive or coloring matter shall be present.
- IV. Kraft paper and Pressboard should be of class A (105°C) insulation material.
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard.
- VI. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.
- VII. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr, sharp edges and dimensional variations.
- VIII. Kraft paper self-adhesive tape to be used for bonding of insulating paper layer, spanner and paperboards that are immersed in the oil filled transformer.
- IX. **Below required values could be verified if required at any stage of the inspection and it should fulfill the requirement as per below table:**

Characteristics	Kraft Paper	Pressboard (all Sizes)
1. Dimension	As specified by bidder with +5% tolerance.	As specified by bidder with tolerance as per IS1576.
2. Apparent Density	>0.80 g/cm ³	as per IS 1576 w.r.t Thickness
3. pH of Aqueous extract	6-8%	6-8%
4. Electrical strength i) in air ii) In Oil	7KV/mm -----	12KV/mm 35KV/mm
5. Ash content	Maximum 1%	Maximum 0.7
6. Moisture content	Maximum 8%	Maximum 8%
7. Oil absorption	-----	Minimum 9%
8. Heat stability	As per IS 9335-part 3	As per IS 1576
9. Tear index	As per IS 9335-part 3	As per IS 1576


Bidder has to submit the test certificates as per IS-9335, IS-1576 for all type of insulating materials covering above stated parameters along with **below parameters during stage inspection :**

- a. Substance (Grammage) (g/m³)
- b. Compressibility

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- c. Tensile strength
- d. Conductivity of water extract
- e. Shrinkage in air
- f. Flexibility
- g. Cohesion between plies¹.
- h. Elongation
- i. Air permeability
- j. **Bidder shall provide the below details in below table**

Sl. No.	Description	Unit	As furnished by bidder
1.	DPC Paper for HV and LV conductors :		
	Type of DPC Paper		
	Make of DPC Paper		
	Thickness DPC Paper	mm	
	Percentage Overlapping (not less than 60%)	%	
2.	Type of Paper for Interlayer Insulation		
	Make of Paper for Interlayer Insulation		
	Thickness of Paper for Interlayer Insulation	mm	
3.	Type of Paper for Insulation Between HV and LV winding		
	Make of Paper for Insulation Between HV and LV winding		
	Thickness of Paper for Insulation Between HV and LV winding (for all sizes)	mm	
4.	Type of Pressboards used for Insulation Between HV and LV winding		
	Make of Pressboards used for Insulation Between HV and LV winding		

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	Thickness of Pressboards for Insulation Between HV and LV winding (all size)	mm	
5.	Type of Paper used for insulation between core and LV		
	Make of Paper used for insulation between core and LV		
	Thickness of Paper used for insulation between core and LV (All sizes)		
6.	Type of Pressboard used for insulation between core and LV		
	Make of Pressboard used for insulation between core and LV		
	Thickness of Pressboard used for insulation between core and LV (All sizes)		
7.	Material used for top and bottom yoke insulation		
	Make of material used for top and bottom yoke insulation		
	Thickness of material used for top and bottom yoke insulation	mm	
8.	Type of material used for Spanner, wedge and Axial for insulation		
	Make of material used for Spanner, wedge and Axial for insulation		
	Thickness of material used for Spanner, wedge and Axial for insulation (all sizes)	mm	

6. MARKING:

6.1 Marking Plates

1. Name Plate (Rating) Plate :

A rating plate shall be fitted to each transformer in a visible position and shall carry

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all the information as **specified in clause no. 6.2**

2. Terminal Marking Plate :

- The terminal marking plate shall be provided which shall be strictly in accordance with **figure 4 of IS 1180-Part 1: 2014**. This plate may be combined with the rating plate or can be provided separately.
- Value of short circuit impedance on extreme tapping and on principal tapping and indication of winding to which impedance is related has to be displayed additionally.

3. Details Plate :

A separate plate of **size 125 mm x 125 mm** shall be provided having following details:

- Name of the firm.
- Serial No.
- Rating of transformer
- Order No. and date
- Date of dispatch

4. Guarantee Plate :

A separate warranty plate made of **Stainless Steel** with following clause written on it.

“THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE OF COMMISSIONING OR 60 MONTHS FROM THE DATE OF LAST SUPPLY”

All the plates described above (clause 1 to 4) should be as followings:

Material	Stainless Steel
Thickness	1 mm
Engraving	The letters on the rating plate shall be engraved black on the white/silver back ground
Fixing	Fixing screws shall be of stainless steel.

5. Danger Plate:

Danger notice shall have red lettering on a white background on a plate as specified in **IS: 2551**


6. BIS Certification Mark:

The Bidder is required to get approval from BIS and display BIS mark on the name plate.

7. BEE LABEL:

A label shall be affixed on the front of the distribution transformer near the name plate, so as to be prominently visible. The label shall be non-detachable weather proof type with the following particulars shall be displayed on its label, namely:

- the logo of the Bureau of Energy Efficiency

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2. that the equipment is a distribution transformer
3. that it is an oil filled, naturally cooled type
4. name of the manufacturer and brand
5. Capacity in KVA as tested
6. Voltage is up to 11 KV
7. Total losses at 50% loading in watts
8. Total losses at 100% loading in watts
9. Star level
10. Model and year of manufacturing.
11. Bureau's authorisation number

6.2 Name Plate Details

The name plate shall be strictly as per **IS 1180: 2014 (figure 1)**. Additionally, following points shall be displayed :


1. Actual no load losses of transformer.
2. Actual total losses of transformer at 50% load and 100% load.
3. Standard mark (BIS certification).
4. "**TPCODL**" shall be written in bold letters.
5. PO number with date has to be mentioned.
6. Overall dimensions of the transformer.

a. MARKING

1. All transformers shall have HV phase windings marked in both, the terminal boards inside the tank and outside with capital letter 1U, 1V, 1W. The LV winding for the same phase shall be marked by corresponding small letter 2u, 2v, 2w. The neutral point terminal shall be indicated by the letter 2n.
2. The markings shall be done by steel strips in which marks had been engraved in black colour.
3. Colour marking of the HV & LV bushings top cap shall be done.
4. On the top cover of tank and the core .

7. TESTS:

- I. All routine, acceptance & type tests shall be carried out in accordance with the IS 2026 and IS 1180: Part-1 (2014).

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- II. All routine tests/ type test shall be witnessed by the TPCODL/his authorized representative as required.
- III. All the components shall also be type tested as per the relevant standards.

Following tests shall be necessarily conducted on the Distribution Transformers in addition to others specified in IS/IEC standards.


7.1 TYPE TESTS

1. Lightning Impulse Test [As per IS 2026 (Part 3) Clause no. 12].
2. Temperature Rise Test [As per IS 2026 (Part 2) Clause no.4]
NOTE: Maximum measured total loss (No load at Rated excitation load loss at maximum current tap converted to 75°C reference temperature) at 100 percent loading shall be supplied during temperature rise test.
3. Short Circuit Withstand test upto 200kVA rating [As per IS 2026 (Part 1) clause no. 16.11 & 2026 part 5].
NOTE: Routine tests before and after short circuit test shall be conducted as per IS 2026(Part 1).
4. Pressure Test [As per IS 1180: Part 1 (2014) clause no. 21.5.1.1].
5. Determination of sound levels at No load [IS 2026 (part 10)].
6. Test to verify IP 55 for cable box. (As per IS 60529 clause 11 to 15)

Note: - Out of the above mention type test, the tests under sl. No. 1, 2 ,3 and 4 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at TPCODL recommended NABL lab.**In-house test labs are accepted if in-house lab is NABL accredited for these tests.**

7.2 ROUTINE TESTS

SNo	Test to be done	Reference BIS	Clause no.
1	Measurement of Winding Resistance at each tap	IS 2026 (Part 1)	16.2.1 & 16.2.3
2	Measurement of voltage ratio, check of voltage displacement, polarity, phase sequence and vector group	IS 2026 (Part 1)	16.3
3	Measurement of short circuit impedance and load loss at 50% and 100% load	IS 2026 (Part 1)	16.4

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4	Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 112.5% of rated voltage	IS 2026 (Part 1)	16.5
5	Measurement of insulation resistance	IS 2026 (Part 1)	16.6
6	Induced over voltage withstand test	IS 2026 (Part 3)	11
7	Separate Source voltage withstand test	IS 2026 (Part 3)	10
8	Pressure test	IS 1180 (Part 1)	21.5.1.2
9	Oil leakage test	IS 1180 (Part 1)	21.5.1.3
10	BDV and moisture content of oil in transformer (Type-2 oil)	IS 335 (2018)	Table 2
11	<u>Unbalance current or Neutral current measurement</u> : The value of the zero sequence current in the neutral of the star winding shall not be more than 2% of the full load current.	CBIP manual publication no. 317	CBIP 317

7.3 ACCEPTANCE TESTS

1. Temperature Rise Test (on one unit of every release order / PO for each rating) [As per IS 2026 (Part 2) Clause no.4]
2. Oil leakage test for acceptance shall be conducted at pressure of 0.35kg/sq.cm for one hour. (IS 1180 (Part 1) clause 21.5.1.3)
3. The painted surface shall pass the Cross Adhesion Test (IS1180 part 1 clause no. 21.4.d).
4. At stage inspection -Checking of weight, dimensions, fitting and accessories, tank sheet thickness, oil quantity, material finish and workmanship, physical verification of core coil assembly and measurement of flux density on one unit of each rating of the offered lot with reference to the GTP and contract drawings. Oil BDV of all offered lot.
5. At least 10% transformer of the offered lot (minimum of one) shall be subjected to all the tests mentioned under the section 'ROUTINE in presence of TPCODL's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS: 1180 and IS: 2026.
6. Magnetic Balance Test on HV & LV side, with magnetizing current HV and LV side as per CBIP manual publication no. 317

8. TYPE TEST CERTIFICATES:


The Bidder shall furnish the type test certificates of the Transformer for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA or as defined in 7.1 as per the relevant standards. 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

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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. PRE-DISPATCH INSPECTION:

- I. Equipment shall be subject to inspection by a duly authorized representative of the TPCODL. 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.
- II. 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 theTPCODLor it's authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
- III. The BA shall arrange for complete dispatch ready transformer at least 10% of lot during inspection.
- IV. 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)
- V. To ascertain the quality of the transformer oil, the original manufacturer's tests report shall be submitted at the time of inspection. Arrangements shall also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of TPCODL's representative. In respect of raw material such as core stampings, winding conductors, insulating paper and oil, bidder shall use materials manufactured/supplied_by_standard manufacturers and furnish the nruanufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the purchaser. The bidder shall furnish following documents along with their offer in respect of the raw materials:

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- a) Invoice of supplier
 - b) Mill's certificate
 - c) Packing List
 - d) Bill of Landing
 - e) Bill of entry certificate by custom.
- VI. To ensure about the quality of transformers, the inspection shall be carried out by the purchaser's representative at following two stages;-
- a) Online anytime during receipt of raw material and manufacture/assembly whenever the purchaser desires.
 - b) At finished stage i.e. transformers are fully assembled and are ready for dispatch.
- VII. Advance intimation of 7 days for Odisha /12 day outside outside Odisha is required for both stage and final inspections.
- VIII. After the main raw material i.e. core and coil material and tanks are arranged and transformers are taken for production on the shop floor and a few assembly have been completed, the Bidder shall intimate the purchaser in this regard, so that an officer for carrying out such inspection could be deputed, as far as possible within seven days from the date of intimation. During the inspection the bidder shall also furnish the information regarding various components used to manufacture the DTs.
- IX. During the stage inspection a few assembled core shall be dismantled (only in case of CRGO material) to ensure that the CRGO laminations used are of good quality. Further, about the readiness of the transformers, for final inspection for carrying out tests as per relevant IS/IECs shall be sent by the Bidder along with routine test certificates. The inspection shall normally be arranged by the purchaser at the earliest after receipt of offer for pre-delivery inspection.
- X. All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer the inspector representing the Purchaser all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage Inspection during manufacturing stage as well as Active Inspection during Acceptance Tests.
- XI. The bidder shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-contractors to ensure the mechanical / electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts

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and equipment as per latest quality standards of ISO 90.00.

- XII. The Purchaser has the right to have the test carried out at his own by an independent agency wherever there is a dispute regarding the quality supplied. Purchaser has right to test 1 % of the supply selected either from the stores or field to check the quality of the product. In case of any deviation purchaser have every right to reject the entire lot or penalize the bidder, which may lead to blacklisting, among other things.
- XIII. TPCODL also reserves the right to inspect the tank of transformer before surface preparation and painting. The same shall be informed to TPCODL accordingly.
- XIV. At the time of inspection the material should be ready as specified, In case of material non readiness or material failure in acceptance, cost of re-inspection shall be borne by bidder.

10. INSPECTION AFTER RECEIPT AT STORE:

- I. The material received at the TPCODL store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection.
- II. In case the transformers proposed for supply against the order are not exactly as per the tested design, the Bidder shall be required to carry out the short circuit test and impulse voltage withstand test at its own cost in the presence of the representative of TPCODL.
- III. The supply shall be accepted only after such test is done successfully, as it confirms on successful withstand of short circuit and healthiness of the active parts thereafter on un-tanking after a short circuit test.
- IV. Apart from dynamic ability test, the transformers shall also be required to withstand thermal ability test or thermal withstand ability will have to be established by way of calculations
- V. TPCODL reserves the right to conduct all tests on Transformer after arrival at site / stores and the manufacturer shall guarantee test certificate figures under actual service conditions.
- VI. TPCODL reserves the right to conduct short circuit test and impulse voltage withstand test in accordance to IS, afresh on each ordered rating at purchaser cost, even if the transformer of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by TPCODL either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies already made to TPCODL stores. The findings and conclusions of these tests shall be binding on the bidder.

11. GUARANTEE:

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	TECHNICAL SPECIFICATION		
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- I. 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 Purchaser 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.
- II. 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 TPCODL, failing which the TPCODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPCODL's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.
- III. In case of Distribution transformer fails within the guarantee period TPCODL will immediately inform the Bidder who shall take back the failed Distribution Transformer within 15 days from the date of intimation at his own cost and replace / repair the transformer within forty five days of date of intimation with a roll over guarantee. The outage period i.e. period from the date of failure till unit is repaired / replaced shall not be counted for arriving at the guarantee period.
- IV. 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:

- I. Bidder shall ensure that all 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.


Note: One use plastic not to be used for packing of the material. Packing shall be done with environment friendly recyclable materials.

13. TENDER SAMPLE:

All offered transformer detailed documents to be submitted as per clause no.18. The sample shall be not applicable

14. QUALITY CONTROL:

The bidder shall submit with the offer Quality assurance plan indicating the various stages of

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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's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

The following information shall necessarily be submitted with the bid:

- I. List of important raw materials, names of sub-suppliers for raw materials, standards to which raw material is tested and the copies of test reports of the tests carried out on raw materials in presence of Bidder's representatives.
- II. List of manufacturing facilities available, level of automation achieved and the areas where manual process exists.
- III. List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of these tests and inspections
- IV. List of testing equipment for final testing with valid calibration reports. Manufacturer shall possess 0.1 class instruments for measurement of losses.

15. TESTING FACILITIES:


Bidder shall have adequate in house testing facilities for carrying out all routine tests, acceptance tests and pre-dispatch inspection as per relevant International / Indian standards.

16. MANUFACTURING FACILITIES:

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 AND TOOLS

- I. Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract Document.
- II. Bidder shall give an assurance that spare parts and consumable items will continue to be available

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through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall be given a minimum of 12 months notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.

- III. Any spare 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.

18. DRAWINGS AND DOCUMENTS:


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

- a. Completely filled in compliance to each clause of Technical Specification and any Additional Details and Fittings.
- b. Description of the transformer and all components drawings.
- c. General arrangement for Transformer.
- d. LV terminal box drawing along with CT if applicable and cleat arrangement and gland plate drawing.
- e. Bill of material.
- f. Foundation plans
- g. Experience Certificate and list
- h. Type test certificates.
- i. List of makes of major components as listed above.

Drawings / documents to be submitted for approval after the award of the order within 7 days before mass manufacturing are as under:

List of Drawings/Parameters to be submitted:

1. Clause wise Compliance of the specification
2. General Arrangement Drawing of the Transformer (Front view, Top view and both sides view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
3. Internal Core arrangement drawing.
4. Internal Core-coil assembly drawing.
5. Marking plates and Markings (as mentioned in clause 6)
6. Foundation Plan drawing.
7. HV and LV bushings drawing (with internal view and metal parts)
8. HT connector / LT connector (palm connector), Aluminium Busbar

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9. HV and LV Box drawing.
10. BH curve of core material offered
11. Gland Plate for HV/LV box.
12. Prismatic oil level gauge drawing.
13. LV Terminal Box drawing with internal wiring arrangement of bus bar etc.
14. Gland plate
15. Cable cleat arrangement
16. Type Test Certificates.
17. Installation Instructions.
18. Quality Assurance plan.


2. List of Calculations to be submitted:

All the calculations shall be step by step showing the use of formulas and other practical considerations. **Concise calculations in table or excel sheet shall not be accepted.** Also, the reference (only standard sources as IS, IEC or any such standard is acceptable) of the formulas shall be mentioned.

1. Resistance Calculation (75 deg. C)
2. Load Losses Calculation (at 75 deg. C)
3. No load Losses.
4. Stray Losses.
5. Weight of Aluminium (Bare and with Insulation also).
6. Weight of Core.
7. Flux Density calculations.
8. Current Density Calculations.
9. Short Circuit withstand.
10. Temperature Rise Calculations.
11. Cooling Calculations showing cooling with tank and radiators separately with no. of radiators and fins mentioned specifically.

Additional Documents to be submitted :

- a. List of raw materials as well as bought out accessories and name of sub-suppliers selected from those furnished along with offer.
- b. Type test certificates of the raw materials and bought out accessories.

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- 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 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:

All clauses and points in the specification to be complied.

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

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1. SCOPE:

- I. 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 Oil immersed, non-sealed, naturally cooled, three Phase 11/0.433 kV, 50Hz, outdoor conventional type, copper winding, Distribution Transformer of 250kVA to 2MVA ratings.
- II. The transformer shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions specified in clause no. 3
- III. Such of the parts that may have not been specifically included, but otherwise form part of the transformer as per standard trade and/or professional practice and/or are necessary for proper operation of transformer, 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. notwithstanding the fact that at the time of an initial offer bidder had segregated such items and quoted for them separately.


2. APPLICABLE STANDARDS:

The equipment (and the materials used) covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian standards & other relevant standards for components, BEE & CEA guidelines with latest amendment from time to time, thereof, some of which are listed below:

Indian Standards	Title
IS 1180	Outdoor Type Oil Immersed Distribution Transformers Upto and Including 2500 KVA, 33 kV-Specification
IS 2026 (all parts)	Specification for Power Transformers
IS 104	Specification for ready mixed paint, brushing, zinc chrome, priming
IS 335	Specification for new insulating oil.
IS 649	Testing for steel sheets and strips and magnetic circuits.
IS 5	Specification for Colors for ready mixed paints and enamels
IS 1576	Solid Pressboard for Electrical Purposes -Specification
IS 2099	Specification for bushings for alternating voltages above 1000 volts

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IS 2362	Determination of water content in oil by Karl in oil Fischer Method – Test Method.
IS 3024	Grain oriented electrical steel sheets and strips
IS3347 (Part I & Part-3)	Dimensions for Porcelain Transformer Bushings for Use in Normal and Lightly Polluted Atmospheres - Part 1 : Up to and including 1 kV
IS 4253: Part II:	Specification for cork composition sheets- Part II : Cork and Rubber
IS 4257(Part I):	Dimensions for Clamping Arrangements for Porcelain transformer Bushings - Part I: For 12 kV to 36 kV Bushings
IS 5082	Wrought Aluminum and Aluminum Alloy bars, Rods , Tubes, Sections, Plates and Sheets for Electrical Applications
IS 5561	Specification for Electric Power Connectors
IS 6103	Specification for Testing of specific resistance of electrical insulating liquids
IS 2026 part 7	Guide for loading of Oil-immersed transformer
IS 6792	Method for Determination of Electric Strength of Insulating Oil
IS 7404 (Part-1):	Paper Covered conductors: Round Conductors
IS 7421	Specification for porcelain bushings for alternating voltages up to and including 1000kv
IS 8603 (Part-1) :	Dimensions for Porcelain Transformer Bushings for Use in Heavily Polluted Atmospheres - Part I:12 kV and 17.5 kV Bushings
IS 9335	Specification for Cellulosic Papers for Electrical Purposes
IS 10028	Code of Practice for Selection, Installation and Maintenance of Transformers
IS 11149	Specification for rubber gaskets
IS 12444	Specification for Continuously Cast and Rolled Electrolytic Copper Wire Rods for Electrical Conductors.
IS/IEC 60947 (PART 1& PART 2)	Specification for LV Switchgear & Control gear
IS 6160	Rectangular electrical conductors for electrical machines
IS 13964	Methods of measurement of transformer and reactor sound levels
IS 3401	Specification of silica Gel

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IS 1897	Copper strip for electrical purposes
IS 60529	Degree of protection provided by enclosure
IS 816	Welding of Mild Steel
CEA	Guidelines for specifications of energy efficient outdoor type single and three phase distribution transformers
IS 6262	Method of test for power factor and dielectric constant of electrical insulating liquids
IS 16659	Fluids For Electro technical Applications - Unused Natural Esters For Transformers And Similar Electrical Equipment
IS 16081	Insulating liquids — Specifications for. Unused synthetic organic esters for Electrical purposes
IEC 60156	Method of determination of electric strength of insulating oils.
IEC 60296	Specification for unused mineral insulating oils for transformers and switchgear.
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IS 1852	: Rolling and cutting tolerances for hot rolled 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

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10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)
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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. GENERAL TECHNICAL REQUIREMENTS:

S. No.	Description	Requirements									
			*	*		*	*		*	*	
1.	Continuous Rated Capacity (kVA)	250 kVA	315 kVA	400 kVA	500 kVA	630 kVA	800 kVA	1 MVA	1.25 MVA	1.6 MVA	2 MVA
2.	Application	Outdoor	Outdo or	Outdo or	Outdo or	Outdo or	Outdo or	Outdo or	Outdo or	Outdoor	Outdoor
3.	System voltage (max.)	12 kV	12 kV	12 kV	12 kV	12 kV	12	12	12	12	12
4.	Rated voltage HV	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv	11Kv
5.	Rated voltage LV (V)	433-250	433-250	433-250	433-250	433-250	433-250	433-250	433-250V	433 V-250V	433 V-250V
6.	Line current HV (A)	13.12 A	16.53 A	20.96 A	26.25 A	33.06 A	42A	52.48 A	65.6 A	83.98 A	104.97A
7.	Line current LV (A)	333.34 A	420.02 A	533.36 A	666.68 A	840.02 A	1066.7A	1333.4 A	1666.7 A	2133.5 A	2666.7
8.	Frequency (Hz)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50Hz	50Hz	50Hz	50Hz
9.	No. of Phases	Three	Three	Three	Three	Three	Three	Three	Three	Three	Three
10.	Connection HV	Delta	Delta	Delta	Delta	Delta	Delta	Delta	Delta	Delta	Delta
11.	Connection LV	Star (Neutral Brought out)	Star (Neut ral Broug ht out)	Star (Neut ral Broug ht out)	Star (Neut ral Broug ht out)	Star (Neut ral Broug ht out)	Star (Neut ral Broug ht out)	Star (Neut ral Broug ht out)	Star (Neut ral Broug ht out)	Star (Neutra l Broug ht out)	Star (Neutral Brought out)
12.	Vector group	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11	Dyn-11
13.	Type of cooling	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN	ONAN
14.	Tap changing arrangement (off load)	+5.0% to -10% in steps of 2.5%		+5.0% to -10% in steps of 2.5%			+5.0% to -10% in steps of 2.5%		+5.0% to -10% in steps of 2.5%		
15.	No. of tap positions	7	7	7			7	7			7
16.	Noise level at rated voltage and frequency	55 dB	56 dB	56 dB	56 dB	57 dB	58 dB	58 dB	60 dB	60 dB	61 dB
17.	Permissible temperature rise										

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	over ambient:											
17.1	Of top oil	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
17.2	Of winding	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
18.	Max. Total Losses at 50% loading at 75°C (watts)	920	955	1150	1430	1745	2147	2620	3220	3970	4790	
19.	Max. Total Losses at 100% loading) at 75°C (Watts).	2700	2750	3330	4100	4850	5838	7000	8400	11300	14100	
20.	Short circuit impedance voltage at 75°C (±10% tolerance)	4.5%	4.5%	4.5%	4.5%	4.5%	5%	5%	5%	6.25%	6.25%	
21	Insulation Class	A	A	A	A	A	A	A	A	A	A	A
22.	Normal Flux Density (at rated voltage and frequency)	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T	1.6 T
23.	Maximum current density (A/mm ²)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24.	Impulse withstand voltage	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp	75 kVp
25.	Power frequency withstand voltage	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV	28 kV
26.	Max. flux density (Increase of +12.5 % combined voltage & frequency variation from rated voltage & frequency)	1.9 T(Max.)										
27.	Voltage fluctuations permissible	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%
28.	Metering CT for LV side	400/5	500/5	600/5	800/5	1000/5	1200/5	1500/5	2000/5 A	2500/5 A	3000/5A	
28.1	Accuracy Class for metering CT	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s	0.5s
28.2	Burden	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA	20 VA
28.3	ISF (Instrument security factor)	5	5	5	5	5	5	5	5	5	5	5
29.	Neutral terminal	Two separate brought out neutral from main neutral bus bar, One for taking out the neutral for 4 wire system and other additional neutral for solid earthing.										
30.	Minimum clearances in air (mm) :											
30.1	HV phase to phase/ phase to earth	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140	255 / 140

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30.2	LV phase to phase/ phase to earth	75 / 40	75 / 40	75 / 40	75 / 40	75 / 40	75/40	75 / 40	75 / 40	75 / 40	75 / 40
31.	Minimum clearances in Cable Box (mm) :										
31.11	HV phase to phase/ phase to earth	130 / 90	130 / 90	130 / 90	130 / 90	130 / 90	130/9 0	130 / 90	130 / 90	130 / 90	130 / 90
31.2	LV phase to phase / phase to earth	25 / 20	25 / 20	25 / 20	25 / 20	25 / 20	25/20	25 / 20	25 / 20	25 / 20	25 / 20
32	Wheels	The transformer shall be provided with four uni-directional rollers with locking arrangement suitable for rail gauges in both the axis for movement of transformer in either direction. Distance between wheels shall be center to center 820mm									
,* : Ratings are for optional/ future use											

5. GENERAL CONSTRUCTION:


- I. The transformer shall be stacked core, copper coil, oil immersed, naturally cooled (ONAN), non-sealed type with plain rectangular tank.
- II. The transformer shall be suitable for service with fluctuations in supply voltage up to +12.5% to -12.5%.
- III. The transformer shall be designed suitable for service life of 25years.
- IV. The transformer and accessories shall be designed to facilitate trouble free operation, inspection, maintenance and repairs under the various operating and atmospheric conditions specified in clause no. 3.
- V. The design shall incorporate every precaution and provision for the safety of the equipment as well as staff engaged in operation and maintenance of the equipment.
- VI. All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.

5.1 CORE:

- I. Transformer core shall be stack type, 2D, constructed from high grade cold rolled, non-ageing, grain oriented, silicon steel lamination which shall be properly annealed (under inert atmosphere, if required) to relieve stresses.
- II. The core shall have low loss and good grain properties.
- III. Core should be coated with hot oil proof, with insulation coating, an inorganic coating equivalent to C-5 type as ASTM A976 or IS 3024, like Carlite -3.
- IV. All core should be clamped together with frames to prevent vibration and noise. The core clamping shall be preferably without through bolts and if any bolt used same shall be effectively insulated.

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- V. The core thickness should be 0.23mm or less. 23HP85 as per IS 3024 or better with Minimum Polarization in Tesla at a Field Strength of 800 A/m
- VI. Only single grade and same thickness of core stampings shall be accepted and mixing of different grades shall not be allowed.
- VII. The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.
- VIII. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated. The vendor shall submit the calculations in support of the same.
- IX. The handling of core lamination and stacking should be smooth and uniform.
- X. The transformer shall be suitable for continuous service without damage under 'over fluxing' where the ratio of voltage over frequency exceeds the corresponding ratio at rated voltage and rated frequency up to 12.5% and the core shall not get saturated. The BH graph to be submitted by bidder for core material.
- XI. The No Load current shall not exceed 2% of the Full Load current for $\geq 250\text{kVA}$ and will be measured by energizing the transformer at rated voltage and frequency. Increase of 12.5% of rated voltage shall not increase the no-load current by 5% maximum of full load current for $\geq 250\text{kVA}$ rating
- XII. The bidder shall be required to submit the following documents in regard to procurement of core material during stage inspection:
 - a. Invoice of supplier
 - b. Mill's test certificate
 - c. Packing list
 - d. Bill of landing
 - e. Bill of entry certificate by custom (if required)
 - f. Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.
- XIII. The bidder shall offer the core for inspection and approval of TPCODL during manufacturing stage. Heavy penalty or black listing shall be imposed on the bidders using defective CRGO sheets i.e in case of nonconformance w.r.t TPCODL Specifications.
- XIV. Transformer core assembly shall have enclosed type lifting lugs for lifting arrangement.
- XV. **Bidder shall provide the below details in below table:**

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Sl. No.	Description	Unit	To be furnished by bidder
1	Magnetizing (No Load) Current		
	90% Voltage	%	
	100% Voltage	%	
	112.5% Voltage	%	
2.	Core grade		
3.	Thickness of core Lamination	Mm	
4.	Core Dimension: Length X height X diameter	mm x mm	
5.	Gross core area	Sq.cm	
6.	Net core area	Sq.cm	
7.	Flux density (calculated)	Tesla	
8.	Over fluxing without saturation (BH curve to be submitted)	Tesla	
9.	Mass of core	Kg	
10.	Loss per Kg of core at the above specified flux	Watt	
11.	Core window height	Mm	
12.	Center to center distance of the core	Mm	
13	Mass of Core Lamination (min.)	Kg	
14	Make of Core offered		


5.2 WINDING CONNECTIONS

- I. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 25% overlap per layer of paper.

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- II. The conductor should be drawn uniformly without any deformation and any burr.
- III. No metallic or non-metallic dust should be present in-between DPC conductor.
- IV. The current density for HV and LV winding should not be more than 2.5 Ampere per sq.mm.
- V. The insulation between core and bolts, core and clamps shall withstand **2.5 kV for one minute.**
- VI. Proper bonding of inter layer insulation with the conductor shall be ensured.
- VII. All turns of windings shall be adequately supported (by which material) to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- VIII. The joints in the winding shall be avoided but if it is necessary then, they shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.**
- IX. LV winding shall be such that neutral formation is at the top.
- X. Bidder shall provide the below details in below table:**


Sl. No.	Description	Unit	To be furnished by bidder
1.	No. of LV coils		
2.	No. of HV coils		
3.	HV conductor grade		
4.	Dia of HV conductor (Bare)	Mm	
5.	Dia of HV conductor with (DPC)	Mm	
6.	Conductivity of HV conductor	%	
7.	Purity of HV conductor	%	
8.	No. of HV Turns	Nos.	
9.	Current density of HV winding(calculated)		
10.	Wt. of the HV winding copper without insulation	Kg	
11.	LV conductor grade		
12.	Dimension of LV conductor (Bare)	mm x mm	
13.	Dimension of LV conductor with (DPC)	mm x mm	
14.	Conductivity of LV conductor	%	
15.	Purity of LV conductor	%	

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16.	No. of LV Turns	Nos.	
17.	Current density of LV winding(calculated)	A	
18.	No. of parallels of LV conductor	Nos.	
19.	Wt. of the LV winding copper without insulation	Kg	
20.	Resistance of windings at 20°C		
	HV winding	Ohm	
	LV winding	Ohm	
21.	Height of LV winding	Mm	
22.	Height of HV winding	Mm	
23.	ID of HV winding	Mm	
24.	OD of HV winding	Mm	
25.	ID of LV winding	Mm	
26.	OD of LV winding	Mm	
27.	Thickness of the duct in LV winding	Mm	
28.	Thickness of the duct in HV winding	Mm	
29.	Thickness of the duct between HV & LV	Mm	
30.	Make of the copper winding conductors		

5.3 INSULATING PAPER AND INSULATING PRESSBOARD

- I. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and compressed pressboard of make (refer Clause no.5.32) subject to approval of TPCODL
- II. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 25% overlap per layer of paper.
- III. Kraft paper and Pressboard should be made of pure Cellulose from soft wood pulp manufactured from sulphate process. No additive, adhesive or coloring matter shall be present.
- IV. Kraft paper and Pressboard should be of class A (105°C) insulation material.
- V. All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard.
- VI. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.

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- VII. Insulation shearing, milling and punching operations shall be carried out in such a way, that there should not be any burr, sharp edges and dimensional variations.
- VIII. Kraft paper self-adhesive tape to be used for bonding of insulating paper layer, spanner and paperboards that are immersed in the oil filled transformer.
- IX. **Below required values could be verified if required at any stage of the inspection and it should fulfill the requirement as per below table:**

Characteristics	Kraft Paper	Pressboard (all Sizes)
1. Dimension	As specified by bidder with +5% tolerance.	As specified by bidder with tolerance as per IS1576.
2. Apparent Density	>0.80 g/cm ³	as per IS 1576 w.r.t Thickness
3. pH of Aqueous extract	6-8%	6-8%
4. Electrical strength i) in air ii) In Oil	7KV/mm -----	12KV/mm 35KV/mm
5. Ash content	Maximum 1%	Maximum 0.7
6. Moisture content	Maximum 8%	Maximum 8%
7. Oil absorption	-----	Minimum 9%
8. Heat stability	As per IS 9335-part 3	As per IS 1576
9. Tear index	As per IS 9335-part 3	As per IS 1576


Bidder has to submit the test certificates as per IS-9335, IS-1576 for all type of insulating materials covering above stated parameters along with **below parameters during stage inspection** :

- a. Substance (Grammage) (g/m³)
- b. Compressibility
- c. Tensile strength
- d. Conductivity of water extract
- e. Shrinkage in air
- f. Flexibility
- g. Cohesion between plies.
- h. Elongation
- i. Air permeability
- j. **Bidder shall provide the below details in below table**

Sl. No.	Description	Unit	As furnished by bidder
1.	DPC Paper for HV and LV conductors :		
	Type of DPC Paper		
	Make of DPC Paper		
	Thickness DPC Paper	mm	

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	Percentage Overlapping (not less than 60%)	%	
2.	Type of Paper for Interlayer Insulation		
	Make of Paper for Interlayer Insulation		
	Thickness of Paper for Interlayer Insulation	mm	
3.	Type of Paper for Insulation Between HV and LV winding		
	Make of Paper for Insulation Between HV and LV winding		
	Thickness of Paper for Insulation Between HV and LV winding (for all sizes)	mm	
4.	Type of Pressboards used for Insulation Between HV and LV winding		
	Make of Pressboards used for Insulation Between HV and LV winding		
	Thickness of Pressboards for Insulation Between HV and LV winding (all size)	mm	
5.	Type of Paper used for insulation between core and LV		
	Make of Paper used for insulation between core and LV		
	Thickness of Paper used for insulation between core and LV (All sizes)		
6.	Type of Pressboard used for insulation between core and LV		
	Make of Pressboard used for		


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	insulation between core and LV		
	Thickness of Pressboard used for insulation between core and LV (All sizes)		
7.	Material used for top and bottom yoke insulation		
	Make of material used for top and bottom yoke insulation		
	Thickness of material used for top and bottom yoke insulation	mm	
8.	Type of material used for Spanner, wedge and Axial for insulation		
	Make of material used for Spanner, wedge and Axial for insulation		
	Thickness of material used for Spanner, wedge and Axial for insulation (all sizes)	mm	

5.4 LOSSES

- I. The bidder shall individually guarantee No load loss (Iron loss at rated voltage and frequency) and full load Copper Loss (at 75°C) without any positive tolerance.
- II. **The bidder shall also guarantee the total loss at 50% and 100% load condition (at rated voltage and frequency and these should be within the limits of maximum total losses declared by TPCODL for both 50% and 100% loading values (as per table below) :**

Description	Rating (kVA)				
	250	315 *	400 *	500	630*
Maximum Losses at 50% loading at 75°C (Watts)	920	955	1150	1430	1745
Maximum Losses at 100% loading at 75°C (Watts)	2700	2750	3330	4100	4850
Description	Rating (kVA)				

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	800*	1000	1200*	1600*	2000
Maximum Losses at 50% loading at 75°C (Watts)	2147	2620	3220	3970	4790
Maximum Losses at 100% loading at 75°C (Watts)	5838	7000	8400	11300	14100

No positive tolerance shall be allowed on the losses as mentioned above. However, bidder can offer losses less than specified but no consideration in cost will be given for the same.

*** : Ratings are for optional/ future use**

- III. **The successful bidder shall guarantee the quoted losses for at least five years.** If at any point of time during operation if it is found that the total losses at 50% and 100% load are more than the values given in specifications, then bidder shall be liable to pay a fine of Rs 250 per watt to the amount by which losses at 50% loading and 100% loading increase with respect to the values given in specifications.
 - IV. During testing at Bidder's works if it is found that the actual measured losses are more than the values quoted by the Bidder, **TPCODL shall have the right to reject the complete lot.**
 - V. During testing at Bidder's works, if the temperature rise exceeds the specified values, **the entire lot shall be rejected by TPCODL.**
 - VI. During testing at Bidder's works, if the impedance values differ from the guaranteed values including tolerance, **the entire lot shall be rejected by TPCODL.**
 - VII. Transformer losses shall be checked on any one of DT from supplied lot at TPCODL workshop. If it is found that the actual measured losses are more than the values quoted by the Bidder, **TPCODL shall have the right to reject the complete lot.**
- VIII. **Bidder shall provide the below details in below table:**


Sl. No.	Description	Unit	To be furnished by bidder
1	No Load losses	Watt	
2	Load losses at 50% loading at 75° C	Watt	
3	Load losses at 100% loading at 75° C	Watt	
4	Total losses at 50% load at 75° C	Watt	
5	Total losses at 100% load at 75° C	Watt	
6	Efficiency at 75 deg. C		
7	Efficiency at Unity P.F.		
7.1	100% load	%	
7.2	80% load	%	

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7.3	60% load	%	
7.4	40% load	%	
7.5	20% load	%	
8	Efficiency at 0.8 P.F.		
8.1	100% load	%	
8.2	80% load	%	
8.3	60% load	%	
8.4	40% load	%	
8.5	20% load	%	
9	Regulation at :		
9.1	Unity P.F. at 75 deg. C	%	
9.2	0.8 P.F. at 75 deg. C	%	
9.3	% Impedance at 75 deg. C	%	

5.5 TRANSFORMER TANK AND TANK CONSTRUCTION

- I. The transformer tank shall be of robust construction, **rectangular in shape** and shall be built up of electrically tested welded mild steel plates.
- II. The tank shall be fabricated by welding at corners. No horizontal or vertical joints in tank side walls and its bottom or top cover shall be allowed.
- III. All welding operations should be carried by **qualified welders** (performance qualification certificates to the customer) as per the relevant ASME standards and a copy of the **welding procedure** has to be submitted to TPCODL at the time of drawing approval.
- IV. The **thickness of tank** should be as below:
For top and bottom : 6 mm (min.)
For Sides : 5 mm (min.)
Tolerance shall be applicable as per IS 1852 as per above thickness band.
- V. In addition the cover of the main tank shall be provided with an **air release plug**.
- VI. The tank plates shall be of such strength that the complete transformer when filled with oil may be lifted bodily by means of the lifting lugs provided. The top cover shall have no cut at point of lifting lug.
- VII. The transformer tank cover shall be bolted with tank rim so as to make a leak proof joint.
- VIII. The tank plate and lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle.
- IX. The tank cover shall have slight slope (10 mm \pm 2mm) towards HV side to drain rain water.
- X. There must be sufficient space from the core to the top cover to take care of oil expansion. The oil volume inside the tank shall be such that even under the extreme operating conditions, the **pressure generated inside the tank does not exceed 0.4**

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kg/sq. cm positive or negative and the tank shall be of adequate mechanical strength to withstand it.

- XI. The transformer should be capable of **withstanding 0.8kg/sq.cm air pressure and a vacuum of 0.7kg/sq.cm**. The permanent deflection of the flat plate, when the tank without oil is subjected to a vacuum of 525 mm of mercury shall not be more than the values specified:


<u>Length of Plate</u>	<u>Deflection</u>
Up to 750 mm	5.0 mm
751 mm to 1250 mm	6.5 mm
1251 mm to 1750 mm	8.0 mm
Above 1750 mm	9.0 mm

- XII. **The tank design shall be such that the core and the windings can be lifted freely without dismantling the bushings.**
- XIII. All joints of tank and fittings shall be oil tight and no bulging shall occur during service.
- XIV. Anti –theft stainless steel fasteners with breakaway nut shall be provided at top cover (minimum 4 nos. at corners) placed in between other bolts without affecting pitch of bolts.
- XV. The tightening torque chart to be provided for all bolts used. This shall be submitted along with each rating drawings.
- XVI. The transformer shall be provided with four pulling lugs of MS plate of 8mm thick to pull the transformer horizontally.


Lifting lugs:

- XVII. The transformer shall be provided with a minimum of four welded heavy duty enclosed lifting lugs of Structural steel E250 or better grade quality A (Minimum quality A) as per IS 2062 plate of minimum 16mm thickness for lower rating and gradually increased for higher rating as per weight suitably reinforced by vertical supporting flat stiffener smooth welded properly on the side walls up to reinforcing angle. They shall be so extended that cutting bend plate is not required. The transformer lifting lug shall be painted with yellow colour.
- XVIII. The location of lifting lugs shall be such that the clearance between lifting chain and nearest part of bushing shall be at least 100 mm.
- XIX. There shall be facilities for lifting the core coil assembly separately.
- XX. The lifting lugs shall be designed in such a way that any two diagonal lugs are capable of lifting two times of the total weight of the transformer. The design of should be such that it should be suitable for 120degree lifting rope angle as per ASME B30.9 and at any point of time the maximum stress allowed on the Lug martial shall be lesser than 82MPa as per ANSI C.57.12.10
- XXI. Calculation sheet for Lifting lug design to be submitted by Bidder. The calculation shall include the Stress on lifting lug material and stress on welding both. The Stress on the welding should be less than 840kg/cm² as per ANSI C.57.12.10. All calculation to be done for considering lifting on any diagonal opposite two lugs conditions.
- XXII. The lifting lugs shall be located on the side walls only and conservator on LT box side. Separate drawing to be submitted stating welding thickness, welding length and location on tank along with stiffener support for all rating and all lugs.
- XXIII. **Bidder shall provide the transformer size and clearances in below table:**

Sl.	Description	Unit	To be furnished by bidder
-----	-------------	------	---------------------------

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No.			
1	Transformer overall Length x Height x width	mm x mm x mm	
2	Only Tank overall Length x Height x width	mm x mm x mm	
3	HV Cable box overall LxWxH	mm x mm x mm	
4	LV Cable box overall LxWxH	mm x mm x mm	
5	Clearances		
5.1	Core and LV (minimum 5mm)	Mm	
5.2	LV and HV (minimum 8mm)	Mm	
5.3	HV Phase to phase (minimum 10mm)	Mm	
5.4	Between HV winding and Yoke (minimum 20mm)	Mm	
5.5	Between LV winding and Yoke (minimum 5mm)	Mm	
5.6	Between yoke and inside of tank to cover (minimum 100mm)	Mm	
5.7	Between yoke and bottom (minimum 10mm)	Mm	
5.8	Any point of winding to tank (minimum 20mm)	Mm	
6	Calculated Impedance	%	
7.1	HV to Earth Creepage distance in oil (minimum 15mm)	Mm	
7.2	LV to Earth Creepage distance in oil (minimum 5mm)	Mm	

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8.	Conservator dimension (dia x Length)	Mmxmm	
9.	Size of Pipe used for conservator to Tank	Mm	
10.	Size of Pipe used for Valves	Mm	
11.	Base Channel size	Mmxmm xmm	
12.	No. of Radiators	Nos	
13.	No. of fins per Radiator	Nos	
14.	Dimension of radiator fins (L x W)	Mmxmm	
15.	Make of Tank material		


5.6 RADIATORS

- I. Radiators of pressed steel type conforming to the design requirement suitable for mineral oil and Ester oil (all type) type transformer.
- II. The Pressed Steel type should be used in vertical formation without any bending and should be individually tested for leakage and pressure test etc. before welding with the main tank.
- III. **Thickness** of sheet for radiators shall be **1.20 mm (min)**.
- IV. The **mounting** of the radiators shall be **non-detachable** (i.e., they should be welded permanently with the tank) for DTs up to 1 MVA.
- V. The number / cross section / length / fixing arrangement of radiators shall be indicated in the general assembly drawing.
- VI. Radiator thickness must be uniform without any dent or damage and also no bulging or concave should occur even after performing pressure/ vacuum test and temperature rise test.
- VII. Corrugated designs are not accepted.

5.7 GASKET

- I. **Cork rubber gaskets** conforming to Type C , grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing & water ingress resistant requirements for components like HV & LV bushings bottom gasket, HV & LV terminal box, Top Cover, Conservator, Valves etc.
- II. **Nitrile/Neoprene rubber gaskets** conforming to Type IV – 4C (heat and oil resistant) as per IS 11149 shall be provided for bushing O ring (oil gaskets).
- III. **Only Joint free Gasket to be used. Only in case of top cover gasket and terminal box gasket up to two dove-tail joints with adhesive shall be allowed. The terminal box gasket joint shall come at bottom part.**
- IV. Cork sheet, Nitrile/Neoprene rubber gaskets shall be free from cracks, pinholes and shall be capable of being cut or punched without crack or tearing.

5.8 TAPS

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- I. Rotary/Ring type tap changing mechanism to be mounted on side of the transformer in such way that could be easily operated in smooth way.
- II. Tap changing shall be carried out by means of an externally operated self-position switch and when the transformer is in de-energised condition.
- III. The taps shall be provided in HV winding and each tap change shall result in voltage variation of 2.5%.
- IV. Switch position no.1 shall correspond to the maximum plus tapping (i.e.+5%) and position no.7 shall correspond to minimum tapping (i.e,-10%).
- V. Tap no. 3 to be considered as principal tap position.
- VI. Provision shall be made for locking the tapping switch handle in position. Suitable plate shall be fixed for tap changing switch to know the position number of tap.

5.9 BUSHINGS AND TERMINAL CONNECTORS

A. HT Bushings (17.5 kV/250 A):

- I. The bushings shall be outdoor type, external part shall be made of porcelain material. Rods, nuts and flat washer (Tightening Nut along with Check Nut) shall be made of tinned brass material.
- II. IS to be followed: IS 8603(Part- I) for porcelain, IS 3347 part3 section 2 for metal part and Complete bushing shall comply IS 2099.
Option 1: Outdoor Bushing on Top with Bird Guard
- III. The HV bushings shall have Hot Dipped Galvanized or Alu-zinc coated or SS material arcing horns with 8mm diameter. The thickness of coating shall be **86 microns** (minimum at any point).
- IV. The HV bushing shall be fitted with bird guard on the bushing connector.
- V. Complete Tinned Brass jointless connectors shall be provided on HV bushing rods suitable for bare dog conductor connections. The connector should have large contact area. Hardware shall be Hot Dipped Galvanized or Aluzinc coated or SS material


Option 2: Side bushing with Cable box

- VI. Transformer shall be with HT cable box on sidewall of tank having porcelain bushing as specified above.
- VII. **In some situation Plinth mounted transformer may require outdoor bushing arrangement. This shall be decided during tender by user group.**

B. LT Bushings(1.1kV/suitable current rating):

- I. The bushings shall be of outdoor type made of porcelain material, The rod shall be Tinned copper for all rating along with neutral. The nuts and washers shall be of (Tightening Nut along with Check Nut) tinned brass material.
- II. IS to be followed: IS 3347(Part-I) (Section-1 for porcelain and Section 2 for metal part) and IS 7421(latest amendment of IS).
- III. The metal portion of the internal HV & LV bushing inside the tank shall remain dipped in oil in all operating condition.
- IV. The LV bushings shall be provided on the side wall of tank along with cable box.
- V. The bushing tinned copper stem sizes to be followed are,

Rating	Size of stem
250kVA	M20
400kVA	M20
500kVA	M30
630kVA	M30
800kVA	M42

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1000kVA	M42
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5.10 CABLE BOXES


- I. Cable boxes made up of Mild Steel 2.2mm thickness with suitable handle and front cover to be provided for both HV and LV side.
- II. Water should not accumulate on cable boxes and proper slope shall be provided in order to ensure drainage of water.
- III. Cable box protection shall be IP 55. Test reports to be submitted from CPRI /ERDA.
- IV. Cable box should be painted in same way as that of tank painting with treatment.
- V. HV and LV cable boxes shall be fixed on opposite sides on the tank with nuts and bolts (gasket placed in between them) in such a way that they can be completely removed whenever required.
- VI. Canopy shall be provided on all gasket joints, the bend edges of cover overlapping gasket to protect from rain and sunlight shall also accepted.
- VII. Cable cleating arrangements shall be provided just below terminal box (outside) to keep Cable straight and to support cables to avoid tension on bushings due to cable weight.
- VIII. For Cable clamping, **Fire retardant nylon grade material to be used for oval shaped clamping arrangement** with GI nut bolt on both HV & LV Side.
- IX. For HV Cable box, Non-magnetic Gland plate shall have thickness of 3mm and shall be in two parts in such a way that HV cable can be easily removed.
- X. For LV cable box, Non-magnetic Gland plate shall have thickness of 4mm and shall be in two or more parts in such a way that LV cables can be easily removed by removing the gland plates.
- XI. Gland plates shall be mounted separately with nut & bolt arrangement and gasket in between them.
- XII. The size of the cable box cover should be moderate so that only one or two people is enough to lift it.
- XIII. The bidder shall submit **drawings for the box with internal details** along with the transformer for approval.

HV CABLE BOX (option 2, ref: 5.9.A):

- XIV. The HV box shall be designed and fixed on transformer such way that only opening of cover shall facilitate for working on cable termination with ease of accessibility of terminal.
- XV. HV box gland plate shall have Single compression gland designed for 11kV, 3C X 150 or 3CX400 sq.mm XLPE Cable as per drawing approved from TPCODL.
- XVI. Distance between HV gland plate and HV bushings should be minimum 650 mm.
- XVII. Earthing provision (Body earth- outside and for cable earthing- inside of box) shall be provided in the HV box with M12 SS bolt & SS washers.
- XVIII. Gland shall be SCG 18 single compression brass gland suitable for diameter of 91mm cable.
- XIX. Bolted type terminal cover with M14/M16 HDG bolts (M12 bolts for 250KVA DT) with danger marking

LV CABLE BOX:

- XX. Neutral terminal of LV winding shall be brought out on LV phase terminals to form four wire system.
- XXI. Epoxy Insulators shall be provided from top side in LV box to support LV busbar.
- XXII. LV busbar shall be of AL material & shall have clearances as mentioned in GTP.

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- XXIII. Lugs shall be of AL material with tin coating & shall comply the IS requirements.
- XXIV. Arrangement in the LV box shall be BYRN from left to right when viewed from LV front.
- XXV. All Nut bolts shall be as per Clause 5.24 and size selection shall with as per the hole size of the AL lugs to be used.
- XXVI. The Neutral to be brought out from box through bushing and shall have same dimension as that of phase bushing.
- XXVII. GI earth strip (Size - 50 x 6 mm) shall be provided from neutral bushing to both side of the box and shall be extended up to bottom of the terminal box both sides.
- XXVIII. Insulator support to be provided on terminal box both sides for GI earth strip so as to avoid tension on secondary neutral bushing.
- XXIX. There shall be gland provision in side wall bottom or base plate of the LV box with gland of size suitable for 10core cable for taking out voltage terminal to box. 10 core cable up to box shall also be provided wired up from bus bar to TB.
- XXX. For Transformer up to 1 MVA ratings, In LV box, there must be provision for flexible mounting arrangement to fix multiple sized CT.
- XXXI. There must be proper provision of connecting voltage wires with closed thimble/lug on LV bus bars (Phases and neutral) with nut bolt size of 6mm & wires to be taken out and connected in the Metering terminal box.

Transformer Rating	Size of cable for Phase & Neutral	Gland Size for LV Box	No. of runs per phase	No. of runs for neutral
315 kVA	1C x 630 sq. mm(1.1 kV Class)	SCG10	1	1
400 kVA			2	2
500 KVA			2	2
630 kVA			2	2
800kVA			3	3
250 kVA	1C x 300 sq.mm (1.1 kV class)	SCG7	2	2

- XXXII. Earthing provision (Body earth) shall be provided in the LV box with M12 bolt.
- XXXIII. The clearance above bushing shall be 120mm and below busbar cable mounting bolt shall be 450mm up to gland plate.
- XXXIV. The no. and size of cables for installation on LV side shall be as follows:

Transformer Rating	Size of cable for Phase & Neutral	No. of runs per phase	No. of runs for neutral
1 MVA	1C x 630 sq. mm (1.1 kV Class)	3	3
1.25MVA		4	4
1.6 MVA		5	5
2 MVA		6	6

- XXXV. The LV busbar shall be one continuous conductor strip with current density of 1A/mm² and length should be min. 225mm for 250kVA. The support insulator shall be provided at the end of busbar such that cable load shall be on top end support. Neutral busbar shall be of same size of phase. The lug shall be have single hole. Busbar shall be connected on four bolts on brass palm connector.

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XXXVI. Bolted type terminal cover with M14/M16 HDG bolts (M12 bolts for 250KVA DT) with danger marking

5.11 TERMINAL CONNECTORS

HT TERMINAL CONNECTOR:

- I. Tinned Brass connectors shall be provided connected with HV bushing rods for bare top plate bushings .
- II. UV resistant polymeric insulating shrouds shall be provided on the HV bare bushing terminals.
- III. For 250 kVA and above ratings Aluminium lugs (with minimum of 2 hole) suitable for 3CX300 sq.mm XLPE shall be provided at HT side for cable connection.


LT TERMINAL CONNECTOR:

- IV. Tinned Brass palm connector (with current rating w.r.t Load current), and Aluminium busbar (current density: not more than 1 A/mm²) shall be provided.
- V. Busbar shall be supported with insulator at the top portion of terminal box.
- VI. Aluminum lugs (with minimum of two holes) shall be provided with suitable size (no. of lugs as per clause 5.10 and size of lugs as per IS 8309) for the LV cables. (Can be share our drawing or specs)

5.12 METERING CURRENT TRANSFORMERS (This shall be decided during tender by user group.)

- I. Cast Resin Type CTs shall be provided for transformers on the LT side for metering purpose.
- II. The CTs shall be Resin Casted ring type and a thickness of min 2mm of resin above the coil of the CT to be ensured.
- III. The core of the CT shall be of high grade non-ageing electrical silicon CRGO Steel or better grade of first quality having low hysteresis loss and high permeability to ensure accuracy at both terminal and over current/ voltage.
- IV. The grade of the Core shall be M4 or better
- V. The Resin Casted CTs shall be embossed as 'P1' and other side as 'P2'. Lock side pole of coupler shall have S1 terminal and other pole shall have S2 terminal.
- VI. The Coil shall be insulated with electrical grade Polyester Tape and the insulation shall be of high insulation grade, excellent mechanical strength (tensile, tear, and stretch), high purity, chemical stability, and heat resistance.
- VII. The Copper wire used shall be super enameled as per the IS 4800 Part IX/ IEC 317.
- VIII. The wiring shall be enclosed in such a way that it can't be disturbed during maintenance activities.
- IX. The CT shall be mounted outside the tank with suitable clamping arrangement (fiber glass material).
- X. The position of secondary terminals shall be such that, it will face towards outside after installation on bushing or bus bar of transformer.
- XI. Mounting arrangement should be such that the CT shall be replaceable at site.
- XII. The terminals shall have shorting facility and it should not get saturated up to 200% of rated current.
- XIII. The weight of the Ring type CTs shall not exceed approx. 2.5 Kg +/- 10%.
- XIV. The CTs shall have following parameters.

Accuracy class	0.5s
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Burden	20 VA
Application	Metering
ISF	5
CT ratio for	As mentioned in clause 4.28

5.13 AUXILIARY TERMINAL BOX

Note: Aux. Terminal Box shall be required for 250kVA to 1MVA and ratings above 1MVA marshalling box shall be required.

- I. Aux. terminal box of suitable size made up of **Mild Steel** and with **theft proof locking arrangement** for box.
- II. Box shall be provided with Stud Type terminal blocks with 2 spare terminals. shorting links required for CT connections.
- III. 10 core multi stranded PVC armored cable (2.5 sq.mm Cu FRLS PVC stranded panel wires) shall be used to terminate connections from CT and voltage terminals (6 CT wires and 4 voltage wires) at LV side to the CT terminal box.
- IV. PVC ferrules engraved with black letters shall be used to mark the wires coming from LV box for CT and volatge.
- V. **PVC ferrules** engraved with black letters shall be used to mark the wires in the terminal box.
- VI. Holes with PVC glands to be provided on bottom side of this box as incoming (01nos.) and outgoing (02Nos.) for 10CX2.5 sq.mm cable and for Auxiliary cables of magnetic float switch, PRV contacts, OTI aux. cable.
- VII. Terminal and cable entry for secondary wiring of Magnetic Float switch in conservator, OTI aux cable, PRV cable (for plinth mount DT) to be provided as required.
- VIII. Terminal box shall have IP 55 protection with rubber gasket and bend cover canopy over joints.
- IX. Terminal box must have provision for connecting I-type or U-type pin arrangement without spring arrangement.


5.14 EQUILISING/ EQUIPOTENTIAL STRIP

- I. The Transformer top cover shall be connected with main tank using **tinned copper strip (30mm wide, 0.7mm thick)** at two places (diagonally opposite with each other).
- II. The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip.
- III. All the covers like inspection cover, LV box cover, HV box cover, Conservator cover must be electrically connected using **tinned copper strip (30mm wide, 0.7mm thick)**.
- IV. Separate arrangement to be made and cover tightening bolt not to be used for equipotential strips.

5.15 EARTHING CONNECTIONS

NEUTRAL EARTHING:

- I. Separate LV neutral bushing to be provided on top of LV box for neutral earthing.

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- II. For connecting LV neutral bushing shall be provided with 2 Nos of 50x6 mm GI strip, one on each side of terminal box (The thickness of GI coating of neutral earthing strip shall be **86 microns** (minimum at any point).
- III. At the bottom of the GI strips two concentric holes of 12 mm diameter shall be made and M12 size SS nuts, bolts and SS washer shall be provided for them.

BODY EARTHING:

- I. Two body earthing terminals pads boss arrangement (up to 500sq.mm) shall be provided on Transformer tank with M12 SS Bolt with 70 sq. mm lug. with SS plain washer and spring washer.
- II. It shall be located on the lower side of the transformer, diagonally opposite to each other.
- III. Each Earthing terminal pad on DT shall be provided with two SS M12 bolts on each pad on each side with two 70 sq.mm AL Lugs and washers.

5.16 OIL

Note: Default Oil shall be Mineral oil only if not specified / asked for other oil.


Mineral Oil: In case of Mineral Oil below are the requirements to be fulfilled:

1. All transformers shall be filled with new, unused, clean, standard mineral oil in compliance with IS 335-2018 / IEC 296 type-II and shall be free from all traces of polychlorinated biphenyl (PCB) compounds.
2. The use of recycled oil is not acceptable.
3. Oil shall be filled under vacuum before filling it shall be filtered and tested (as per IS 6103).
4. The test parameters should be as per the table below:

Test parameters	Values
Break Down Voltage (min)	60 kV
Water content ppm, (max.)	20 ppm
Specific resistance (min.) (at 27°C)	2.5 × 10 ¹² ohm-cm

Bidder has to provide the oil data in below table:

Sl. No.	Description	Unit	To be furnished by bidder
1	Type of oil		
2	Oil Qty. for first filling	Ltr.	
3	Grade of Oil		
4	Maker's name		
5	BDV at the time of first filling	kV	

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5.17 CONSERVATOR

- I. The conservator shall be supported / fixed on the main body of the transformer tank.
- II. The capacity of the conservator tank shall be designed keeping in view the total quantity of oil and its contraction and expansion due to temperature variations. The total volume of conservator shall be such as to contain **10% quantity of the oil used in transformer**. Normally, at least **30% volume of conservator** shall be filled with Oil.
- III. The connecting pipe of the conservator shall be so fitted to transformer tank that the pipe can be detached from the tank.
- IV. Jointless pipe shall be used which shall be connected with round flanges.
- V. The inside diameter of the pipe connecting the conservator to the main tank shall be within 25 to 50 mm and it should be projected into the conservator so that its end is approximately 20mm above the bottom of the conservator so as to create a sump for collection of impurities. The minimum oil level corresponding to -5°C should be above the sump level.
- VI. The conservator oil filling cap/hole shall be of 32mm diameter & female type cap to be provided.
- VII. For DT up to 1600kVA, the conservator to be fitted with float switches such that it shall operate/open contact when the oil level in conservator goes below -5 degree C /Minimum mark. The float switch shall be with normally closed type. This contact shall be wired up in auxiliary terminal box.
- VIII. Buchholz relay: The pipe should not contain any right angle elbows. Its diameter should correspond to the diameter of the hole for the passage of oil of the relay. The pipe must be arranged to slope upwards towards the conservator at an angle of about 2 to 4 degrees to the horizontal (max 5 degrees). The part of the pipe preceding the relay should be straight for a length equal to at least five pipe diameters; the part of the pipe leading to the conservator immediately adjacent to the relay should be straight for a length equal to at least three pipe diameters.
- IX. The Oil conservator shall be provided with:
 - a. **Oil level indicator** (as per clause no. 5.18).
 - b. **Dehydrating breather** (as per clause no. 5.22).
 - c. **Drain plug**
 - d. **Oil filling hole** (1.25 inch/32mm with thread size of BSP 1.25inch, 11TPI) with cover.
 - e. **Detachable end plate** on one side (the side on which the gauge glass is fitted), to enable the maintenance staff to periodically clean the inside of the conservator tank

Center of Gravity


The transformer should be designed in such a way that the centre of gravity of complete transformer with oil and with all accessories shall fall at the vertical centre at lower height such that the transformer should be stable on flat surface ground and while lifting at lifting hooks.

5.18 OIL LEVEL INDICATOR

- I. Oil level indicator with **prismatic glass and red colour background** shall be provided.
- II. The oil gauge glass shall be removable and so embodied in the end plate so as to prevent oil leakage.
- III. The Oil level indicator should indicate oil level at minimum, normal and maximum as -5°C, 30°C and 90°C respectively.

5.19 PRESSURE RELEASE DEVICE

- I. All DTs, 250 kVA and above shall be provided with PRV/PRD with auxiliary contacts. The contact to be wired up in the auxiliary terminal box.

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- II. PRV shall be provided to operate before reaching the test pressure as specified in the above class.
- III. PRV shall not have air release arrangement.
- IV. The PRV shall seal-off after the excess pressure has been released and it shall have mechanical flag arrangement.
- V. The PRV shall have NO, NC contacts wired up in auxiliary terminal box.

5.20 AIR RELEASE PLUG

The cover of the main tank shall be provided with an **air release plug on all ratings.**


5.21 DRAIN VALVE AND FILTER VALVE

- I. The drain valve and filter valve shall be of Brass with gate valve.
- II. The drain valve and filter valve shall have double round flanges. One side shall be fixed with tank and other side should be left open for oil filling/filtration purpose.
- III. The drain valve and filter valve shall be provided with embossed name plate stating drain valve and filter valve.
- IV. The drain valve shall be located on the bottom and filter valve shall be provided at side top of tank.
- V. Locking arrangement shall be provided to stop movement of hand wheel.
- VI. The valves shall be covered with a MS box of 2mm thickness by welding on tank. The paint thickness shall be min. 80 micron on the box.

5.22 DEHYDRATING BREATHER

- I. The breather pipe shall enter the conservator from the upper side of the conservator.
- II. The breather shall contain 1 kg of silica gel for 250/315/400/500/630 kVA/800kVA & 1MVA DTs and 2kg for above 1 MVA rating.
- III. The silica gel shall be blue colored as per IS: 3401 – 1992. The granules size should be 3-5 mesh (4 to 6.73mm) up to 2kg capacity breather.
- IV. The body of the breather shall be unbreakable, transparent, UV stabilized seamless polycarbonate tube of minimum thickness 3mm
- V. The top cover shall be of pressure die cast aluminum and powder coated.
- VI. The oil cup shall be of UV protected polycarbonate.
- VII. Oil cup shall have marking of oil filling level
- VIII. The breather shall be supplied as per approved make and as per specifications.
- IX. The gasket should be of Class 3B, Type III as per IS 11149 Nitrile rubber (Oil resistant gaskets)
- X. All tie rods and all hardware should be of stainless steel material (SS 304)
- XI. Breather mounting arrangement,
 - a. Up to 2 kg capacity of Silicagel breather shall have top threaded mounting arrangement with 1/2" pipe having BSP threading.
 - b. 2kg and above capacity shall have flange mounting with 4 holes of 12mm diameter on 83 PCD.
- XII. While fixing of breather on transformer Teflon tape should be used to make it air tight & water tight. This shall be checked during inspection and after receipt at our stores on each transformer.
- XIII. The breather should have passed air pressured test as per our specification i.e. Breather shall be tested at an air pressure of 0.35kg/cm² (5 PSI) for period of 30 minutes. NABL lab test report to be submitted from OEM. For further details please refer our specifications of breathers.

5.23 OIL TEMPERATURE INDICATOR

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- I. Dial Type Oil temperature indicator shall be provided on the top cover of the transformer. It should be suitable for outdoor mounting with maximum indicator pointer. Fixing union shall be of female thread.
- II. Range: 0- 120 °C, Accuracy: ± 4 °C.
- III. The OTI shall have auxiliary contacts for alarm and trip contacts at preset temperatures, both the contacts should be wired up in the auxiliary terminal box.
- IV. The IP65 gland should be used for dial for taking out auxiliary wires.
- V. The OTI shall be IP55 tested.

5.24 FASTENERS

- I. All the bolts or studs shall be **at least 6 mm in diameter** except when used for small wiring terminals. **All bolts shall be of grade 8.8.**
- II. All nuts/bolts/washers exposed to atmosphere shall be as follows:


Size 12mm (or below)	Stainless Steel
Above 12mm	Steel with antirust coating (aluzinc coated), Hot dip galvanized

- III. All ferrous bolts, nuts and washers placed in outdoor positions shall be hot dip galvanized to prevent corrosion (except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals).
- IV. In case the galvanization is removed due to welding or manufacturing, the parts should be properly cleaned and painted to avoid exposure to atmosphere.
- V. The cup type washers to be used as spring washers, cut spring washers are not accepted.
- VI. Taper washers shall be provided where necessary. Protective washers of suitable material shall be provided on front and back of the securing screws.
- VII. Each bolt shall project at least one thread but more than three threads through the nut. If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided. The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.
- VIII. Core bolts shall be black colored high tensile grade-8.8

5.25 SURFACE PREPARATION AND PAINTING

- I. The paint shall be applied by airless spray.
- II. Steel surfaces shall be prepared by **shot blast cleaning** (IS-9954) to grade Sq.2.5 of ISO 8501-1 or **chemical cleaning** including phosphating of the appropriate quality (IS 3618).
- III. **Heat resistant (Hot oil proof) paint** shall be used for the **inside surface** and whereas for **external surface one coat of thermosetting powder paint or one coat of epoxy primer (zinc chromate/Zinc Phosphate) followed by two coats of polyurethane (P.U.) base paint.** as per table given below

S.No.	Paint type (should be UV restraint, non-fading)	Area to be painted	No of coats	Total dry film thickness (min); micron
1.	Thermosetting	Inside	01	30

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	powder paint	Outside	01	60
2.	Liquid Paint			
a.	Epoxy (primer)	Outside	01	30
b.	P.U. Paint (finish paint)	Outside	02	25 (each)
c.	Hot oil resistant paint	Inside	01	35

The two coats shall be of oil and weather-resistant nature with final coat as glossy and non-fading paint of shade 631 as per IS 5.

- IV. The dry film thickness shall not exceed the specified minimum dry film thickness by more than 25%.
- V. Any damaged part shall be cleaned to bare metal with an area extending 25 mm around its boundary. A priming coat shall be immediately applied followed by full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage. The repainted surface shall present a smooth surface which shall be obtained by carefully chamfering the paint edges before and after priming.
- VI. Painting shall not be affected by weather changes & performance against pilling out or fading etc. to be guaranteed for 5 Years.

5.26 RADIO INTERFERENCE

When operated at voltages up to **12.5%** in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.


5.27 OVERLOAD CAPACITY

The transformer shall be suitable for loading as per IS 2026 part 7

5.28 FITTINGS

The following standard fittings shall be provided:

- I. Two earthing terminal pads/ boss with earthing symbol \perp for body earthing on opposite sides with 70sq.mm AL lug and M12 SS bolt and washers.
- II. Air Release Device.
- III. Thermometer Pocket with cap.
- IV. 1MVA and above with Inspection Cover.
- V. Drain cum Sampling Valve & filter valve (Double Flanged for 630kVA and above & Up to 500kVA with T type drain valve without filter valve) and (0.75 inch nominal size thread, IS 554) with locking arrangement and a valve cover made of M.S. steel painted with minimum 70 micron layer.
- VI. Pressure relief device with auxiliary contacts for DT up to 250 kVA and above.
- VII. Welded fixed type Radiators upto 1MVA.

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- VIII.** LV cable box for all DT. For HV side, cable box or Bare bushings can be provided. **User group shall decide this during tender.**
- IX.** For HV bare bushing DT- bird guard on bushings terminals connectors
- X.** Terminal Connectors for HV (Tinned brass for pole mounted DT) /LV side (tinned brass palm connector, Al busbar with support insulator on top and Al lugs) up to 500kVA DT.
- XI.** 1000kVA and above DT, epoxy bushing in HV and LV with tinned copper busbar shall be accepted for compact designs with top cover terminal & cable box.
- XII.** HV and LV two part Gland plates (Non-Magnetic and with Single compression Brass glands).
- XIII.** Conservator with Dehydrating Breather on LV side.
- XIV.** Prismatic Oil level Gauge and magnetic float switch in conservator.
- XV.** Lifting lugs (enclosed type) for the top cover, complete transformer and core and winding assembly.
- XVI.** Pulling Lugs.
- XVII.** Jacking Pads
- XVIII.** Stiffener Angle.
- XIX.** 2 Base channels all DT
- XX.** Marking Plates as asked in clause 6.1
- XXI.** Oil Temperature indicator with alarm & trip contact ($\geq 250\text{kVA}$ rating)
- XXII.** Magnetic float switch for 250kVA to 1600kVA DT on conservator tank.
- XXIII.** Two GI earth strip of Size 50x6 mm for neutral earthing from both side of LV box with minimum GI coating thickness of 86 microns. With SS nut bolts and washer.
- XXIV.** Magnetic Oil level Gauge ($>1600\text{kVA}$), Winding Temperature Indicator ($>1600\text{kVA}$), Magnetic Reed type Buchholz relay (for ratings above 1MVA) in line with IS 1180.
- XXV.** Marshalling Box with stud type terminals (for ratings above 1000kVA).

5.29 WINDING TEMPERATURE INDICATOR (WTI)


- I. WTI shall be provided in one winding of each phase.
- II. WTI shall be **indicating type**, responsive to the combination of top oil temperature and winding current, calibrated to follow the hottest spot temperature of the transformer winding.
- III. WTI shall operate a remote alarm and trip in the event of attaining the predefined temperature.

5.30 BUCHHOLZ RELAY

- I. Only for $>1\text{MVA}$ DT.
- II. Magnetic Reed type Buchholz relay shall be provided with alarm and tripping contacts to detect accumulation of gas.
- III. The installation shall be fixed and weather proof to avoid any water seepage inside the relay.
- IV. Round flange of nominal pipe bore of **50mm diameter** shall be used.
- V. In addition, pocket with heater coil along with Resistance Temperature Indicator (RTD) shall be provided for WTI and OTI. CT for RTD for winding hot spots shall be provided.

5.31 MARSHALLING BOX AND PROTECTION

- I. Marshalling Box of suitable size, made up of **Mild Steel** and with **theft proof locking arrangement** shall be provided.
- II. Marshalling box shall have IP 55 protection.
- III. Above 1MVA DT - Marshalling Box shall have provision for wiring the **WTI, OTI, MOG, PRV, Buchholz relay and LT CT terminals**. The terminals shall be provided as per table below:

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Element	Alarm	Trip
Oil Temperature Indicator	NO,NC,COM	NO,NC,COM
Winding Temperature Indicator HT Side	NO,NC,COM	NO,NC,COM
Winding Temperature Indicator LT Side	NO,NC,COM	NO,NC,COM
Buchholz	NO,NC,COM	NO,NC,COM
Magnetic Oil Level Gauge	NO,NC,COM	
PRV	NO,NC,COM	
LT Neutral CT Secondary Terminal	N	
LT Phase CT Secondary Terminal	RYB	
LT Voltage terminals	RYBN	
Spare TB	4 No.	

- IV. WTI meter shall be wired/ installed in the marshalling box.
- V. 10 core PVC wire (4 sq.mm Cu FRLS PVC stranded panel wires) shall be used to terminate connections from CTs at LV side to the Marshalling box.
- VI. Plastic ferrules engraved with black letters shall be used to mark the wires in the marshalling box.
- VII. Wiring in Marshalling box shall be done by 2.5 sq.mm Cu FRLS PVC stranded panel wires.
- VIII. For TPCODL, The equipments connected into marshalling box shall be compatible with power pack relay as per attached specification for 1MVA & above ratings.
- IX. All the cables and conduits between the transformer and control cabinet shall be included in the scope of supply by the bidder.

5.32 MAKE OF MAJOR COMPONENTS & RAW MATERIALS

The BA shall procure the following constituent items from the designated vendors as follows:

S.no	RAW MATERIAL/EQUIPMENT	MAKE
a)	Copper	M/S Sterlite, M/S Hindustan Copper, M/S Hindalco.
b)	Core	M/S AK Steels, POSCO, Kawasaki/JFE, Nippon Steel.
c)	Insulation paper and Pressboards	ITC paper, ABB, Raman Boards-Mysore, Senapathy Whiteley – Bangalore

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d)	Transformer Oil (Mineral oil)	Savita, Apar, Gandhar
e)	Gaskets & Corks	Nu Cork, Anchor Corks
f)	Steel For Tank	M/s, TATA Steel, M/s SAIL, M/s. JSW Steel, M/s. IISCO, M/s. RINL/Vizag Steel, M/s. Jindal Steel,
g)	Dehydrating Breather	Yogya, Anushree, Electrical engineers
h)	Bushings HV & LV	GE,Hindustan Chemicals, Rashtriya Electricals,LAMCO
i)	Bucholz, PRD, SPR, OTI , WTI, and other devices	Reputed make to be approved by TPCODL during detailed engineering.

Also, Bidder has to provide all test certificates from original manufacturers & relevant sourcing documents. BA shall also have shot blasting facility.

6. MARKING:

6.1 MARKING PLATES

I. Name Plate (Rating) Plate : SS material

A rating plate shall be fitted to each transformer in a visible position and shall carry all the information as **specified in clause no. 6.2**

II. Terminal Marking Plate : on same name plate also accepted

- The terminal marking plate shall be provided which shall be strictly in accordance with **figure 4 of IS 1180-Part 1: 2014**. This plate may be combined with the rating plate or can be provided separately.
- Value of short circuit impedance on extreme tapping and on principal tapping and indication of winding to which impedance is related has to be displayed additionally.

III. Details Plate : MS sheet of 2.5mm with punched details and welded on tank.


A separate plate of **size 125 mm x 125 mm** shall be provided having following details:

- Name of the firm.
- Serial No.
- Rating of transformer.
- Order no. and date.
- Date of dispatch.

IV. Guarantee Plate :

A separate warranty plate made of **Stainless Steel** with following clause written on it.

“THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE

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OF COMMISSIONING OR 60 MONTHS FROM THE DATE OF LAST SUPPLY”

All the plates described above (clause 1 to 4) should be as followings:

Material	Stainless Steel
Thickness	1 mm
Engraving	The letters on the rating plate shall be engraved black on the white/silver back ground.
Fixing	Fixing screws shall be of stainless steel.

V. Danger Plate: On all cable boxes

Danger notice shall have red lettering on a white background on a plate as specified in **IS: 2551 – 1982.**

VI. BIS Certification Mark: On main name plate

The Bidder is required to get approval from BIS and display BIS mark on the name plate.

VII. BEE LABEL (up to 200 kVA transformers only):

A label shall be affixed on the front of the distribution transformer near the name plate, so as to be prominently visible. The label shall be non-detachable weather proof type with the following particulars shall be displayed on its label, namely:

- a. the logo of the Bureau of Energy Efficiency
- b. that the equipment is a distribution transformer
- c. that it is an oil filled, naturally cooled type
- d. name of the manufacturer and brand
- e. Capacity in KVA as tested
- f. Voltage is up to 11 KV
- g. Total losses at 50% loading in watts
- h. Total losses at 100% loading in watts
- i. Star level
- j. Model and year of manufacturing.
- k. Bureau’s authorisation number

VIII. Control Circuit drawing Plates:


- Engraved drawing for control circuit unit shall be available on Marshalling box.

6.2 NAME PLATE DETAILS

The name plate shall be strictly as per **IS 1180: 2014 (figure 1)**. Additionally, following points shall be displayed :

- I. **Actual no load losses of transformer.**
- II. **Actual total losses of transformer at 50% load and 100% load.**
- III. Standard mark (BIS certification).
- IV. **“PROPERTY OF TPCODL”** shall be written in bold letters.
- V. PO number with date has to be mentioned.
- VI. Overall dimensions of the transformer

6.3 MARKING

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- I. All transformers shall have HV phase windings marked in both, the terminal boards inside the tank and outside with capital letter 1U, 1V, 1W.
- II. The LV winding for the same phase shall be marked by corresponding small letter 2u, 2v, 2w. The neutral point terminal shall be indicated by the letter 2n.
- III. The markings shall be done by steel strips in which marks had been engraved in black colour.
- IV. Colour marking of the bushings shall be done.
- V. On the top cover of tank and the core channel, Manufacturer's name and Manufacturer's serial no. shall be engraved.
- VI. On the body of tank, Manufacturer's name, rating, serial no. and year of manufacturing shall be written with black paint on yellow base. It should be written in suitable place in approved format that it is readable from ground after installation on pole.
- VII. Durable QR code Sticker with name plate details and warranty details to be fixed on two accessible places i.e one on side wall of LV terminal box and other one is on conservator.

7. TESTS:


- I. All routine, acceptance & type tests shall be carried out in accordance with the IS 2026 and IS 1180: Part-1 (2014).
- II. All routine & acceptance tests shall be witnessed by the TPCODL/his authorized representative.
- III. All the components shall also be type tested as per the relevant standards.

Following tests shall be necessarily conducted on the Distribution Transformers in addition to others specified in IS/IEC standards.

7.1 TYPE TESTS

- I. Lightning Impulse Test [As per IS 2026 (Part 3) Clause no. 12].
- II. Temperature Rise Test [As per IS 2026 (Part 2) Clause no.4].
NOTE: Maximum measured total loss (No load at Rated excitation load loss at maximum current tap converted to 75°C reference temperature) at 100 percent loading shall be supplied during temperature rise test.
- III. Short Circuit Withstand test [As per IS 2026 (Part 5)].
NOTE: Routine tests before and after short circuit test shall be conducted as per IS 2026(Part 1).
- IV. Pressure Test [As per IS 1180: Part 1 (2014)].
- V. Determination of sound levels [IS 2026 (part 10)].
- VI. No load current at 112.5% voltage
- VII. BDV and moisture content of oil in transformer (IS 335).
- VIII. Magnetic balance test.
- IX. Measurement of Zero-phase sequence impedance.
- X. Measurement of Harmonics of no-load current.
- XI. Test to verify IP 55 for CT terminal Box and cable boxes.

Note: - Out of the above mention type test, the tests under sl. No. 1, 2 ,3 and 4 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at TPCODL recommended NABL lab.**In-house test labs are accepted if in-house lab is NABL accredited for these tests.**

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7.2 ROUTINE TESTS

Sr. No.	Test to be done	Reference BIS	Clause no.
1	Measurement of Winding Resistance on each tap.	IS 2026 (Part 1)	16.2.1 & 16.2.3
2	Measurement of voltage ratio, check of voltage displacement, polarity, phase sequence and vector group	IS 2026 (Part 1)	16.3
3	Measurement of short circuit impedance (principal tapping, when applicable) and load loss at 50% and 100% load	IS 2026 (Part 1)	16.4
4	Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 112.5% of rated voltage	IS 2026 (Part 1)	16.5
5	Measurement of insulation resistance	IS 2026 (Part 1)	16.6
6	Induced over voltage withstand test	IS 2026 (Part 3)	11
7	Separate Source voltage withstand test	IS 2026 (Part 3)	10
8	Oil leakage test	IS 1180 (Part 1)	21.5.1.3
9	Neutral current measurement	IS 1180	7.9.2
10	BDV and moisture content of oil in transformer (Type-2 oil)	For mineral oil : IS 335 (2018) For Ester oil : IEC 60247 & IEC61099	For mineral oil : IS 335 Table 2

7.3 ACCEPTANCE TESTS

- I. Temperature Rise test on one unit of first lot against every release order / PO for each rating. For further lots, TPCODL reserves the right to perform Temperature rise if required. [As per IS 2026 (Part 2) Clause no.4]
- II. Oil leakage test for acceptance shall be conducted at pressure of 0.35kg/sq.cm for one hour. (IS 1180 (Part 1) clause 21.5.1.3)
- III. The painted surface shall pass the Cross Adhesion Test (IS1180 part 1 clause no. 21.4.d).
- IV. Calibration of WTI and OTI.
- V. Magnetic Balance Test.
- VI. OEM test reports for CT if used.
- VII. OEM test reports for breather for air pressure test.
- VIII. At stage inspection -Checking of weight, dimensions, fitting and accessories, tank sheet thickness, oil quantity, material finish and workmanship, physical verification of core coil assembly and measurement of flux density on one unit of each rating of the offered lot with reference to the GTP and contract drawings. Oil BDV of all offered lot.
- IX. At least 10% transformer of the offered lot (minimum of one) shall be subjected to all the tests mentioned under the section 'ROUTINE Test" in presence of TPCODL's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS: 1180 and IS: 2026.
- X. Device trails & test for 1MVA & above (Buchholz trip, Buchholz alarm, PRV trip, WTI alarm, WTI trip and OTI alarm.
- XI. At Stage and Final inspection, the incoming raw material and its movement/consumption record in the related jobs of TPCODL will be verified by inspecting officer. In case of any deviation or non-availability of such records, the offered lot may get rejected.


8. TYPE TEST CERTIFICATES:

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- I. The Bidder shall furnish the type test certificates of the offered rating and design of transformer for the tests as mentioned above as per the corresponding standards.
- II. All the tests shall be conducted at CPRI / ERDA or as defined in 7.1 as per the relevant standards.
- III. 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.
- IV. Type tests should have been conducted in CPRI/ERDA during the period not exceeding 5 years from the date of opening the bid.

9. PRE-DISPATCH INSPECTION:


- I. Bidder to raise the inspection calls for stage inspection and only after getting clearance from TPCODL shall proceed for further manufacturing. The bidder shall raise the inspection call for Final Inspection or prototype Inspection in TPCODL format.
- II. If the prototype inspections asked for during drawing approval then bidder to make one unit of transformer and raise for inspection call for stage and final for prototype inspection.
- III. Equipment shall be subject to inspection by a duly authorized representative of the TPCODL.
- IV. 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.
- V. Bidder shall grant free access to the places of manufacture to TPCODL's representatives at all times when the work is in progress.
- VI. Inspection by the TPCODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
- VII. The BA shall ensure that 100% of the lot must be ready for inspection and atleast 10% must be ready with all mounting and accessories during inspection.
- VIII. Material shall be dispatched only after getting MDCC (Material Dispatch Clearance Certificate) from TPCODL.
- IX. 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)
- X. To ascertain the quality of the transformer oil, the original manufacturer's tests report shall be submitted at the time of inspection.
- XI. Arrangements shall also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of TPCODL's representative.
- XII. In respect of raw material such as core stampings, winding conductors, insulating paper and oil, bidder shall use materials manufactured/supplied by standard manufacturers and furnish the manufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the TPCODL.

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- XIII. The bidder shall furnish following documents along with their offer in respect of the raw materials:
- a) Invoice of supplier.
 - b) Mill's certificate
 - c) Packing List.
 - d) Bill of Landing
 - e) Bill of entry certificate by custom.
- XIV. To ensure about the quality of transformers, the inspection shall be carried out by the TPCODL's representative at following two stages:
- a) Online anytime during receipt of raw material and during manufacturing/assembly Stage.
 - b) At finished stage i.e. transformers are fully assembled and ready for dispatch.
- XV. Advance intimation of 7Days (Within Odisha)/12 Day (Outside Odisha) is required for both Stage and final inspections.
- XVI. All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and TPCODL at the time of purchase.
- XVII. The manufacturer shall offer the inspector representing the TPCODL all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage Inspection during manufacturing stage as well as Active Inspection during Acceptance Tests.
- XVIII. During the stage inspection a few assembled core coil and assembled Tanked transformer shall be dismantled (only in case of CRGO material) to ensure that the CRGO laminations, Windings and workmanship are of good quality. TPCODL also reserves the right to review any document or certificates related to material, manufacturing process, quality checks at any point of stage inspection.
- XIX. TPCODL also reserves the right to inspect the tank of transformer before surface preparation and painting. The same shall be informed to TPCODL accordingly.
- XX. Final inspection Call for carrying out acceptance tests as per relevant IS/IECs shall be sent by the Bidder along with routine test certificates.
- XXI. The bidder shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-contractors to ensure the mechanical / electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9000.
- XXII. The TPCODL has the right to have the test carried out at his own by an independent agency wherever there is a dispute regarding the quality supplied. **Also TPCODL has right to test 1% of the supply selected either from the stores or field** to check the quality of the product. In case of any deviation TPCODL have every right to reject the entire lot or penalize the bidder, which may lead to blacklisting, among other things.
- XXIII. At the time of inspection the material should be ready as specified, In case of material non-readiness or material failure in acceptance, Cost of re-inspection shall be borne by bidder.

10. INSPECTION AFTER RECEIPT AT STORE:

- I. The material received at the TPCODL store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection.
- II. In case the transformers proposed for supply against the order are not exactly as per the tested design, the Bidder shall be required to carry out the short circuit test and impulse voltage withstand test at its own cost in the presence of the representative of TPCODL.

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- III. The supply shall be accepted only after such test is done successfully, as it confirms on successful withstand of short circuit and healthiness of the active parts thereafter on un-tanking after a short circuit test.
- IV. Apart from dynamic ability test, the transformers shall also be required to withstand thermal ability test or thermal withstand ability will have to be established by way of calculations
- V. TPCODL reserves the right to conduct all tests on Transformer after arrival at site / stores and the manufacturer shall guarantee test certificate figures under actual service conditions.
- VI. TPCODL reserves the right to conduct short circuit test and impulse voltage withstand test in accordance to IS, afresh on each ordered rating at purchaser cost, even if the transformer of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by TPCODL either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies already made to TPCODL stores. The findings and conclusions of these tests shall be binding on the bidder.

11. GUARANTEE:


- I. 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 Purchaser 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.
- II. 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 TPCODL, failing which the TPCODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPCODL's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.
- III. In case of Distribution transformer fails within the guarantee period TPCODL will immediately inform the Bidder who shall take back the failed Distribution Transformer within 15 days from the date of intimation at his own cost and replace / repair the transformer within forty five days of date of intimation with a roll over guarantee. The outage period i.e. period from the date of failure till unit is repaired / replaced shall not be counted for arriving at the guarantee period.
- IV. 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:

- I. Bidder shall ensure that all 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.
- II. Transformers shall be delivered filled with oil and supplied with all accessories mounted. Screws and bolts shall be thoroughly tightened to ensure no leakage of oil.

Note: One use plastic not to be used for packing of the material.

13. TENDER SAMPLE:

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All offered transformer detailed documents to be submitted as per clause no.18. The sample shall be not applicable

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. TPCODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

The following information shall necessarily be submitted with the bid:

- I. List of important raw materials, names of sub-suppliers for raw materials, standards to which raw material is tested and the copies of test reports of the tests carried out on raw materials in presence of Bidder's representatives.
- II. List of manufacturing facilities available, level of automation achieved and the areas where manual process exists.
- III. List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of these tests and inspections
- IV. List of testing equipment for final testing with valid calibration reports. Manufacturer shall possess 0.1 class instruments for measurement of losses.
- V. QAP withhold points for TPCODL inspection.

15. TESTING FACILITIES:

Bidder shall have adequate in house testing facilities for carrying out all routine tests, acceptance tests and pre-dispatch inspection as per relevant International / Indian standards.

16. MANUFACTURING FACILITIES:


The successful bidder will have to submit (after placement of RC) technical compliance document and drawing of each part along with CCA, breather, bushings, terminal box etc. as per RC line items to be submitted for getting approval before mass manufacturing.

The first time supplier will have to make one prototype sample of each line item of RC as per CAT-B approved drawing within 30 days of drawing approval. Inspection call to be raised by bidder before 7 days of date of proposed inspection. TPCODL shall arrange inspectors and intimate or confirm the date. Any observation during inspection shall have to be addressed within 7 days and revised improved drawing & technical details to be shared to TPCODL for final approval.

Manufacturing mass quantity to start only after getting CAT-A approved drawings or as per intimation from TPCODL

17. SPARES, ACCESSORIES AND TOOLS

Bidder shall give an assurance that the reparability of transformer is ensured by using standard spare parts and accessories available in market in India.

 TP CENTRAL ODISHA DISTRIBUTION LIMITED	TATA POWER CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR		
	TECHNICAL SPECIFICATION		
Document Title	Specification For 11/0.4 KV Distribution transformer 250 KVA - 2000 KVA (Copper)		
Document No.	ENG-ELC-048	Issue Date: 19.02.2022	
Revision No.	00	Page 40 of 42	
Prepared by: Srastanth Mohanty	Reviewed By: Swarup Nayak	Approved By: Khajan C. Bhardwaj	Issued By: Pourush Garg

18. DRAWINGS AND DOCUMENTS:

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

- a. Completely filled in compliance to each clause of Technical Specification and any Additional Details and Fittings.
- b. Description of the transformer and all components drawings.
- c. General arrangement for Transformer.
- d. LV terminal box drawing along with CT if applicable and cleat arrangement and gland plate drawing.
- e. Bill of material.
- f. Design calculation details of transformer losses, cooling, efficiency and current density, weight of coils and components
- g. Experience Certificate and list
- h. Type test certificates.
- i. List of makes of major components as listed above.


Drawings / documents to be submitted for approval after the award of the order within 7 days before mass manufacturing 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 Transformer (Front view, Top view and both sides view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).
- c. Internal Core arrangement drawing.
- d. Internal Core-coil assembly drawing.
- e. Foundation Plan drawing.
- f. Marking plates and Markings (as mentioned in clause 6)
- g. HV and LV bushings drawing (with internal view and metal parts)
- h. HT connector, LT connector (palm connector), Aluminum Busbar
- i. HV and LV Box drawing.
- j. Gland Plate for HV/LV box.
- k. Conservator drawing.
- l. Prismatic oil level gauge drawing.
- m. Silica Gel Breather drawing.
- n. Auxiliary Terminal Box drawing with internal wiring arrangement.
- o. Gland plate of drawing
- p. BH curve & Loss/Kg graph of core material offered.
- q. The tightening torque chart to be provided for all bolts used in specific rating.
- r. Type Test Certificates.
- s. Installation/ Mounting Instructions/Drawing.
- t. Efficiency vs Load curve of the offered design.
- u. Quality Assurance plan.

List of Calculations to be submitted:

- a. All the calculations shall be step by step showing the use of formulas and other practical considerations. **Concise calculations in table or excel sheet shall**

 TPCODL TP CENTRAL ODISHA DISTRIBUTION LIMITED	TATA POWER CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR		
	TECHNICAL SPECIFICATION		
Document Title	Specification For 11/0.4 KV Distribution transformer 250 KVA - 2000 KVA (Copper)		
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not be accepted. Also, the reference (only standard sources as IS, IEC or any such standard is acceptable) of the formulas shall be mentioned.

- b. Resistance Calculation (75 deg. C)
- c. Load Losses Calculation (at 75 deg. C)
- d. No load Losses.
- e. Stray Losses.
- f. Weight of Copper (Bare and with Insulation also).
- g. Weight of Core.
- h. Flux Density calculations.
- i. Current Density Calculations.
- j. Short Circuit withstand.
- k. Temperature Rise Calculations.
- l. Conservator Volume calculations
- m. Cooling Calculations showing cooling with tank and radiators separately with no. of radiators and fins mentioned specifically (For both Mineral oil and Ester oil)
- n. Calculation sheet for Lifting lug design and mounting lug design to be submitted by Bidder.

Additional Documents to be submitted :

- a. List of raw materials as well as bought out accessories and name 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 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:

All clauses and points in the Specification to be complied for along with GTR and offered design 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:

 TP CENTRAL ODISHA DISTRIBUTION LIMITED	TATA POWER CENTRAL ODISHA DISTRIBUTION LIMITED, BHUBANESWAR		
	TECHNICAL SPECIFICATION		
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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-1008

**Specification Name : ENG-ELC-072- SPECIFICATION FOR ACCESSORIES OF
33kV XLPE COVERED CONDUCTOR-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

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TPWODL*



Specification No: [ENG-EHV-1008](#)

Specification Name:
SPECIFICATION FOR ACCESSORIES OF 33kV XLPE
COVERED CONDUCTOR

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1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of Accessories for All Aluminum Alloy Stranded XLPE Covered Conductors for use on 33kV Distribution System.

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	Description
EN 50397-1:2006	Covered Conductor Specification- Up to 33 kV
EN 50397-2:2006	Covered Conductor Accessories Specification- up to 33 kV
EN 50397-2 (MARCH 2010)	Covered conductors for overhead lines and the related accessories for rated voltages above 1kV a.c. and not exceeding 36kV a.c. PART 2: Accessories for covered conductors: tests and acceptance criteria
IS 398:1996 (Part IV)	Specification for aluminum conductors for overhead distribution purpose
EN 61238-1: 2003	Compression and mechanical connectors for power cables for rated voltages up to 36 kV Test methods and requirements
ANSI C119.4 :2011	Electric Connectors - Connectors for Use Between Aluminum-To-Aluminum and Aluminum-To-Copper Conductors Designed For Normal Operation At Or Below 93 °C And Copper-To-Copper Conductors Designed for Normal Operation at Or Below 100 °C

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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. Cm/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 Accessories of 33kV XLPE Covered Conductor are specified below and shall consist of the following:

4.1 TENSION ASSEMBLY-WEDGE TYPE (TA)/CRIMPING TYPE

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor size	50 Sq.mm to 240 Sq.mm /as per covered conductor size
4	Installation (with/without disassembly)	Ready-to-use (without disassembly)
5	Type & grade	Heat treated aluminium Alloy for Body and Weather resistant Thermoplastic for wedge/crimping type
6	Operating/Rated voltage	33kV/36kV
7	Mechanical Strength	To be furnished by the Bidder for each type of conductor

8	Dimensions (mm)	To be furnished by bidder
9	Tension Load	To be furnished by bidder

4.2 NON-METALLIC ALIGNMENT TIES

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor size	50 Sq.mm to 240 Sq.mm /as per covered conductor size
4	Mounting	Can mount directly on cable without any accessories
5	Type	Top Tie/side tie/helical tie
6	Material	UV Resistant Thermoplastic
7	Operating/Rated voltage	33 kV/36kV
8	Dimensions (mm)	To be furnished by bidder

4.3 MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	IEC 61238-1
3	Range of Conductor size	For Phase conductor of diameter range 50-240 sq.mm/as per covered conductor size
4	Installation	Crimping by shear head bolt compression
5	Type of connection required	Connection by compression pressure
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Material	Aluminium Alloy For mechanical connector UV resistant polymer for heat shrink sleeve
8	Connector ID	Ø 14 mm to Ø 33 mm

4.4 INSULATION PIERCING CONNECTOR

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor sizes accommodated for Main & Branch	Main : 50 - 240 sq.mm Tap : 50 - 240 sq.mm /as per covered conductor size
4	Operating/Rated voltage	33 kV/36kV
5	Type of connection required	Insulation Piercing Type (Covered to Covered)

6	Is any metallic part carrying potential in operation exposed during installation	No
7	Are end caps of branch cable a) Slide on type (b) Rigid	Slide on type
Sl. No.	Technical Parameters	Desired Values
8	Are torque limiting shear heads provided to tightening bolts	Yes
9	Specified Torque	18±1.5 Nm
10	Torque for establishing connection between main and Tap (Nm)	Within 70% of Min. Torque specified

4.5 MID SPAN JOINTS

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50483-4
3	Type No & Size Range	For Phase conductor of 50 Sq.mm to 240 sq. mm/as per covered conductor size
4	Operating/Rated voltage	33 kV/36kV
5	Type of connection required	Crimping type
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Installation	Crimping by Hexagonal Compression
8	Guarantee	24 months from the date of commissioning or 30 months from the date of last supplies made under the contract

5. GENERAL CONSTRUCTIONS:

5.1 TENSION ASSEMBLY-WEDGE TYPE (TA)

For fitting onto a pole for tensioning at the beginning or end of a length of Covered Conductor, or for anchoring while a major change in direction. The Tension assembly consists of one wedge type Tension anchoring clamp and one Tracking protection IPC.

The following key criterion to be followed for the design of the same: -

- a) There shall be no losable part (except Tracking IPC) in the process of clamping arrangement.
- b) The clamp should consist of an Aluminum alloy corrosion resistant casted body and self-adjusting fully insulating type of mechanical and weather resisting thermoplastic wedges which shall anchor/hold the conductor.
- c) Locking mechanism should be wedge type self-locking. Wedges are to be made of high strength, climatic resistance Engineering Plastic with glass fiber.
- d) The fittings shall be able to withstand the specific minimum failure load (SMFL) and shall not damage the covering of cable. SMFL is the minimum failure load for clamp at which mechanical

failure will not take place.

- e) No tools shall be needed for fitting the Covered Conductor into the clamp.
- f) The Anchoring clamp shall have an IPC to avoid tracking phenomenon by maintaining the metallic clamp as well as the cable passing through it at equipotential.

5.2 NON-METALLIC ALIGNMENT TIES:

For supporting and aligning Covered Conductor at an intermediate pole in a length, with small angle of deviation. The Tie hold the Covered Conductor in its position on top of the pin insulator. Tie consists of an "Insulated Plastic" Type for Lin Alignment. The ties shall be designed suitably to hold the Covered Conductor in its position on top of the insulator. The Tie shall be made of Insulating Plastic materials (UV Resistant Thermoplastic) to ensure tracking resistance and to avoid any insulation damage to covered conductor due to abrasion while mechanical or wind induced vibration. Plastic coated metallic ties are not allowed.

5.3 MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE:

It is used for main (Bare) to main (Covered Conductor) networking Connection. This connector is to ensure the electrical characteristics with in the required limits, while ensuring necessary insulation protection against tracking and water penetration on Covered Conductor. The body as well as the shear head screws of the mechanical connector should be made of aluminum alloy. It should have a centered bore with tapered edges and a moisture block barrier in the center of the tube. Heat shrink sleeve shall be rated for up to 36kV

5.4 INSULATION PIERCING CONNECTOR:

Insulation Piercing Connectors (IPC) are used for making Tee / Tap-off/ connections to a Covered Conductor. Insulation Piercing Connectors are designed to make a connection between the uncut main conductor and a branch cable conductor without having to strip either cable to expose the conductor. Instead, the tightening action of the IPC will first pierce the Insulation, then make good electrical contact between the main and branch conductor while simultaneously insulating and sealing the connection. The connector bodies shall be made entirely of mechanical and weather resistant plastic insulation material made of weather & UV resistant reinforced polymer and no metallic part outside the housing is acceptable except for the tightening bolt or nuts.

Any metallic part that is exposed must be free from potential during or after connector installation.

Screws or nuts assigned for fitting with IPC (Insulating Piercing connector), must be fitted with torque limiting shear heads to prevent over tightening or under tightening.

The min & max torque values should not exceed 27 N mtr for IPC for main conductor < 95 sq

mm, and 42 Nmtr for main conductor >95, but < 240 sq mm.

The contact teeth or blade of the connector is made of tinned copper with equivalent Cross Section with respect to % IACS to suit the max branch cable size declared. The shear bolt/nut shall be suitable for tightening with a hexagonal socket of 13 mm or 17mm.

The IPCs shall be water proof and the water tightness shall be ensured by appropriate elastomeric materials and not by grease, gel or paste alone. Grease can be applied to protect the contact blade alone and shall not be visible on the outer surface of the connector. Connector should not be dipped in grease.

Each IPC should be provided with a cap to seal the cut end of the Branch cable. It should be of a design that once the connector is installed, it should not be possible to remove the cap without dismantling the connector.

All the metallic parts of the connector should be corrosion resistant and there should not be any appreciable change in contact resistance & temperature after overloads & load cycling and should confirm to the long duration tests specified in this standard.

5.5 MID SPAN JOINTS:

Mid-span tension joints for jointing covered conductor over a span. The sleeves should be Pre-Insulated type. Sleeve should be made of Aluminum, insulated with an Anti-UV black thermoplastic tube hermetically sealed two ends with 2 flexible rings. Strip length, Hexagonal crimping die reference and size to be marked on the outer surface of plastic sleeve.

5.6 ARC PROTECTION DEVICES:

Arching Horn Assembly is an Arc protection device for power arc evacuation without insulator damage. The arching Horn Assembly protection device consists of:

- a) Two arcing horns with adjustable distance "L" directly mounted on the insulator terminals.
- b) A covered conductor with clamp on the horn side.
- c) An insulation piercing connector on the main cable side.

6. MARKING:

The following particulars shall be properly legible embossed/Printing on the accessories.

- a) Name & Trade mark of the manufacturer
- b) Product Code
- c) Batch Number
- d) The minimum and maximum cross section of Conductor for which the unit is suitable
- e) Month and Year of Manufacturer



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f) "TPWODL/ TPCODL/ TPNODL/ TPSODL" Name

7. TESTS

A type test shall be performed on the accessories. All the Acceptance test, Type test and Routine test should be as per EN 50397-2 and latest amendment. The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

i) Tension Assembly-Wedge Type (TA)

- a) Visual examination
- b) Dimension verification
- c) Tensile test at ambient temperature
- d) Check for permanent marking

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test

iv) Insulation Piercing Connector

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test
- e) Short Circuit test

7.2 ROUTINE TESTS

i) Tension Assembly-Wedge Type (TA)

- a) Visual examination
- b) Dimension verification

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

iv) Insulation Piercing Connector

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test

7.3 TYPE TESTS**i) Tension Assembly-Wedge Type (TA)**

- g) Visual examination
- h) Dimension verification
- i) Tensile test at ambient temperature
- j) Tensile test at low temperature
- k) Tensile test at high temperature
- l) Corrosion test
- m) Climate ageing test
- n) Check for permanent marking

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests
- g) Thermal Tests under load
- h) Corrosion test
- i) Climate ageing test

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test
- h) Electrical Ageing Test

iv) Insulation Piercing Connector

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test
- h) Electrical Ageing Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test
- e) Short Circuit test

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards and as per CEA guidelines. All the tests shall be conducted at CPRI / ERDA as per relevant IS/IEC standard. Type tests should have been conducted in certified Test laboratories during the period not exceeding 7years 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.

8. 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



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

9. INSPECTION AFTER RECEIPT AT STORES:

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 copy of the report shall be sent to Engineering department.

10. 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 24 months from the date of commissioning or 30 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.

The guarantee clause is applicable for all the items covered in this specification.

11. 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. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

12. TENDER SAMPLE:

Bidder shall submit the sample of material during submission of Bids.

13. 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.

14. TESTING FACILITIES:

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

15. 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.

16. SPARES, ACCESSORIES AND TOOLS

Not applicable.

17. 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.

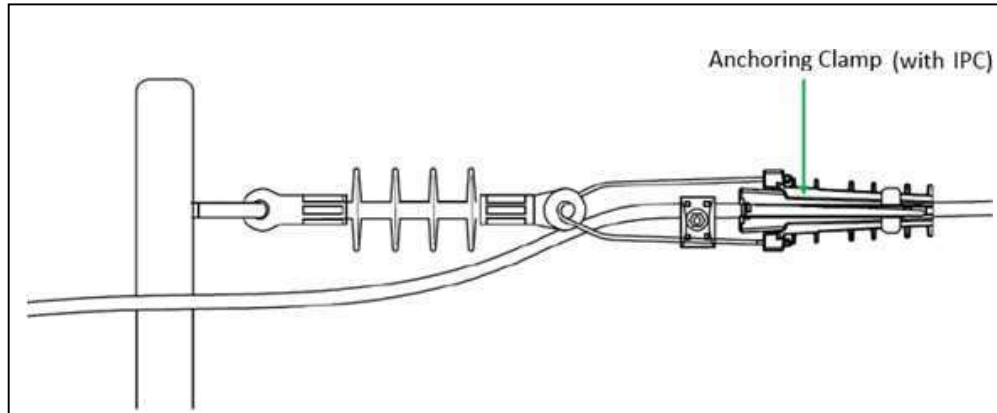


Fig.1: - Tension Assembly (TA) with Anchoring clamp and one Tracking protection IPC

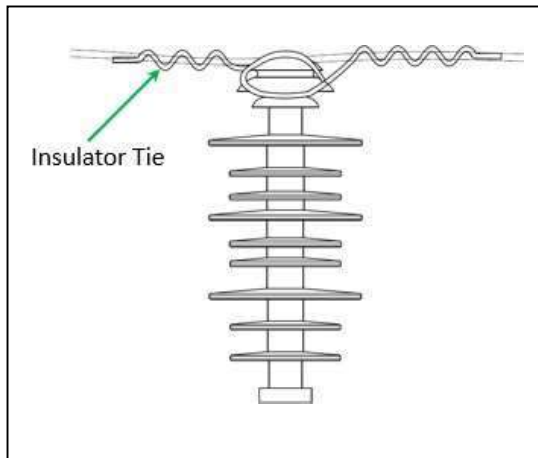


Fig.2: - Non-Metallic Alignment Tie

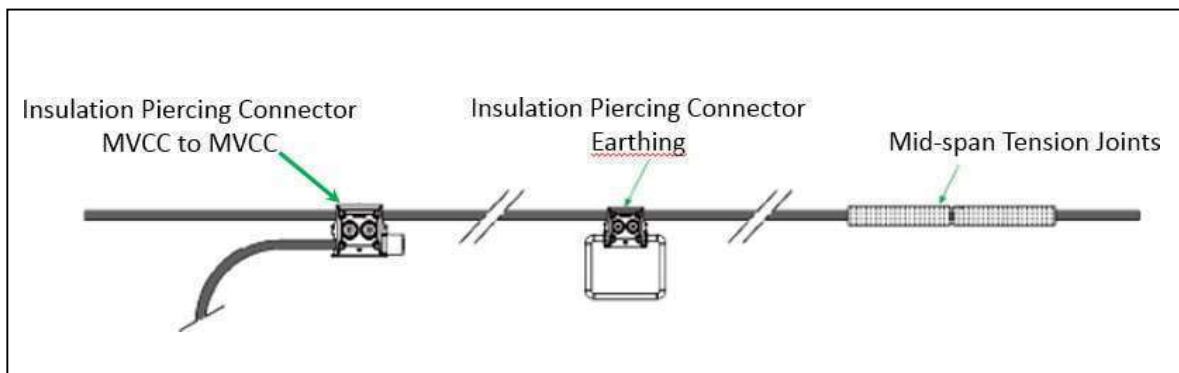


Fig.3:- Insulation Piercing Connector for Networking / Branching / Looping and Midspan Joints

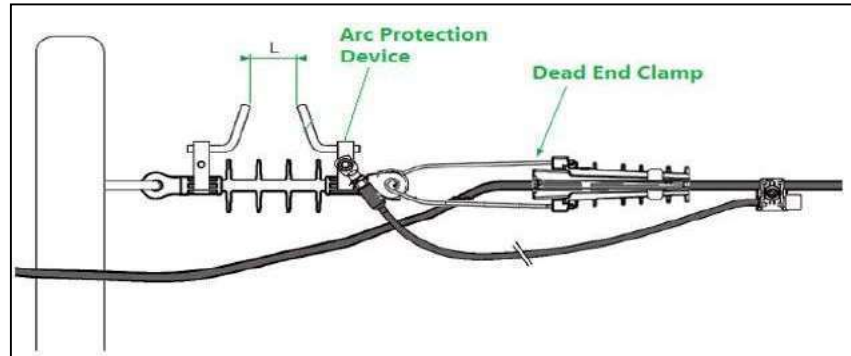


Fig.4: - Arc Protection Device

Note: - These are the Sample Drawing for tender purpose only.

18. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

TENSION ASSEMBLY-WEDGE TYPE (TA)

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Installation (with/without disassembly)	
5	Type & grade	
6	Application	
7	Mechanical Strength	
8	Dimensions (mm)	

NON-METALLIC ALIGNMENT TIES

Sl. No.	Technical Parameters	To Be Furnished by The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Mounting	
5	Type	
6	Material	
7	Application	
8	Dimensions (mm)	

MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE

Sl. No.	Technical Parameters	To Be Furnished by The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Installation	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Material	
8	Connector ID	

INSULATION PIERCING CONNECTOR

Sl. No.	Technical Parameters	To Be Furnished by The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor sizes accommodated for Main & Branch	
4	Application	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Are end caps of branch cable a) Slide on type (b) Rigid	
8	Are torque limiting shear heads provided to tightening bolts	
9	Specified Torque	
10	Torque for establishing connection between main and Tap (Nm)	

MID SPAN JOINTS

Sl. No.	Technical Parameters	To Be Furnished by The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Type No & Size Range	



Specification No: [ENG-EHV-1008](#)

Specification Name:
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4	Application	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Installation	

19. 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-1009

**Specification Name : ENG-ELC-070- TECHNICAL SPECIFICATION FOR 33kV
XLPE COVERED CONDUCTOR- 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

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TPWODL*



Specification No: [ENG-EHV-1009](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 33KV XLPE
COVERED CONDUCTOR

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2. APPLICABLE STANDARDS
3. CLIMATIC CONDITIONS OF THE INSTALLATION
4. GENERAL TECHNICAL REQUIREMENTS
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6. MARKING
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8. TYPE TEST CERTIFICATES
9. PRE-DISPATCH INSPECTION
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17. SPARES, ACCESSORIES AND TOOLS
18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of 33kV All Aluminum Alloy Stranded XLPE Covered Conductors. The material shall be complete with all components, which are necessary or usual for their efficient performance and trouble-free 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	Description
IS 398:1996 (Part IV)	Specification for aluminum conductors for overhead distribution purpose
EN 50397-1:2006	Covered Conductor Specification for voltage 1kV to 33kV
IS : 10418	Reels and drums for bare conductors

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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 as mentioned above.

4. GENERAL TECHNICAL REQUIREMENTS:

The XLPE covered conductor shall comply in all respect with IS: 398 (Part.4)/1996 with latest amendment, if any from the date of its applicability

Sl. No.	Technical Parameters	Desired Values		
1	Name of the manufacturer	To be furnished by Bidder		
2	Applicable Standard	EN 50397-1:2006, IS 398-IV/1994		
3	Type of Conductor	AAAC XLPE Covered Conductor		
4	Voltage Grade	36kV/ 33kV		
5	Nominal Cross-sectional area of conductor	100	148	232
6	Conductor			
a)	Material	Aluminium Alloy (AAAC)		
b)	Shape	Stranded Circular and Watertight		
c)	No / diameter of wire (before stranding)	7x4.26	19x3.15	19x3.94
d)	Approx. conductor diameter	12.78 mm	15.75 mm	19.7 mm

e)	Max. D.C. Resistance at 20°C	0.339 Ω/Km	0.229 Ω/Km	0.1471 Ω/Km
f)	Resistance Temperature co-efficient	0.004 / °C	0.004 / °C	0.004 / °C
g)	Minimum Tensile strength of conductor	29.26 kN	43.5 kN	68.05 kN
7	Thickness and dimensions			
7.1	Conductor Screen			
a)	Material	Extruded Semi-Conducting Compound		
b)	Nominal Thickness	0.4 mm	0.4 mm	0.4 mm
7.2	Insulation inner layer			
a)	Material	Extruded XLPE		
b)	Nominal thickness	2.43 mm	2.43 mm	2.43 mm
7.3	Insulation Outer layer			
a)	Material	Track Resistance, UV Resistant and Erosion Resistance XLPE (Black)		
b)	Nominal thickness	1.2 mm	1.2 mm	1.2 mm
8	Lightening Impulse withstand strength of XLPE Layer	170 KVp	170 KVp	170 KVp
9	Approx. Overall Diameter	20.5 mm	23.5 mm	28.1 mm
10	Maximum continuous operating temperature	90 °C	90 °C	90 °C
11	Max short circuit current, 1 sec (KA)	9.4kA	13.912kA	21.808kA
12	Approx. Weight	480 kg/km	700 kg/km	970 kg/km
13	Standard Packing length	1000 (+/- 5%) as per PO terms	1000 (+/- 5%) as per PO terms	1000 (+/- 5%) as per PO terms
14	Raw Material Make	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta		

5. GENERAL CONSTRUCTIONS:

5.1 CONDUCTOR

a) The properties of stranded all aluminum alloy conductors of various sizes are as follows

Actual Area	Stranding & wire dia.	Approx. overall dia.	Approx. mass	Calculated resistance at 20 d.c. (max.)	Approx. calculated Breaking Load	Reactance per km	Current Rating
mm. sq.	mm	mm	Kg/km	Ohm/km	kN	Ohms	Amps
100	7/ 4.26	12.78	272.86	0.339	29.26	0.3394	325
148	19/ 3.15	15.75	406.91	0.2290	43.50	0.3238	440
232	19 / 3.94	19.70	636.67	0.1471	68.05	0.3146	520

- b) The properties of aluminum alloy wires to be used in the construction of the Stranded conductors are as follows:

Diameter		Cross sectional area of Nominal Diameter	Mass	Minimum Breaking Load after stranding	Resistance at 20 deg.c
Nom	Max				
mm	mm	Sq.mm	Kg	kN	Ohm/kM
3.15	3.18	7.793	21.04	2.29	4.290
3.94	3.98	12.190	32.92	3.58	2.746
4.26	4.30	14.25	38.48	4.18	2.345

- c) No negative tolerance shall be permitted on the nominal diameter aluminum wire used in the manufacture of XLPE COVERED CONDUCTOR. However, positive tolerance in this respect shall be as provided in IS: 398 (Part IV)/1994 (amended up to date).
- d) The wire shall be smooth and free from all imperfections such as spills, splits, slag inclusion, dia. marks scratches, fittings, blow holes, projections, looseness, overlapping of strands, chipping of aluminum layers etc. and all such other defects which may hamper the mechanical and electrical properties of the conductor. Special care should be taken to keep away dirt, grit etc. during stranding.
- e) There shall be no joint in any wire of a stranded conductor containing seven wires, except those made in the base rod or wire before final drawing.
- f) In conductors containing more than seven wires, joints in individual wires are permitted in any layer except the outermost layer (in addition to those made in the brass rod or wire before final drawing) but no two such joints shall be less than 15 m apart in the complete stranded conductor, such joint shall be made by resistance or cold pressure butt welding. They are not required to fulfill the mechanical requirement of unjointed wires. Joints made by resistance butt welding shall, subsequent to welding, be annealed over a distance of at least 200 on each side of the joint.
- g) The wires used in the construction of a stranded conductor shall, before stranding satisfy all the relevant requirements of this standard.
- h) Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta
- i) The lay ratio of the different layers shall be within the limits given below: -

No. of wires in Conductors	Lay Ratio in			
	6 - wire layer		12 - wire layer	
	Min.	Max.	Min.	Max.
7	10	14	-	-



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TECHNICAL SPECIFICATION FOR 33kV XLPE
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19	10	16	10	14
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5.2 FILLING (WATER BLOCKING):

The Stranded Conductor shall be longitudinally water tight by means of a water blocking material incorporated during the extrusion process. The use of grease/water swell able tape / water swell able powder etc. is not permitted. The water blocking material shall be stable at maximum operating conductor temperature of 90 Deg. Cent. The water blocking compound shall be compatible with the conductor material as well as the semi conducting screen above it and not adversely affect its electrical or mechanical properties.

5.3 SEMICONDUCTING SCREEN:

An extruded semi conductive compound should be applied over the filled stranded conductor to ensure a lower voltage stress on the Insulation applied over the screen.

5.4 INSULATIONS:

The Insulation should be dual layered with the Inner Layer being XLPE with a nominal thickness of 2.43 mm and the Outer Layer being a suitable XLPE which is UV Resistant, Anti Tracking and Erosion Resistant with a nominal wall thickness of 1.2 mm. The minimum combined Insulation Thickness of both Layers should be 3.63 mm.

The conductor manufacturing and stranding process shall incorporate the longitudinal water blocking also.

The Semiconducting Screen, Inner Insulation and Outer Insulation should be extruded in one step i.e. triple extrusion to ensure a good, permanent bond between the three layers and also with the conductor. It shall be possible to remove the Semi Conducting Screen, Inner and Outer Insulation Layers without damage to the conductor.

6. MARKING:

The following particulars shall be properly legible embossed on the covered conductor at the intervals of not exceeding one meter throughout the length of the Conductor. The covered conductor with poor and illegible embossing shall be liable for rejection.

- a) Name & Trade mark of the manufacturer
- b) Voltage Grade
- c) Year of manufacture
- d) Size of Covered Conductor
- e) EN 50397-1: 2006
- f) PO Number



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g) "TPWODL/ TPCODL/ TPNODL/ TPSODL" Name

Note: - Sequential meter marking shall be printed (after each meter)

Following details shall be provided on flanges of drum:

- a) Manufacturer's name
- b) Type of Cable/Conductor
- c) Size of Cable/Conductor
- d) Voltage Grade
- e) Length of the cable/conductor 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.

7. TESTS

A type test shall be performed on every covered conductor type, irrespective of the cross-sectional area. All the type test, Routine test and acceptance test should be as per EN 50397-1:2006 and latest amendment. The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

- a) Visual examination and Dimension Check Test
- b) Conductor Resistance Test
- c) High Voltage Test
- d) Spark Test
- e) Hot Set Test on covering
- f) Longitudinal Water Tightness Test
- g) Anti-tracking Test
- h) Marking

7.2 ROUTINE TESTS

- a) Visual examination and Dimension Check Test
- b) Conductor Resistance Test
- c) High Voltage Test
- d) Spark Test
- e) Hot Set Test on covering

- f) Longitudinal Water Tightness Test
- g) Marking

7.3 TYPE TESTS

i) Electrical Test

- a) Conductor Resistance Test
- b) High Voltage Test
- c) Spark Test
- d) Leakage Test
- e) Tracking Resistance

ii) Non-Electrical Test on Covering

- a) Mechanical properties Test
- b) Carbon Black Content
- c) Resistance to UV rays
- d) Ageing of complete product sample
- e) Shrinkage Test
- f) Hot Set Test
- g) Pressure Test At High Temperature
- h) Water Absorbs Test
- i) Hardness Test
- j) Longitudinal Water Tightness Test
- k) Marking
- l) Slippage Test

iii) Visual examination and Dimension Check Test

iv) Mechanical properties of the conductor.

8. TYPE TEST CERTIFICATES:

The Bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards and as per CEA guide line. All the tests shall be conducted at CPRI / ERDA as per relevant IS/ IEC standard. Type tests should have been conducted in certified Test laboratories 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



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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) 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 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 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 24 months from the date of commissioning or 30 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. The bidder shall provide instructions regarding handling and storage precautions to be taken at site. The Conductor shall be wound on wooden/STEEL drums and packed in line with requirements of IS 10418-1982. The ends of the Conductor shall be sealed by means of non-hygroscopic sealing material. Heat or cold Shrinkable end caps with sealant shall be used for effectively sealing the end terminals of the covered conductor. The inner diameter range of cap shall be such that it shall tightly fit to the covered conductors to prevent moisture ingress.

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 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.

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



Specification No: [ENG-EHV-1009](#)

Specification Name:
TECHNICAL SPECIFICATION FOR 33KV XLPE
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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 Parameters	To Be Furnished By The Bidder		
1	Name of the manufacturer			
2	Applicable Standard			
3	Type of Conductor			
4	Voltage Grade			
5	Nominal Cross-sectional area of conductor	100	148	232
6	Conductor			
a)	Material			
b)	Shape			
c)	No / diameter of wire (before stranding)			
d)	Approx. conductor diameter			
e)	Max. D.C. Resistance at 20°C			
f)	Resistance Temperature co-efficient			
g)	Minimum Tensile strength of conductor			
7	Thickness and dimensions			
7.1	Conductor Screen			
a)	Material			
b)	Nominal Thickness			
7.2	Insulation inner layer			
a)	Material			
b)	Nominal thickness			
7.3	Insulation Outer layer			
a)	Material			
b)	Nominal thickness			
8	Lightening Impulse withstand strength of XLPE Layer			
9	Approx. Overall Diameter			
10	Maximum continuous operating temperature			



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11	Max short circuit current, 1 sec (KA)			
12	Approx. Weight			
13	Standard Packing length			
14	Raw Material make			

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-2005

**Specification Name : ENG-ELC-071- SPECIFICATION FOR ACCESSORIES OF
11kV XLPE COVERED CONDUCTOR- 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

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Specification No: [ENG-HV-2005](#)

Specification Name:
SPECIFICATION FOR ACCESSORIES OF 11kV XLPE
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18. DRAWINGS AND DOCUMENTS
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20. SCHEDULE "B" DEVIATIONS



Specification No: [ENG-HV-2005](#)

Specification Name:
SPECIFICATION FOR ACCESSORIES OF 11kV XLPE COVERED CONDUCTOR

1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of Accessories for All Aluminum Alloy Stranded XLPE Covered Conductors for use on 11 kV Distribution System.

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	Description
EN 50397-1:2006	Covered Conductor Specification- Up to 33 kV
EN 50397-2:2006	Covered Conductor Accessories Specification- up to 33 kV
EN 50397-2 (MARCH 2010)	Covered conductors for overhead lines and the related accessories for rated voltages above 1kV a.c. and not exceeding 36kV a.c. PART 2: Accessories for covered conductors: tests and acceptance criteria
IS 398:1996 (Part IV)	Specification for aluminum conductors for overhead distribution purpose
EN 61238-1: 2003	Compression and mechanical connectors for power cables for rated voltages up to 36 kV Test methods and requirements
ANSI C119.4 :2011	Electric Connectors - Connectors for Use Between Aluminum-To-Aluminum and Aluminum-To-Copper Conductors Designed for Normal Operation at Or Below 93 °C and Copper-To-Copper Conductors Designed for Normal Operation at Or Below 100 °C

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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



Specification No: [ENG-HV-2005](#)

Specification Name:
SPECIFICATION FOR ACCESSORIES OF 11kV XLPE COVERED CONDUCTOR

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. Cm/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 Accessories of 11 kV XLPE Covered Conductor are specified below and shall consist of the following:

4.1 TENSION ASSEMBLY-WEDGE TYPE (TA)/ CRIMPING TYPE

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor size	50 Sq.mm to 240 Sq.mm/as per covered conductor size
4	Installation (with/without disassembly)	Ready-to-use (without disassembly)
5	Type & grade	Heat treated aluminium Alloy for Body and Weather resistant Thermoplastic for wedge/ crimping type
6	Operating/Rated voltage	11 kV/12kV



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Sl. No.	Technical Parameters	Desired Values
7	Mechanical Strength	80% of the breaking load of the Conductor
8	Dimensions (mm)	To be furnished by bidder
9	Tension Load	To be furnished by bidder

4.2 NON-METALLIC ALIGNMENT TIES

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor size	50 Sq.mm to 240 Sq.mm /as per covered conductor size
4	Mounting	Can mount directly on cable without any accessories
5	Type	Top Tie/side tie/Helical tie
6	Material	UV Resistant Thermoplastic
7	Operating/Rated voltage	11 kV/12kV
8	Dimensions (mm)	To be furnished by bidder

4.3 MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	IEC 61238-1
3	Range of Conductor size	For Phase conductor of diameter range 50-240 sq.mm/as per covered conductor size
4	Installation	Crimping by shear head bolt compression
5	Type of connection required	Connection by compression pressure
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Material	Aluminium Alloy For mechanical connector UV resistant polymer for heat shrink sleeve
8	Connector ID	Ø 14 mm to Ø 33 mm



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4.4 INSULATION PIERCING CONNECTOR

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50397-2
3	Range of Conductor sizes accommodated for Main & Branch	Main : 50 - 240 sq.mm Tap : 50 - 240 sq.mm /as per covered conductor size
4	Operating/Rated voltage	11 kV/12kV
5	Type of connection required	Insulation Piercing Type (Covered to Covered)
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Are end caps of branch cable a) Slide on type (b) Rigid	Slide on type
8	Are torque limiting shear heads provided to tightening bolts	Yes
9	Specified Torque	18±1.5 Nm
10	Torque for establishing connection between main and Tap (Nm)	Within 70% of Min. Torque specified

4.5 MID SPAN JOINTS

Sl. No.	Technical Parameters	Desired Values
1	Name of the manufacturer	To be furnished by bidder
2	Applicable Standard	EN 50483-4
3	Type No & Size Range	For Phase conductor of 50 Sq.mm to 240 sq.mm /as per covered conductor size
4	Operating/Rated voltage	11 kV/12kV
5	Type of connection required	Crimping type
6	Is any metallic part carrying potential in operation exposed during installation	No
7	Installation	Crimping by Hexagonal Compression



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5. GENERAL CONSTRUCTIONS:

5.1 TENSION ASSEMBLY-WEDGE TYPE (TA)

For fitting onto a pole for tensioning at the beginning or end of a length of Covered Conductor, or for anchoring while a major change in direction. The Tension assembly consists of one wedge type Tension anchoring clamp and one Tracking protection IPC.

The following key criterion to be followed for the design of the same: -

- a) There shall be no losable part (except Tracking IPC) in the process of clamping arrangement.
- b) The clamp should consist of an Aluminum alloy corrosion resistant casted body and self-adjusting fully insulating type of mechanical and weather resisting thermoplastic wedges which shall anchor/hold the conductor.
- c) Locking mechanism should be wedge type self-locking. Wedges are to be made of high strength, climatic resistance Engineering Plastic with glass fiber.
- d) The fittings shall be able to withstand the specific minimum failure load (SMFL) and shall not damage the covering of cable. SMFL is the minimum failure load for clamp at which mechanical failure will not take place.
- e) No tools shall be needed for fitting the Covered Conductor into the clamp.
- f) The Anchoring clamp shall have an IPC to avoid tracking phenomenon by maintaining the metallic clamp as well as the cable passing through it at equipotential.

5.2 NON-METALLIC ALIGNMENT TIES:

For supporting and aligning Covered Conductor at an intermediate pole in a length, with small angle of deviation. The Tie hold the Covered Conductor in its position on top of the pin insulator. Tie consists of an "Insulated Plastic" Type for Lin Alignment. The ties shall be designed suitably to hold the Covered Conductor in its position on top of the insulator. The Tie shall be made of Insulating Plastic materials (UV Resistant Thermoplastic) to ensure tracking resistance and to avoid any insulation damage to covered conductor due to abrasion while mechanical or wind induced vibration. Plastic coated metallic ties are not allowed.

5.3 MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE:

It is used for main (Bare) to main (Covered Conductor) networking Connection. This connector is to ensure the electrical characteristics with in the required limits, while ensuring necessary insulation protection against tracking and water penetration on Covered Conductor. The body as well as the shear head screws of the mechanical connector should be made of aluminum alloy. It should have a centered bore with tapered edges and a moisture block barrier in the center of the tube. Heat shrink sleeve shall be rated for up to 12kV



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5.4 INSULATION PIERCING CONNECTOR:

Insulation Piercing Connectors (IPC) are used for making Tee / Tap-off/ connections to a Covered Conductor. Insulation Piercing Connectors are designed to make a connection between the uncut main conductor and a branch cable conductor without having to strip either cable to expose the conductor. Instead, the tightening action of the IPC will first pierce the Insulation, then make good electrical contact between the main and branch conductor while simultaneously insulating and sealing the connection. The connector bodies shall be made entirely of mechanical and weather resistant plastic insulation material made of weather & UV resistant reinforced polymer and no metallic part outside the housing is acceptable except for the tightening bolt or nuts.

Any metallic part that is exposed must be free from potential during or after connector installation.

Screws or nuts assigned for fitting with IPC (Insulating Piercing connector), must be fitted with torque limiting shear heads to prevent over tightening or under tightening.

The min & max torque values should not exceed 27 N mtr for IPC for main conductor < 95 sq mm, and 42 Nmtr for main conductor >95, but < 240 sq mm.

The contact teeth or blade of the connector is made of tinned copper with equivalent Cross Section with respect to % IACS to suit the max branch cable size declared. The shear bolt/nut shall be suitable for tightening with a hexagonal socket of 13 mm or 17mm.

The IPCs shall be water proof and the water tightness shall be ensured by appropriate elastomeric materials and not by grease, gel or paste alone. Grease can be applied to protect the contact blade alone and shall not be visible on the outer surface of the connector. Connector should not be dipped in grease.

Each IPC should be provided with a cap to seal the cut end of the Branch cable. It should be of a design that once the connector is installed, it should not be possible to remove the cap without dismantling the connector.

All the metallic parts of the connector should be corrosion resistant and there should not be any appreciable change in contact resistance & temperature after overloads & load cycling and should confirm to the long duration tests specified in this standard.

5.5 MID SPAN JOINTS:

Mid-span tension joints for jointing covered conductor over a span. The sleeves should be Pre-Insulated type. Sleeve should be made of Aluminum, insulated with an Anti-UV black thermoplastic tube hermetically sealed two ends with 2 flexible rings. Strip length, Hexagonal crimping die reference and size to be marked on the outer surface of plastic sleeve.

5.6 ARC PROTECTION DEVICES:

Arching Horn Assembly is an Arc protection device for power arc evacuation without insulator damage. The arching Horn Assembly protection device consists of:

- a) Two arcing horns with adjustable distance “L” directly mounted on the insulator terminals.
- b) A covered conductor with clamp on the horn side.



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- c) An insulation piercing connector on the main cable side.

6. MARKING:

The following particulars shall be properly legible embossed/Printing on the accessories.

- a) Name & Trade mark of the manufacturer
- b) Product Code
- c) Batch Number
- d) The minimum and maximum cross section of Conductor for which the unit is suitable
- e) Month and Year of Manufacturer
- f) "TPWODL/ TPCODL/ TPNODL/ TPSODL" Name

7. TESTS

A type test shall be performed on the accessories. All the Acceptance test, Type test and Routine test should be as per EN 50397-2 and latest amendment. The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

i) Tension Assembly-Wedge Type (TA)

- a) Visual examination
- b) Dimension verification
- c) Tensile test at ambient temperature
- d) Check for permanent marking

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test



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iv) Insulation Piercing Connector

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test
- e) Short Circuit test

7.2 ROUTINE TESTS

i) Tension Assembly-Wedge Type (TA)

- a) Visual examination
- b) Dimension verification

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test



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- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test

7.3 TYPE TESTS

i) Tension Assembly-Wedge Type (TA)

- g) Visual examination
- h) Dimension verification
- i) Tensile test at ambient temperature
- j) Tensile test at low temperature
- k) Tensile test at high temperature
- l) Corrosion test
- m) Climate ageing test
- n) Check for permanent marking

ii) Non-Metallic Alignment Ties

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Failure Load Tests
- e) Slip Load Tests
- f) Lift / Side Load Tests
- g) Thermal Tests under load
- h) Corrosion test



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i) Climate ageing test

iii) Mechanical Connector with Heat Shrink Sleeve

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test
- h) Electrical Ageing Test

iv) Insulation Piercing Connector

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test
- h) Electrical Ageing Test

v) Mid Span Joints

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Mechanical Test
- e) Water Tightness test
- f) Climatic Ageing Test
- g) Corrosion Test

vi) Arc Protection Devices

- a) Visual examination
- b) Dimension verification
- c) Check for permanent marking
- d) Clamp Bolt Tightening Test
- e) Short Circuit test



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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/ IEC standard and as per CEA guidelines. Type tests should have been conducted in certified Test laboratories during the period not exceeding **7 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) 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 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 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,



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as an integrated product delivered under this contract. In the event any defect is found by the Company up to a period of 24 months from the date of commissioning or 30 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.

The guarantee clause is applicable for all the items covered in this specification.

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. 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 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.

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.

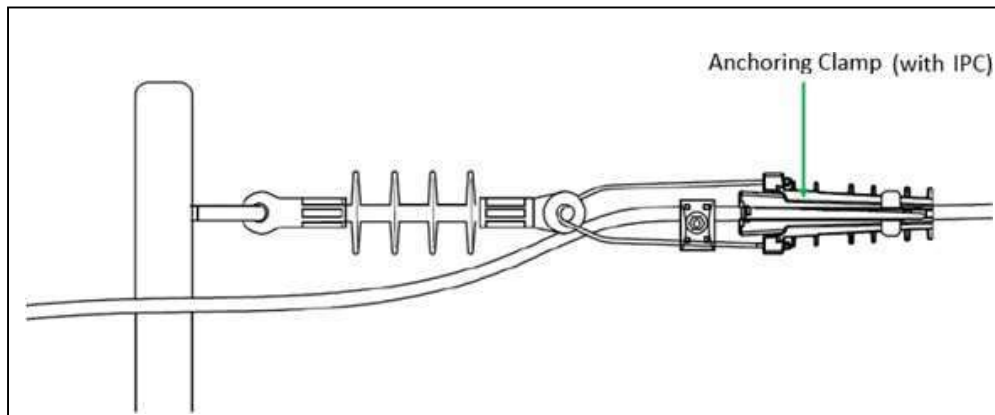


Fig.1: - Tension Assembly (TA) with Anchoring clamp and one Tracking protection IPC

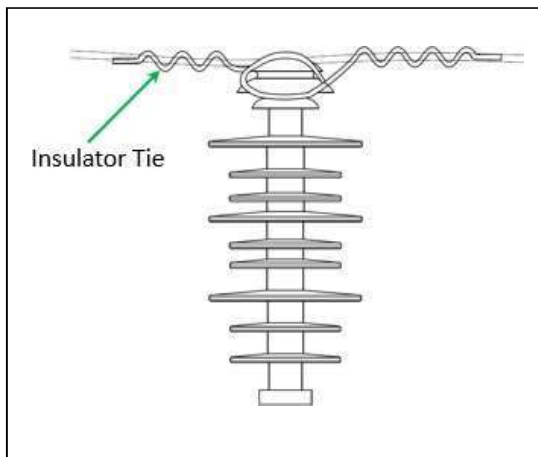


Fig.2: - Non-Metallic Alignment Tie

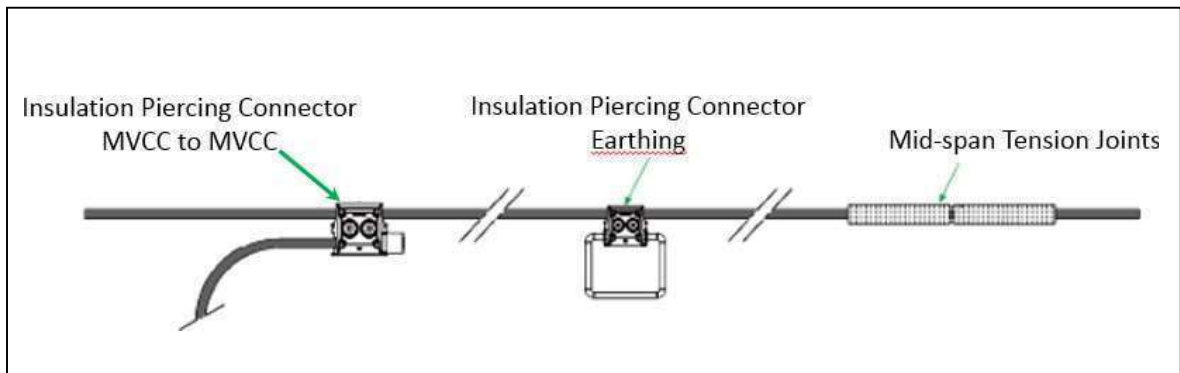


Fig.3: - Insulation Piercing Connector for Networking / Branching /Looping and Midspan Joints

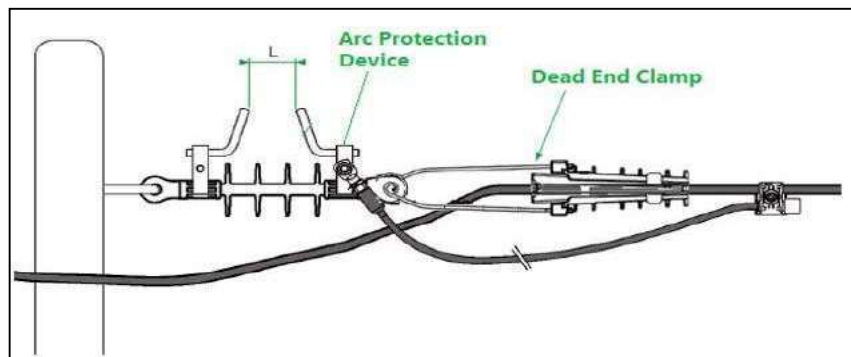


Fig.4:- Arc Protection Device

Note:- These are the Sample Drawing for tender purpose only.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS

TENSION ASSEMBLY-WEDGE TYPE (TA)

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Installation (with/without disassembly)	
5	Type & grade	
6	Application	
7	Mechanical Strength	
8	Dimensions (mm)	
9	Tension Load	



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NON-METALLIC ALIGNMENT TIES

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Mounting	
5	Type	
6	Material	
7	Application	
8	Dimensions (mm)	

MECHANICAL CONNECTOR WITH HEAT SHRINK SLEEVE

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor size	
4	Installation	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Material	
8	Connector ID	

INSULATION PIERCING CONNECTOR

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Range of Conductor sizes accommodated for Main & Branch	
4	Application	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Are end caps of branch cable a) Slide on type (b) Rigid	
8	Are torque limiting shear heads provided to tightening bolts	
9	Specified Torque	
10	Torque for establishing connection between main and Tap (Nm)	



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MID SPAN JOINTS

Sl. No.	Technical Parameters	To Be Furnished By The Bidder
1	Name of the manufacturer	
2	Applicable Standard	
3	Type No & Size Range	
4	Application	
5	Type of connection required	
6	Is any metallic part carrying potential in operation exposed during installation	
7	Installation	

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-2006

**Specification Name : ENG-ELC-069- TECHNICAL SPECIFICATION FOR 11kV
XLPE COVERED CONDUCTOR**

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

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TPWODL*



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Specification Name:
TECHNICAL SPECIFICATION FOR 11kV XLPE
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1. SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store of 11kV All Aluminum Alloy Stranded XLPE Covered Conductors. The material shall be complete with all components, which are necessary or usual for their efficient performance and trouble-free 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	Description
IS 398:1996 (Part IV)	Specification for aluminum conductors for overhead distribution purpose
EN 50397-1:2006	Covered Conductor Specification for voltage 1KV to 33KV
IS: 10418	Reels and drums for bare conductors

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	VALUES
1	Max. altitude above sea level	1000m
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 as mentioned above.

4. GENERAL TECHNICAL REQUIREMENTS:

The XLPE covered conductor shall comply in all respect with IS: 398 (Part.4)/1996 with latest amendment, if any from the date of its applicability

Sl. No.	Technical Parameters	Desired Values				
1	Name of the manufacturer	To be furnished by Bidder				
2	Applicable Standard	EN 50397-1:2006, IS 398-IV/1994				
3	Type of Conductor	AAAC XLPE Covered Conductor				
4	Rated Voltage/Operating voltage	12kV/11kV				
5	Nominal Cross-sectional area of conductor	55	80	100	148	232
6	Conductor					
a)	Material	Aluminium Alloy (AAAC)				
b)	Shape	Stranded Circular and Watertight				
c)	No / diameter of wire (before stranding)	7x3.15	7x3.81	7x4.26	19x3.15	19x3.94
d)	Approx. conductor diameter	9.45 mm	11.43 mm	12.78 mm	15.75mm	19.70mm
e)	Max. D.C. Resistance at 20°C	0.621 Ω/Km	0.425 Ω/Km	0.339 Ω/Km	0.229 Ω/Km	0.1471 Ω/Km

f)	Resistance Temperature co-efficient	0.004 / °C	0.004 / °C	0.004 / °C	0.004 / °C	0.00004 / °C
g)	Minimum Tensile strength of conductor	16.03kN	23.41 kN	29.26 kN	43.50 kN	68.05 kN
7	Thickness and dimensions					
7.1	Conductor Screen					
a)	Material	Extruded Semi-Conducting Compound				
b)	Nominal Thickness	0.3 mm	0.3 mm	0.3 mm	0.3 mm	0.3 mm
7.2	Insulation inner layer					
a)	Material	Extruded XLPE				
b)	Nominal thickness	1.2 mm	1.2 mm	1.2 mm	1.2 mm	1.2 mm
7.3	Insulation Outer layer					
a)	Material	Track Resistance, UV Resistant and Erosion Resistance XLPE (Black)				
b)	Nominal thickness	1.1 mm	1.1 mm	1.1 mm	1.1 mm	1.1 mm
8	Lightening Impulse withstand strength of XLPE Layer	75kV	75kV	75kV	75kV	75kV
9	Approx. Overall Diameter	15 mm	16 mm	18 mm	21mm	25mm
10	Maximum continuous operating temperature	90 °C	90 °C	90 °C	90 °C	90 °C
11	Max short circuit current, 1 sec (KA)	5.17 kA	7.52 kA	9.4 kA	13.912 kA	21.808 kA
12	Approx. Weight	To be provided by bidder				
13	Standard Packing length	1000 (+/- 5%) as per PO terms				
14	Make of Raw Material	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta				

5. GENERAL CONSTRUCTIONS:

5.1 CONDUCTOR

a) The properties of stranded all aluminum alloy conductors of various sizes are as follows

Actual Area	Stranding & wire dia.	Approx. overall dia.	Approx. mass	Calculated resistance at 20 d.c. (max.)	Approx. calculated Breaking Load	Reactance per km	Current Rating
mm. sq.	mm	mm	Kg/km	Ohm/km	kN	Ohms	Amps
55	7/ 3.15	9.45	149.20	0.621	16.03	0.3556	234
80	7/ 3.81	11.43	218.26	0.425	23.41	0.3394	270
100	7/ 4.26	12.78	272.86	0.339	29.26	0.3394	325

b) The properties of aluminum alloy wires to be used in the construction of the Stranded

conductors are as follows:

Diameter		Cross sectional area of Nominal Diameter	Mass	Minimum Breaking Load after stranding	Resistance at 20 deg.c
Nom	Max				
mm	mm	Sq.mm	Kg	kN	Ohm/kM
3.15	3.18	7.793	21.04	2.29	4.290
3.81	3.85	11.40	30.78	3.34	2.938
4.26	4.30	14.25	38.48	4.18	2.345

- c) No negative tolerance shall be permitted on the nominal diameter aluminum wire used in the manufacture of XLPE COVERED CONDUCTOR. However, positive tolerance in this respect shall be as provided in IS: 398 (Part IV)/1994 (amended up to date).
- d) The wire shall be smooth and free from all imperfections such as spills, splits, slag inclusion, dia. marks scratches, fittings, blow holes, projections, looseness, overlapping of strands, chipping of aluminum layers etc. and all such other defects which may hamper the mechanical and electrical properties of the conductor. Special care should be taken to keep away dirt, grit etc. during stranding.
- e) There shall be no joint in any wire of a stranded conductor containing seven wires, except those made in the base rod or wire before final drawing.
- f) The wires used in the construction of a stranded conductor shall, before stranding satisfy all the relevant requirements of this standard.
- g) Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta
- h) The lay ratio of the different layers shall be within the limits given below: -

No. of wires in Conductors	Lay Ratio in			
	6 - wire layer		12 - wire layer	
	Min.	Max.	Min.	Max.
7	10	14	-	-

5.2 FILLING (WATER BLOCKING):

The Stranded Conductor shall be longitudinally water tight by means of a water blocking material incorporated during the extrusion process. The use of grease/water swell able tape / water swell able powder etc. is not permitted. The water blocking material shall be stable at maximum operating conductor temperature of 90 Deg. Cent. The water blocking compound shall be compatible with the conductor material as well as the semi conducting screen layer above it and not adversely affect its electrical or mechanical properties.



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5.3 SEMICONDUCTING SCREEN:

An extruded semi conductive compound should be applied over the filled stranded conductor to ensure a lower voltage stress on the Insulation applied over the screen.

5.4 INSULATIONS:

The Insulation should be dual layered with the Inner Layer being XLPE with a nominal thickness of 1.2 mm and the Outer Layer being a suitable XLPE which is UV Resistant, Anti Tracking and Erosion Resistant with a nominal wall thickness of 1.1 mm. The minimum combined Insulation Thickness of both Layers should be 2.3 mm.

The conductor manufacturing and stranding process shall incorporate the longitudinal water blocking also.

The Semiconducting Screen, Inner Insulation and Outer Insulation should be extruded in one step i.e. triple extrusion to ensure a good, permanent bond between the three layers and also with the conductor.

It shall be possible to remove the Semi Conducting Screen, Inner and Outer Insulation Layers without damage to the conductor.

6. MARKING:

The following particulars shall be properly legible embossed on the covered conductor at the intervals of not exceeding one meter throughout the length of the Conductor. The covered conductor with poor and illegible embossing shall be liable for rejection.

- a) Name & Trade mark of the manufacturer
- b) Voltage Grade
- c) Year of manufacture
- d) Size of Covered Conductor
- e) EN 50397-1: 2006
- f) PO Number
- g) "TPWODL/ TPCODL/ TPNODL/ TPSODL" Name

Note: - Sequential meter marking shall be printed (after each meter)

Following details shall be provided on flanges of drum:

- a) Manufacturer's name
- b) Type of Cable/Conductor
- c) Size of Cable/Conductor
- d) Voltage Grade
- e) Length of the cable/conductor 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.

7. TESTS:

A type test shall be performed on every covered conductor type, irrespective of the cross-sectional area. All the type test, Routine test and acceptance test should be as per EN 50397-1:2006 and latest amendment. The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

- a) Visual examination and Dimension Check Test
- b) Conductor Resistance Test
- c) High Voltage Test
- d) Spark Test
- e) Hot Set Test on covering
- f) Longitudinal Water Tightness Test
- g) Anti-tracking test
- h) Marking

7.2 ROUTINE TESTS

- a) Visual examination and Dimension Check Test
- b) Conductor Resistance Test
- c) High Voltage Test
- d) Spark Test
- e) Hot Set Test on covering
- f) Longitudinal Water Tightness Test
- g) Marking

7.3 TYPE TESTS

i) Electrical Test

- a) Conductor Resistance Test
- b) High Voltage Test
- c) Spark Test
- d) Leakage Test
- e) Tracking Resistance

ii) Non-Electrical Test on Covering

- a) Mechanical properties Test
- b) Carbon Black Content
- c) Resistance to UV rays
- d) Ageing of complete product sample
- e) Shrinkage Test
- f) Hot Set Test
- g) Pressure Test at High Temperature
- h) Water Absorbs Test
- i) Hardness Test
- j) Longitudinal Water Tightness Test
- k) Marking
- l) Slippage Test

iii) Visual examination and Dimension Check Test**iv) Mechanical properties of the 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 as per relevant IS/ IEC standard and as per CEA guidelines. Type tests should have been conducted in certified Test laboratories 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.



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Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPWODL/ TPCODL/ TPNODL/ 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 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 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 24 months from the date of commissioning or 30 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. The bidder shall provide instructions regarding handling and storage precautions to be taken at site. The Conductor shall be wound on wooden/STEEL drums and packed in line with requirements of IS 10418-1982. The ends of the Conductor shall be sealed by means of non-hygroscopic sealing material. Heat or cold Shrinkable end caps with sealant shall be used for effectively sealing the

end terminals of the covered conductor. The inner diameter range of cap shall be such that it shall tightly fit to the covered conductors to prevent moisture ingress.

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 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.

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



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Sl. No.	Technical Parameters	To Be Furnished By Bidder				
1	Name of the manufacturer					
2	Applicable Standard					
3	Type of Conductor					
4	Voltage Grade					
5	Nominal Cross-sectional area of conductor	55	80	100	148	232
6	Conductor					
a)	Material					
b)	Shape					
c)	No / diameter of wire (before stranding)					
d)	Approx. conductor diameter					
e)	Max. D.C. Resistance at 20°C					
f)	Resistance Temperature co-efficient					
g)	Minimum Tensile strength of conductor					
7	Thickness and dimensions					
7.1	Conductor Screen					
a)	Material					
b)	Nominal Thickness					
7.2	Insulation inner layer					
a)	Material					
b)	Nominal thickness					
7.3	Insulation Outer layer					
a)	Material					
b)	Nominal thickness					
8	Lightening Impulse withstand strength of XLPE Layer					
9	Approx. Overall Diameter					
10	Maximum continuous operating temperature					
11	Max short circuit current, 1 sec (KA)					
12	Approx. Weight					
14	Make of Raw Material					

20. SCHEDULE “B” DEVIATIONS:



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(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

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1. SCOPE

The Specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at store/ site of 11 kV Pin polymer insulator 5 KN used in 11 kV Overhead Transmission lines.

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	Description
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 systems with a nominal voltage greater than 1 000 V
IS: 2071/ IEC: 60060-1	Methods of High Voltage Testing
IS: 2486	Specification for Insulator fittings for Overhead power Lines with a nominal voltage greater than 1000V
IS: 13134/ IEC: 60815	Guide for the selection of insulators in respect of polluted condition
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: 2633	Testing of Uniformity of Coating of zinc coated articles
IS:6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles
STRI Guide 1.92/1	Hydrophobicity Classification Guide
ASTM D 578-05	Standard specification for glass fiber strands

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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:

- i) The Composite insulators will be used on lines on which the conductor will be ACSR/AAAC of size up to 100 Sq.mm. The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind.
- ii) Insulator shall be suitable for 3 Phase, 50 Hz effectively earthed 11KV Overhead Distribution System in a moderately/heavily polluted atmosphere.
- iii) **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.
- 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:
 - $\pm (0.04d + 1.5)$ mm when $d \leq 300$ mm
 - $\pm (0.025d+6)$ 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.

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Type of insulator	11 kV Polymeric composite Pin Insulator
2	Reference Standard	IEC 61109
3	Material of FRP Rod	Borrone free ECR
4	Material of sheds	High voltage grade Silicone rubber Wacker-Germany, Dow Corning-USA
5	Material of End Fittings	SGCI /MCI/FORGED STEEL
6	Material of sealing compound	RTV Silicon
7	Colour of sheds	Grey
8	Rated system voltage	11 KV
9	Highest system voltage	12 KV
10	Dry Power Frequency Withstand voltage	70 KV
11	Wet Power Frequency Withstand voltage	35 KV
12	Dry Lightning Impulse withstand voltage	Positive: 75 KV Negative: 75 KV
13	Dry Lightning Impulse Flashover voltage	Positive: 95 KV Negative: 95 KV
14	RIV at 1 MHz when energized at 10 KV / 30 KV (rms) under dry condition	< 50 microvolt
15	Creepage distance (min)	320 mm
16	Min Failing load/ SCL (Specified cantilever Load)	5 KN
17	Dia of FRP Rod	24 mm
18	Length of FRP Rod (min)	200 mm
19	Dia of weather sheds	≥90 mm
20	Thickness of housing	3 mm
21	Dry arc distance(min)	165 mm
22	Method of fixing sheds to housing	Injection moulding
23	Visible Discharge Voltage	9 kV
24	Type of sheds	Aerodynamic
25	Dia of bottom end fitting	20 mm
26	Thread length of bottom end fitting	150 mm (Min)

5. GENERAL CONSTRUCTIONS:

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-fibre reinforced epoxy resin rod of high strength (FRP rod). Glass fibres and resin shall be optimized in the FRP rod. Glass fibres shall be Boron free electrically corrosion resistant (ECR) glass fibre 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 fibre 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 HARDWARE 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 aluminium alloy. Metal end fitting

shall be suitable for pin 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 outer of end fittings should be machined to make the surface uniform round to ensure effective sealing when housing is moulded 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 fibres or crack the core. 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. The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IS: 2486 - Part-II. Outer portion of Pin should be Zinc sleeved with minimum 99.95% purity of Electrolytic high grade zinc. 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 insulator shall not lead to deterioration. The pin insulator shall not engage directly with hard metal.

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 manufacture
- 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) Verification of the locking system or the tightness of the interface between end fitting and insulator housing
- v) Galvanizing Test
- vi) Verification of the specified mechanical load
- vii) Bending Load Test
- viii) Dry Power Frequency Withstand Voltage Test
- ix) Wet Power Frequency Withstand Voltage Test
- x) Analysis of material properties of housing material
- xi) Analysis of material properties of Core material

7.2 ROUTINE TESTS

- i) Visual examination (Free from voids, cavity, foreign particle and scratch/nick spot)
- ii) Mechanical Load Test (bending/cantilever)

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) 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.

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:

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 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.

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

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY BIDDER
1	Type of insulator	
2	Reference Standard	
3	Material of FRP Rod	
4	Material of sheds	
5	Material of End Fittings	
6	Material of sealing compound	
7	Colour of sheds	
8	Rated system voltage	
9	Highest system voltage	
10	Dry Power Frequency Withstand voltage	
11	Wet Power Frequency Withstand voltage	
12	Dry Lightning Impulse withstand voltage	
13	Dry Lightning Impulse Flashover voltage	
14	RIV at 1 MHz when energized at 10 KV / 30 KV (rms) under dry condition	
15	Creepage distance (min)	
16	Min Failing load/ SCL (Specified cantilever Load)	
17	Dia of FRP Rod	
18	Length of FRP Rod (min)	
19	Dia of weather sheds	
20	Thickness of housing	
21	Dry arc distance(min)	
22	Method of fixing sheds to housing	
23	Visible Discharge Voltage	
24	Type of sheds	

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY BIDDER
25	Dia of bottom end fitting	
26	Thread length of bottom end fitting	

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

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1. SCOPE
2. APPLICABLE STANDARDS
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7. TESTS
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18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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.	CONDITONS	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:

- 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	SGI/Forged Steel	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.	< 50 microvolt	< 50 microvolt

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
		33 kV 90 KN	33 kV 120 KN
(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
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

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** 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.

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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.

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Bidder shall submit the sample of material during submission of Bids.

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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.

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18. DRAWINGS AND DOCUMENTS

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

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- 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	To Be Furnished By The Bidder	
		33 kV 90 KN	33 kV 120 KN
1	Type of Insulator		
2	Standard according to which the insulators manufactured and tested.		
3	Name of material used in manufacture of the insulator with class/grade)		
(a)	Material of core (FRP rod) (I) E-glass of ECR-glass.		
(b)	Material of housing weather sheds (silicon content)		
(c)	Material of end fittings		
(d)	Sealing compound for end fittings		
4	Colour		
5	Electrical characteristics		
(a)	Nominal system voltage		
(b)	Highest system voltage		
(c)	Dry Power frequency withstand voltage		
(d)	Wet Power frequency withstand voltage		
(e)	Dry flashover voltage		
(f)	Wet flash over voltage		
(g)	Dry lighting impulse withstand voltage		
	(a) Positive		
	(b) Negative		
(h)	Dry lighting impulse flashover voltage		
	a) Positive		
	b) Negative.		
(i)	FRP rod leakage current at 175 V/mm		

SL. No.	TECHNICAL PARTICULARS	To Be Furnished By The Bidder	
		33 kV 90 KN	33 kV 120 KN
(j)	RIV at 1 MHz when energized at 10 kV/30kV (rms) under dry condition.		
(k)	Creepage distance (Min.)		
6	Minimum failing load.		
7	Dimensions of insulator		
(i)	Weight (Approx.)		
(ii)	Dia of FRP rod		
(iii)	Length of FRP rod		
(iv)	Dia of weather sheds		
(v)	Thickness of housing		
(vi)	Dry arc distance Dimensioned drawings of insulator (including weight with tolerances in weight)		
8	Method of fixing of sheds to housing (specify). Single mould or Modular construction (injection moulding/compression		
9	Type of sheds		

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

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1. SCOPE

The Specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at store/ site of 33 kV Pin polymer insulator 10 KN used in 33 kV Overhead Transmission lines.

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	Description
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 systems with a nominal voltage greater than 1 000 V
IS: 2071/ IEC: 60060-1	Methods of High Voltage Testing
IS: 2486	Specification for Insulator fittings for Overhead power Lines with a nominal voltage greater than 1000V
IS: 13134/ IEC: 60815	Guide for the selection of insulators in respect of polluted condition
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: 2633	Testing of Uniformity of Coating of zinc coated articles
IS:6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles
STRI Guide 1.92/1	Hydrophobicity Classification Guide
ASTM D 578-05	Standard specification for glass fiber strands

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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:

- i) The Composite insulators will be used on lines on which the conductor will be ACSR/AAAC of size up to 232 Sq.mm. The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind.
- ii) Insulator shall be suitable for 3 Phase, 50 Hz effectively earthed 33kV Overhead Distribution System in a moderately/heavily polluted atmosphere.
- iii) **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.
- 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.

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Type of insulator	33 kV Polymeric composite Pin Insulator
2	Reference Standard	IEC 61109
3	Material of FRP Rod	Boron free ECR
4	Material of sheds	High voltage grade

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
		Silicone rubber Wacker-Germany, Dow Corning-USA
5	Material of End Fittings	SGCI /MCI/ FORGED STEEL
6	Material of sealing compound	RTV Silicon
7	Colour of sheds	Grey
8	Rated system voltage	33 kV
9	Highest system voltage	36 kV
10	Dry Power Frequency Withstand voltage	95 kV
11	Wet Power Frequency Withstand voltage	75 kV
12	Dry Power Frequency Flashover Voltage	>95 kV
13	Wet Power Frequency Flashover Voltage	>75 kV
14	Dry Lightning Impulse withstand voltage	Positive: 170 KV Negative: 180 KV
15	Dry Lightning Impulse Flashover voltage	Positive: 210 KV Negative: 230 KV
16	RIV at 1 MHz when energized at 10 KV / 30 KV (rms) under dry condition	< 70 microvolt
17	Creepage distance (min)	900 mm
18	Min Failing load/ SCL (Specified cantilever Load)	10 KN
19	Dia of FRP Rod	32 mm
20	Length of FRP Rod (min)	300 mm
21	Dia of weather sheds	≥100 mm
22	Thickness of housing	3 mm
23	Dry arc distance(min)	300 mm
24	Method of fixing sheds to housing	Injection moulding
25	Visible Discharge Voltage	27 KV
26	Type of sheds	Aerodynamic
27	Dia of bottom end fitting	24 mm
28	Thread length of bottom end fitting	150 mm (min)

5. GENERAL CONSTRUCTIONS:

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:

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 pin 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 outer of end fittings should be machined to make the surface uniform round to ensure effective sealing when housing is

moulded 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 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. The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IS: 2486 - Part-II. Outer portion of Pin should be Zinc sleeved with minimum 99.95% purity of Electrolytic high grade zinc. 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 insulator shall not lead to deterioration. The pin insulator shall not engage directly with hard metal.

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 manufacture
- 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) Verification of the locking system or the tightness of the interface between end fitting and insulator housing
- v) Galvanizing Test

- vi) Verification of the specified mechanical load
- vii) Bending Load Test
- viii) Dry Power Frequency Withstand Voltage Test
- ix) Wet Power Frequency Withstand Voltage Test
- x) Analysis of material properties of housing material
- xi) Analysis of material properties of Core material

7.2 ROUTINE TESTS

- i) Visual examination (Free from voids, cavity, foreign particle and scratch/nick spot)
- ii) Mechanical Load test (Bending/Cantilever)

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) 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.

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 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 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.

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

SL. NO.	TECHNICAL PARTICULARS	TO BE FURNISHED BY BIDDER
1	Type of insulator	
2	Reference Standard	
3	Material of FRP Rod	
4	Material of sheds	
5	Material of End Fittings	
6	Material of sealing compound	
7	Color of sheds	
8	Rated system voltage	
9	Highest system voltage	
10	Dry Power Frequency Withstand voltage	
11	Wet Power Frequency Withstand voltage	
12	Dry Lightning Impulse withstand voltage	
13	Dry Lightning Impulse Flashover voltage	
14	RIV at 1 MHz when energized at 10 KV / 30 KV (rms) under dry condition	
15	Creepage distance (min)	
16	Min Failing load/ SCL (Specified cantilever Load)	
17	Dia of FRP Rod	
18	Length of FRP Rod (min)	
19	Dia of weather sheds	
20	Thickness of housing	
21	Dry arc distance(min)	
22	Method of fixing sheds to housing	
23	Visible Discharge Voltage	
24	Type of sheds	
25	Dia of bottom end fitting	
26	Thread length of bottom end fitting	

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

TPCODLTPNODLTPWODLTPSODL

Specification No: ENG-GEN-4031

Specification Name: Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's

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TPCODL**TPNODL****TPWODL****TPSODL****Specification No:** ENG-GEN-4031**Specification Name:** Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's**1. SCOPE:**

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at site/store. Performance of Clamps & Connectors for AAAC Conductors including for breaker, isolator, CT, IVT, BPI and SA required for the switch yard with all accessories and necessary training for trouble free & efficient performance.

2. APPLICABLE STANDARDS:

The terminal connectors under this specification shall conform strictly to the requirements of the latest version of the following standards as amended up-to-date, except where specified otherwise.

Sl.No	IS	Description
1	IS: 5561	Specification for Electrical Power Connectors
2	IS: 617	Aluminium & Aluminium Alloy
3	IS: 2629	Recommended Practice for hot dip galvanizing of iron and steel
4	IS: 2633	Method of testing uniformity of coating of zinc coated articles. HDG- Refer to Line Hardware Items

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	1000m
8	Wind Pressure	300 Km/hr

TPCODL**TPNODL****TPWODL****TPSODL****Specification No:** ENG-GEN-4031**Specification Name:** Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's

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 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 Connector rating shall match with the rating of the respective equipment for the terminal connectors and the connectors for bus bar and dropper should be of following rating. Minimum Thickness at any part of connector shall be at least 10 MM

A. TENSION CLAMPS:

Sl. No.	Details Suitable for AAAC (148/100mm ²)	Requirement:
1	Type	Compression type tension clamp
2	Material	Ext. Al.Alloy/Ext. Al.
3	Breaking Strength	95% of UTS of Conductor
4	Slipping Strength	95% of UTS of Conductor
5	Galvanizing	
a	Ferrous Parts	Hot Dip Galvanized
b	Spring Washers	Electro Galvanized
6	Quality of Zinc used	99.95 %
7	Number of dips which the clamp can withstand	4/ 1 minute dips
8	Standard to which Conforming	IS 2633
9	Electrical conductivity	
a.	Results of heating cycle test carried out	
b.	Electrical resistance	Not more than 75% of equivalent length of conductor

TPCODL**TPNODL****TPWODL****TPSODL****Specification No:** ENG-GEN-4031**Specification Name:** Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's

10	Reference to type tests and other test reports attached	
11	Make of bolts and Nuts used	Standard Make

B. SUSPENSION CLAMPS:

Sl. No.	Details Suitable for AAAC (148/100mm ²)	Requirement:
1	Type of material used for retaining rod for AGS assembly giving reference of ISS	Alluminium Alloy 6061/Equivalent
2	Minimum tensile strength of retaining rod material	35 Kg/mm ²
3	Chemical composition of retaining rod materials	As per IS:733
4	Electrical conductivity of Armour Rod material(In percentage of the conductivity of IACS i.e. International Annealed Copper Standard	Not less than 40 %of IACS
5	Slipping strength of cushioned suspension assembly	8% to 15% of UTS of Conductor
6	Breaking strength of suspension Clamp	6000 Kgf
7	Minimum Tensile Strength	2000 Psi
8	Minimum ultimate Elongation	300 %
9	Ageing (guaranteed life of the assembly)	40 Years
10	Hardness	65 to 80 A

C. FLEXIBLE COPPER BOND:

Sl. No.	Details	Requirement:
1	Stranding	37/ 7/ 0.417
2	Cross sectional area(Sq.mm)	75.6
3	Minimum copper equivalent area(sq.mm)	34(each individual wire)
4	Length of copper cable(mm)	500

TPCODL**TPNODL****TPWODL****TPSODL****Specification No:** ENG-GEN-4031**Specification Name:** Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's

5	Material Lugs	Tinned copper
6	Bolt Size	
	(i) Diameter(mm)	16
	(ii) Length(mm)	40
7	Resistance(ohm)	0.0004(as per IS.2121)
8	Total weight of Flexible copper bond(kg)	0.45(approx.)

D. C-type Wedge Connector

Sl.No	Details	Requirement
1	Applicable standard	IS:5561 1970
2	Metallic Material of connector	
	a. 'C' Member	AL Alloy
	b. Wedge Member	AL Alloy
	Non-Metallic Material of connector	Anti-Corrosion inhibitor contain metallic abrasive grit
3	Suitable Conductor for Main & Tap	Main: 80, 100, 148 sq mm Tap: 80, 100, 148 sq mm
4	Rated voltage in KV	Upto 33 kv
5	Rated Tensile strength in kgf	110
6	Current carrying capacity	As per conductor size

E. PG Connector

Sl. No	Description	Units	Requirement					
	Types		35sq mm	50-55sq mm	80sq mm	100sq mm	148sq mm	232 sq. mm
1	Application		To provide connection between: Main- 16-150 sq.mm Aluminum Tap- 16-150 sq.mm Aluminum					To provide connection between: Main- 35-240 sq.mm Aluminum Tap- 35-240 sq.mm Aluminum

TPCODL**TPNODL****TPWODL****TPSODL****Specification No:** ENG-GEN-4031**Specification Name:** Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's

2.	Rated Voltage	KV	12	
3.	System Frequency	Hz	50	
4.	Tightening Torque	Nm	22 (+/-2)	29 (+/-2)
5.	Material Composition		Clamp & Keeper- Aluminium Alloy Nut,Bolt,Washers- MS HDG Spring Washer- HDG/EG Body- Corrosion resistant aluminium alloy, tensile Strength 300 N/mm'. Screw- Hot-dip galvanized steel, strength class of 8.8 Grade Galvanizing shall be as per relevant IS standards.	
6.	Pressure Surface		Grooved or gripped jawed	
7.	Bolt		Shear head arrangement, 8.8 grade	
8.	No./Size of Bolts		2 x M8	3 x M10
9.	Overall Diameter	mm	5.1 - 15.7	7.5 - 20.3

5. GENERAL CONSTRUCTION:

The terminal connectors shall be manufactured from Aluminium Silicon Alloy and conform to designation A6 of IS: 617 (latest edition).The connectors shall be of best quality and workmanship, well finished and of approved design. Specific materials for clamps and connectors should have high current carrying capacity, high corrosion resistance and be free from corona formation.

All connectors or its components to be connected with conductor shall be of bolted type having aluminium purity not less than 99.5%.All bus bar clamps shall be made preferably from forged aluminium of purity not less than 99.5%. The thickness and contact surface should be maintained in such a way that the clamp should conform to IS: 5561/1970 or any latest revision thereof



Specification No: ENG-GEN-4031

Specification Name: Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's

5.1 EQUIPMENT CONNECTORS

Bimetallic connectors shall be used to connect conductors of dissimilar metal. The following bimetallic arrangement shall be preferred.

a) Copper cladding of minimum 4 mm. thickness on the aluminium portion of connector coming in contact with the copper palm or stud of the equipment.

b) Alternatively, to provide cold rolled aluminium copper strip between the aluminium portion of the connection, the sheet thickness shall not be less than 2 mm

Sufficient contact pressure should be maintained at the joint by the provision of the required number of bolts or other fixing arrangements, but the contact pressure should not be so great as to cause relaxation of the joint by cold flow, the joint should be such that the pressure is maintained within this range under all conditions of service, to avoid excessive local pressure, the contact pressure should be evenly distributed by use of pressure plates, washers or suitable saddles of adequate area of thickness should be less than that of an equal length of conductor where measured individually test results showing the milli drop test and resistance should be enclosed with the bid

All connectors shall be so designed and manufactured as to offer ease of installation as these are to be used in overhead installations, design shall be such that full tightening of nuts and bolts should be possible with the use of double wrench.

5.2 WEDGE CONNECTOR:

The connector shall conform to Heavy Duty, Class A as per International Standard - ANSI C 119.4. It also shall conform to Indian Standard - IS 5561. It consists of a spring 'C' member and a Wedge, both made from a special tin plated copper alloy and heat treatment, which results in spring action. Both members shall be factory coated with a conductive inhibitor containing abrasive particles to help in cleaning the contact surface during installation.

They shall connect conductors of Aluminium, Copper and their alloys regardless of the combination (i.e. Al to Al, Al to Cu, Cu to Cu). These connectors shall provide a non-corrosive connection and that is protected against temperature variation and overloading. In addition, connector shall provide a reliable electrical as well as mechanical connection for solid, stranded or compacted conductor combinations including AAC, AAAC and ACSR. A good connection shall be easily verified by visual inspection. All the connectors shall be removed without damaging the conductor and the conductor as well as the connector can be used again. The connector shall be useful for the conductor size of service connections.

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‘C’ Member

This shall be formed from a special Copper alloy so that the grain (extrusion direction) runs perpendicular to the conductor. This orientation of grain direction provides for lower rates of stress relaxation in the metal and will maintain the level of contact pressure at or near the value at initial installation for the life of connection. The material used shall be specially designed with close tolerances on the chemical composition to ensure consistency of the C- member production regarding dimensions & mechanical properties

Wedge

This also made up of special Cu alloy which is manufactured to close tolerances to ensure repeatability and reliability of the connection.

Inhibitor

An oxidation inhibitor shall be applied to the surface there by elimination of oxidation of metallic surface. The chemical composition of the inhibitor shall be synthetic and compatible with the rubber gloves used by the utilities. This inhibitor shall contain special conducting abrasive particles, optimized in size and quantity, to ensure repeatability and reliability of the electrical contact made in every connection.

Freedom From Defects

The wedge type connectors shall be smooth and free from cavities, blowholes, and such other defects, which would likely cause them to be unsatisfactory in service.

The wedge type connectors shall be so designed and proportioned that they are capable of safely withstanding stresses to which they may be subjected (including those due to short circuit and climatic conditions) and that the effects of vibration both on conductor and on connector itself are minimized.

They shall be designed, manufactured, and finished to avoid sharp radius of curvature, ridges and excrescences, which might lead to, localized pressure on or damage to the conductor in service.

The joint should be such that the pressure is maintained within this range under all conditions of service.

5.3 PG Connector

Aluminum Parallel Groove connectors i.e. connector designed for connecting two or more conductors whose axes are parallel to each other. These connectors are composed of Metal Oxide parts, an upper body and Lower body. They have two parallel grooves to receive the conductors. In aluminum clamps, the two bodies are made out of high strength aluminum alloy. The bolts are made out of hard steel and hot-dip galvanized with aluminum shear off head arrangement operating with normal/ordinary tools.

6. MARKING:

- i). Markings/Embossing- TPCODL/TPNODL/TPWODL/TPSODL,
- ii). Manufacture’s trademark
- iii). Applicable Rating

	<p>Specification No: ENG-GEN-4031</p> <p>Specification Name: Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's</p>
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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) Tensile Test
- ii) Resistance Test
- iii) Dimensional Check
- iv) Galvanizing Test, where Applicable

7.2 ROUTINE TEST:

- i) Visual Inspection
- ii) Dimensional Check

7.2 TYPE TESTS (As per relevant IS/IEC)

- i) Tensile Test
- ii) Resistance Test
- iii) Temperature Rise Test
- iv) Short time Current Test
- v) Dimensional Check
- vi) Galvanising 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/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, it 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.

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Following documents shall be sent along with material.

- a) Test reports
- b) MDCC issued by TPCODL/TPNODL/TPWODL/TPSODL
- c) TPCODL/TPNODL/TPWODL/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/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 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 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. 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:

Required

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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

19.1 TENSION CLAMPS



Sl. No.	Details Suitable for AAAC (148/100mm ²)	<u>To be furnished by Bidder</u>
1	Type	
2	Material	
3	Breaking Strength	
4	Slipping Strength	

TPCODL**TPNODL****TPWODL****TPSODL****Specification No:** ENG-GEN-4031**Specification Name:** Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's

5	Galvanising	
a	Ferrous Parts	
b	Spring Washers	
6	Quality of Zinc used	
7	Number of dips which the clamp can withstand	
8	Standard to which Conforming	
9	Electrical conductivity	
a.	Results of heating cycle test carried out	
b.	Electrical resistance	
10	Reference to type tests and other test reports attached	
11	Make of bolts and Nuts used	

19.2 SUSPENSION CLAMPS

Sl. No.	Details	<u>To be furnished by Bidder</u>
	Suitable for AAAC (148/100mm²)	
1	Type of material used for retaining rod for AGS assembly giving reference of ISS	
2	Minimum tensile strength of retaining rod material	
3	Chemical composition of retaining rod materials	
4	Electrical conductivity of Armour Rod material(In percentage of the conductivity of IACS i.e. International Annealed Copper Standard	
5	Slipping strength of cushioned suspension assembly	
6	Breaking strength of suspension Clamp	
7	Minimum Tensile Strength	
8	Minimum ultimate Elongation	
9	Ageing (guaranteed life of the assembly)	

   	Specification No: ENG-GEN-4031 Specification Name: Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's
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10	Hardness	
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19.3 FLEXIBLE COPPER BOND


Sl. No.	Details (Flexible Copper Bond)	<u>To be furnished by Bidder</u>
1	Stranding	
2	Cross sectional area(Sq.mm)	
3	Minimum copper equivalent area(sq.mm)	
4	Length of copper cable(mm)	
5	Material Lugs	
6	Bolt Size	
	(iii) Diameter(mm)	
	(iv) Length(mm)	
7	Resistance(ohm)	
8	Total weight of Flexible copper bond(kg)	

19.4 Wedge Connector

Sl.No	Details	<u>To be furnished by Bidder</u>
1	Product designation	
2	Applicable standard	
3	Metallic Material of connector	
	a. 'C' Member	
	b. Wedge Member	
	c. Hardware	
4	Non-Metallic Material of connector	
5	Suitable Conductor for Main & Tap	
6	Installation & Application tooling	
7	Rated voltage in KV	
8	Rated Tensile strength in kgf	
9	Rated voltage in KV	

19.5 PG Connector

Sl. No	Details	To be furnished by bidder
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   	Specification No: ENG-GEN-4031 Specification Name: Technical Specification for Clamps & Connectors for AAAC Conductors & Equipment's
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1.	Suitable size of main conductor	
2.	Suitable size of branch conductor	
3.	Rated Voltage	
4.	System Frequency	
5.	Tightening Torque	
6.	Material Composition	
7.	Pressure surfaces	

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

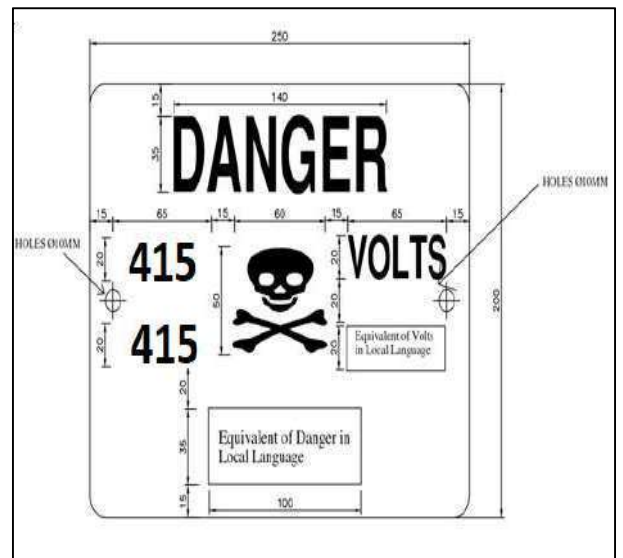
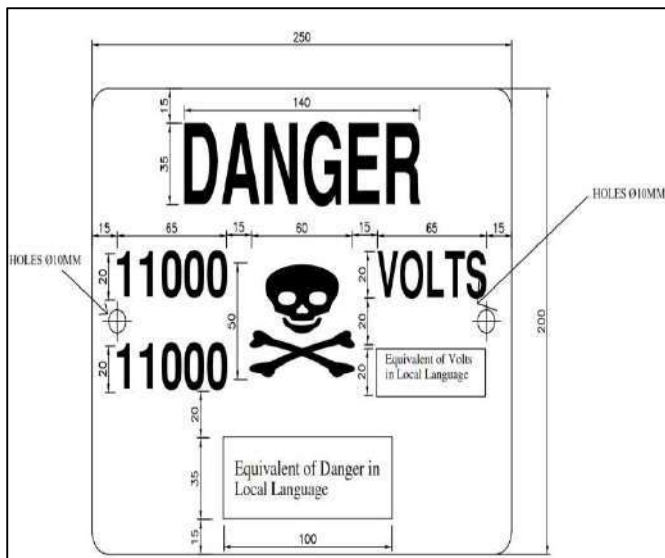
Designation

DANGER BOARD

GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULAR	DESIRED VALUE
1	Size of the danger board	250mm X 200 mm (11kV & LT)
2	Thickness of Sheet	1.6mm
3	Front side of the board	The plate is vitreous enamelled white with letters, figures and the conventional skull and cross-bones in signal red colour.
4	Rear side of the board	Rear Side of the plate is black enamelled
5	Letter Size	As per IS 2551/1982
6	Holes	10 mm dia. holes at suitable place as per sketch for fixing
7	Languages	The language will be Odia and English
8	Marking	TPCODL/ TPNODL/ TPWODL/ TPSODL, Manufacture's name or trademark, Year of Manufacturing.

DRAWINGS



Note: -All Dimensions are in mm unless noted otherwise specified.



Specification No: ENG-EHV-1021

Specification Name: Technical Specification for
33KV Lightning Arrester (10 KA)

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2. APPLICABLE STANDARDS
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15. TESTING FACILITIES
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17. SPARES, ACCESSORIES AND TOOLS
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19. TRAINING
20. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
21. SCHEDULE "B" DEVIATIONS

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 Lightning 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 arrester 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 arrester. 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 arrester 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 arrester failure, consequent to uneven voltage gradient across the stack in the event of contamination of the arrester 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 resistor 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 its 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 arrester 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 runaway 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.



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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 arrester 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 arrester.
- 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 samples from 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



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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



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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



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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

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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







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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		

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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

CONTENTS

1. SCOPE
2. APPLICABLE STANDARDS
3. CLIMATIC CONDITIONS OF THE INSTALLATION
4. GENERAL TECHNICAL REQUIREMENTS
5. GENERAL CONSTRUCTIONS
6. MARKING
7. TESTS
8. TYPE TEST CERTIFICATES
9. PRE-DISPATCH INSPECTION
10. INSPECTION AFTER RECEIPT AT STORES
11. GUARANTEE
12. PACKING
13. TENDER SAMPLE
14. QUALITY CONTROL
15. TESTING FACILITIES
16. MANUFACTURING ACTIVITIES
17. SPARES, ACCESSORIES AND TOOLS
18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of 33kV GI V Cross Arm to be used in Structures. 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 2062	Hot Rolled Medium and High Tensile Structural Steel
IS 1852	Rolling and Cutting Tolerances for Hot Rolled Steel products
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
IS 6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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.

SL.NO.	CONDITIONS	VALUES
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:

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Materials	100X50X5 mm Channel , 65X65X6 mm Angle
2	Galvanisation process	Hot-Dip Galvanized
3	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
4	Make	SAIL, JINDAL, RINL & TATA (Billet with re rolling not allowed)
5	Weight of Cross Arm	20 KG (Approx.)
6	Grade of Steel	E 250 A
7	Minimum Tensile Strength	410 N/mm ²
8	Yield Stress	250 N/mm ²
9	Percentage Elongation (Min.) at Gauge Length	23%
10	Bend Test (Internal Dia)	Min-2t
11	Mass of Zinc Coating	Min 705 gm/m ²
12	Zinc Coating Thickness	Min 100 micron (6 Dip)
13	Chemical composition	Grade: E 250 A (As per IS: 2062)
14	Tolerance	As per IS 1852 latest amendment

5. GENERAL CONSTRUCTION:

The Chemical composition and Physical properties of the finished material shall be as per the equivalent standards. Chemical Composition and Physical Properties shall conforming to IS: 2062. The approved makes are SAIL, JINDAL, RINL & TATA (Billet with re rolling not allowed).

5.1 CHEMICAL COMPOSITION

Chemical composition for 250 A 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%

5.2 Galvanization:

All 33kV V Cross Arms 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 (Min 705 gms per sq.mt / 100 Micron, 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.
- f) 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.
- g) Quality of Hot Dip Galvanization should comply with IS 2629, ISO 1461 & should be guaranteed for any type of damage due to harsh climatic condition for 5 Years. These V Cross Arms are to be used in coastal areas of Odisha where climate is hot, humid & saline. These areas are prone to flood & frequent rainfall.

6. MARKING:

Following distinct non-erasable embossing is to be made on each Channel and Angles to be supplied to TPCODL/TPWODL/TPNODL/TPSODL under this Tender.

- a) Manufacturer Name/ Trade Mark
Engraved Marking (Punching before galvanization)
- a) "TPCODL/TPWODL/TPNODL/TPSODL"
- b) Year of manufacturing
- c) PO Number

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) Chemical Composition
- ii) Mechanical Properties
- iii) Dimension Test & Weight (kg/M) Visual Examination,
- iv) Test in respect of Hot Dip Galvanization i.e. Thickness of zinc coating in microns

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS

- i) Chemical Composition
- ii) Mechanical Properties
- iii) Test in respect of Hot Dip Galvanization i.e. thickness of zinc coating in microns

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 Govt. Lab** as per relevant IS. However, 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/ 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 12 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.

Galvanization Guarantee- Quality of Hot Dip Galvanization should be guaranteed for any type of damage due to harsh climatic condition for 5 Years.

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:

The Bidder shall provide 1 no. sample of the product. The product will be accepted only if it meets all specifications as defined in the document.

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 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.

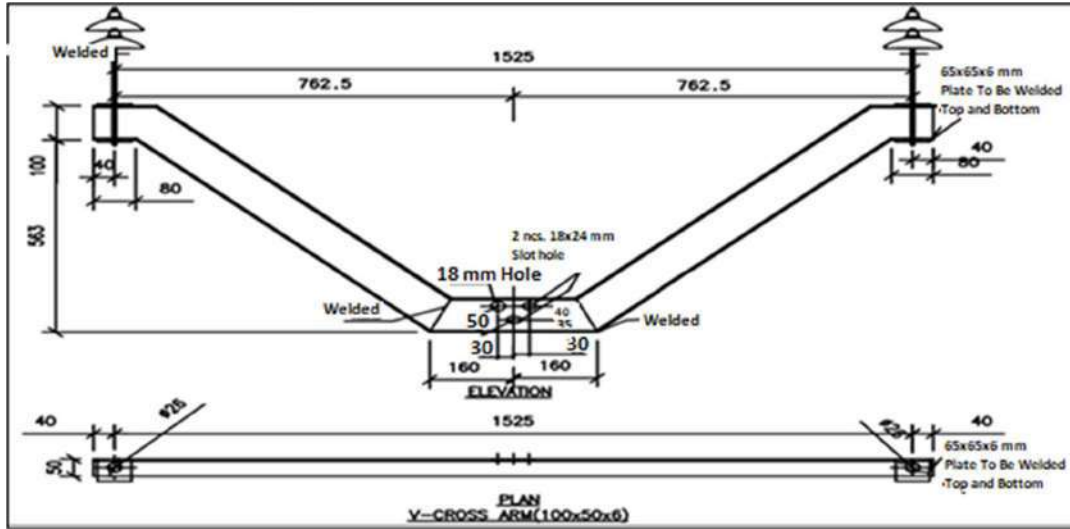
17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

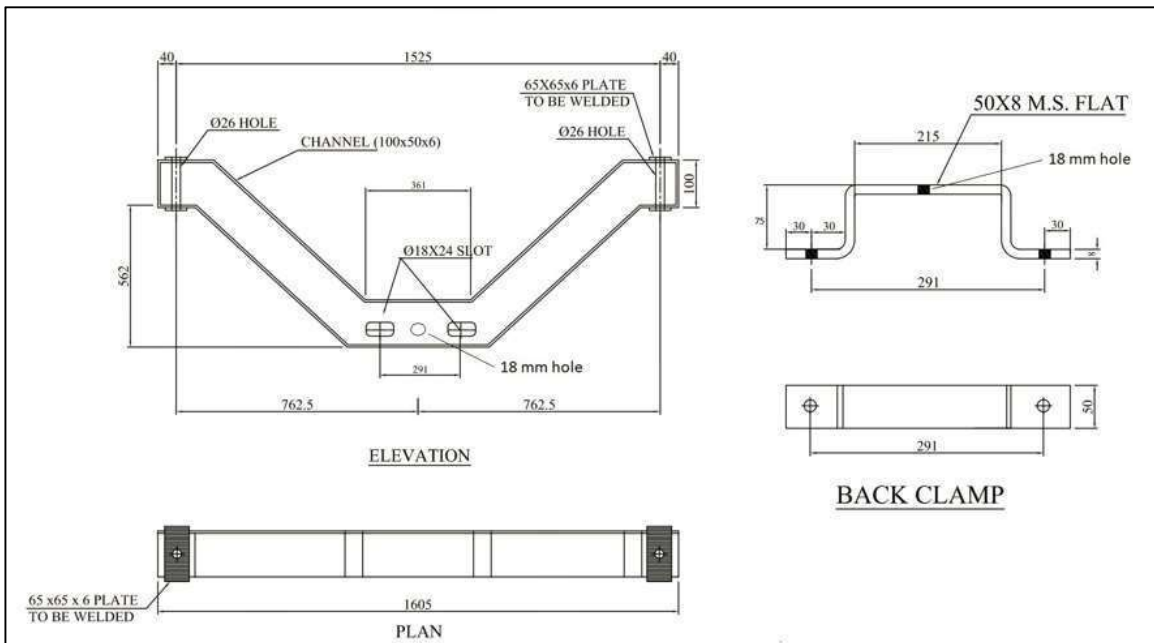
18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

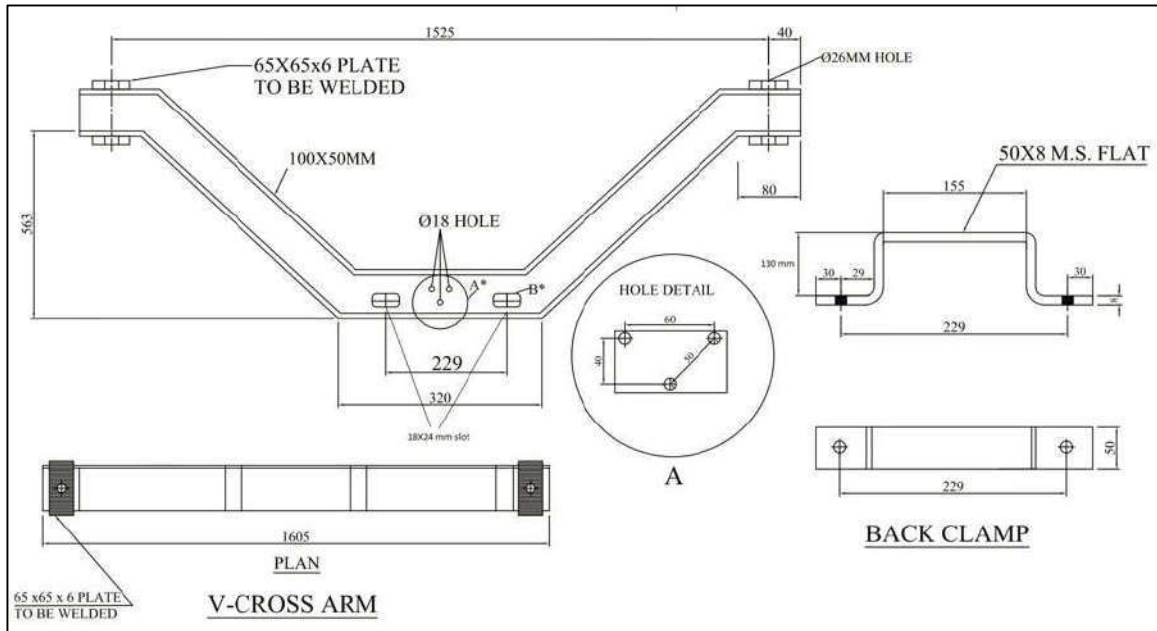
- a) Completely filled—in clause wise compliance of the specification
- b) Schedule "B" Deviations
- c) Work Experience details
- d) Type test certificates.
- e) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.



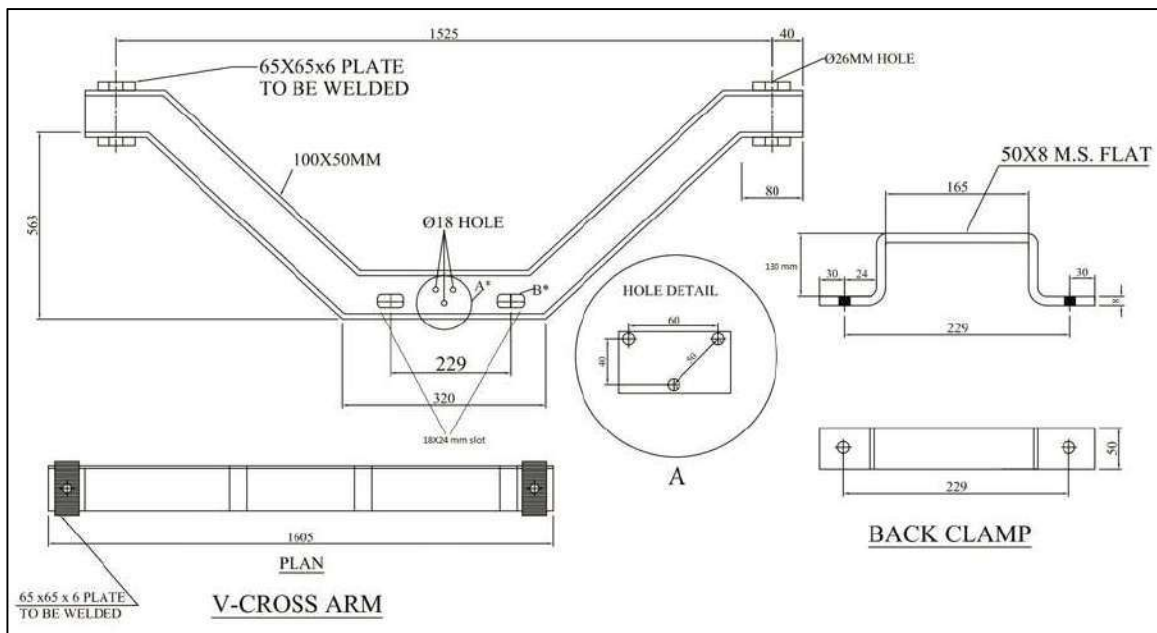
OPTION1:- Arrangement in WPB Pole



OPTION2:- Arrangement in 9 Mtr. PSC Pole



OPTION 3:- Arrangement in RSJ Pole



OPTION 4:- Arrangement in WPB Pole

Note:- The drawing is for tender purpose only and indicative in nature & will be finalized during detailed engineering

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

TPCODL

TPNODL

TPWODL

TPSODL

Specification No: ENG-GEN-4021

Specification Name: Technical Specification of
GI nut and bolt

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TPCODL**TPNODL****TPWODL****TPSODL****Specification No:** ENG-GEN-4021**Specification Name:** Technical Specification of GI nut and bolt**1. SCOPE:**

This specification covers the design, manufacture, testing and supply of GI Nuts and Bolts to be used in structures. 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: 1363/ Part-I & III	Hexagon Head Bolts, Screws and Nuts of Product Grade C Part 1: Hexagon Head Bolts (Size Range M 5 to M 64) Part 3: Hexagon Nuts (Size Range M5 to M64)
IS 14394	Industrial Fasteners - Hexagon Nuts of Product Grade C - Hot-Dip Galvanized (Size Range M12 to M36)
IS 1367/ Part- III, VI & XIII	Technical Supply Conditions for Threaded Steel Fasteners, Part 3: Mechanical Properties of Fasteners Made of Carbon Steel and Alloy Steel - Bolts, Screws and Studs Part 6: Mechanical Properties and Test Methods for Nuts with Specified Proof Loads Part 13: Mechanical Properties of Fasteners Made of Carbon Steel and Alloy Steel - Bolts, Screws and Studs
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
IS 6745	Method for determination of mass of zinc coating on zinc coated 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	95%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m

   	Specification No: ENG-GEN-4021 Specification Name: Technical Specification of GI nut and bolt
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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 PARTICULARS	DESIRED VALUE
1	Material details	Hot-Dip Galvanized Nut, Bolt & Washer
2	Material	Carbon steel
3	Relevant Standard	IS:1363, IS 1367, IS: 2633, IS: 2629.
4	Grade of Steel	5.6
5	Mass of Zinc Coating	As per IS 1367 Part XIII
6	Zinc Coating Thickness	As per IS 1367 Part XIII
7	Chemical Properties	C:-0.13-0.55 Max P:-0.05 Max S:- 0.06 Max B:-0.003 Max
8	Tensile Load	Table 6 of IS 1367 Part III

5. GENERAL CONSTRUCTION:

Bolts & Nuts should be strictly supplied confirming to IS-1363/Part-I & III. The Bolt and Nut should be hot dip galvanized. The Chemical Composition should be as per IS 1367 Part-III.


6. MARKING:

Following distinct non-erasable embossing is to be made on each Nut and Bolt to be supplied to TPCODL/TPNODL/TPSODL/TPWODL under this Tender.

- a) Manufacturer's name
- b) Grade of steel
- c) Year of manufacturing

7. TESTS:

The bidder shall be required to submit complete set of the following test reports along with the

	<p>Specification No: ENG-GEN-4021</p> <p>Specification Name: Technical Specification of GI nut and bolt</p>
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offer:-

7.1 ACCEPTANCE TESTS

- i) Visual Inspection
- ii) Verification of Dimensions
- iii) Checking of threads,
- iv) Galvanization Test
- v) Proof Load Test
- vi) Hardness Test
- vii) Surface Integrity Test

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS


- i) Visual Inspection
- ii) Verification of Dimensions
- iii) Checking of threads,
- iv) Galvanization 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 / Other Government 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 representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized

	<p>Specification No: ENG-GEN-4021</p> <p>Specification Name: Technical Specification of GI nut and bolt</p>
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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 12 months from the date of commissioning or 18 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

	<p>Specification No: ENG-GEN-4021</p> <p>Specification Name: Technical Specification of GI nut and bolt</p>
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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) 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	TO BE FURNISHED BY BIDDER
1	Material	
2	Relevant Standard	

 	Specification No: ENG-GEN-4021 Specification Name: Technical Specification of GI nut and bolt
 	

3	Grade of Steel	
4	Mass of Zinc Coating	
5	Zinc Coating Thickness	
6	Chemical Properties	
7	Tensile Load	

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

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18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of GI Structural Items includes Channel, Angles and Top brackets to be used in Structures. 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 2062	Hot Rolled Medium and High Tensile Structural Steel
IS 1852	Rolling and Cutting Tolerances for Hot Rolled Steel products
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
IS 6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL. NO.	CONDITIONS	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

SL. NO.	CONDITIONS	VALUES
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			
		100X50X5 mm	75X40x4.8 mm	65X65X6 mm	50X50X6 mm
1	Material	Hot-Dip Galvanized Channel	Hot-Dip Galvanized Channel	Hot-Dip Galvanized Angle	Hot-Dip Galvanized Angle
2	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, IS: 4759	IS: 2062, IS: 2633, IS: 2629, IS: 4759	IS: 2062, IS: 2633, IS: 2629, IS: 4759	IS: 2062, IS: 2633, IS: 2629, IS: 4759
3	Make	SAIL, JINDAL, RINL & TATA (Billet with re rolling not allowed)			
4	Grade of Steel	E 250 A	E 250 A	E 250 A	E 250 A
5	Minimum Tensile Strength in Mpa	410	410	410	410
6	Yield Stress in Mpa	250	250	250	250
7	Percentage Elongation (Min.) at Gauge Length	23%	23%	23%	23%

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE			
		100X50X5 mm	75X40x4.8 mm	65X65X6 mm	50X50X6 mm
8	Bend Test (Internal Dia)	Min-2t	Min-2t	Min-2t	Min-2t
9	Mass of Zinc Coating	Min 705 gm/m ²	Min 705 gm/m ²	Min 705 gm/m ²	Min 705 gm/m ²
10	Zinc Coating Thickness & No of Dips	Min. 100 Micron at every point with 6 Dips	Min. 100 Micron at every point with 6 Dips	Min. 100 Micron at every point with 6 Dips	Min. 100 Micron at every point with 6 Dips
11	Chemical composition	Grade: E 250 A (As per IS: 2062)	Grade: E 250 A (As per IS: 2062)	Grade: E 250 A (As per IS: 2062)	Grade: E 250 A (As per IS: 2062)
12	Standard length of supply For Channel and Angles only	6 Metre Long			
13	Tolerances	As per IS 1852 latest Amendment			

5. GENERAL CONSTRUCTION:

The Chemical composition and Physical properties of the finished material shall be as per the equivalent standards. Chemical Composition and Physical Properties shall conforming to IS: 2062. The approved makes are SAIL, JINDAL, RINL & TATA (Billet with re rolling not allowed). Mass of the Channel and Angles are as follows:-

- a) 100x50x5 mm:- 9.56kg/m
- b) 75x40x4.8 mm:- 7.14kg/m
- c) 65x65x6 mm:- 5.8kg/m
- d) 50x50x6 mm:-4.5kg/m

5.1 CHEMICAL COMPOSITION

Chemical composition for E 250 A 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%

5.2 Galvanization:

All the channels and angles 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 (Min 705 gms per sq.mt / Min. 100 Micron at every point with 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.
- f) 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.
- g) Quality of Hot Dip Galvanization should comply with IS 2629, ISO 1461 & should be guaranteed for any type of damage due to harsh climatic condition for 5 Years. These channels and angles are to be used in coastal areas of Odisha where climate is hot, humid & saline. These areas are prone to flood & frequent rainfall.

6. MARKING:

Following distinct non-erasable embossing is to be made on each Channel and Angles and top Bracket to be supplied to TPCODL/TPNODL/TPWODL/TPSODL under this Tender.

- a) Manufacturer Name/ Trade Mark
- b) E-250 A

Engraved Marking (Punching before galvanization)

- a) "TPCODL/TPNODL/TPWODL/TPSODL"
- b) Year of manufacturing
- c) PO Number

Specification Name:Technical Specification For GI Channel & Angle,
GI Top Bracket**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) Chemical Composition
- ii) Mechanical Properties
- iii) Dimension Test & Weight (kg/M) Visual Examination,
- iv) Test in respect of Hot Dip Galvanization i.e. Thickness of zinc coating in microns
- v) Mass of Zinc Test

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS

- i) Chemical Composition
- ii) Mechanical Properties
- iii) Test in respect of Hot Dip Galvanization i.e. thickness of zinc coating in microns

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 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/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) TPCODL/TPNODL/TPWODL/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/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 54 months from the date of commissioning or 60 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.

Galvanization Guarantee- Quality of Hot Dip Galvanization should be guaranteed for any type of damage due to harsh climatic condition for 5 Years.

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:

The Bidder shall provide 1 no. sample of the product. The product will be accepted only if it meets all specifications as defined in the document.

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.

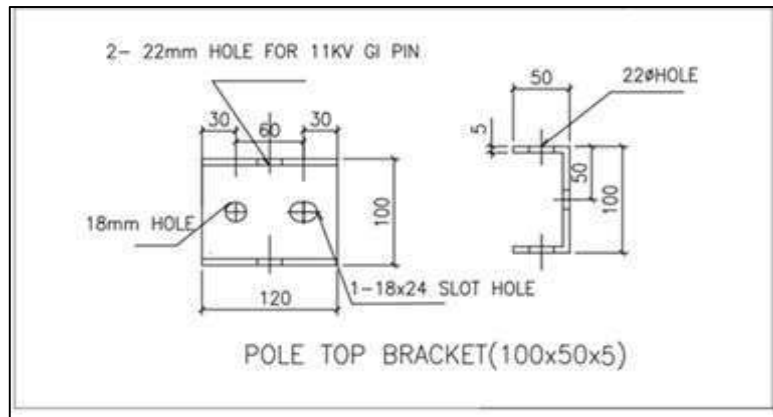
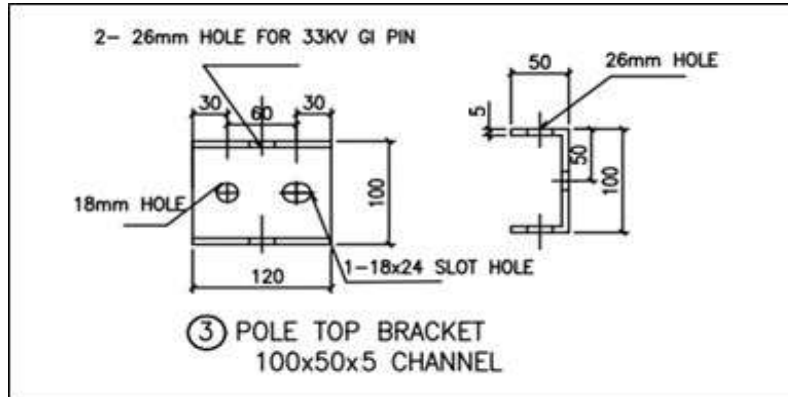
18. DRAWINGS AND DOCUMENTS:

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.

Specification Name:

Technical Specification For GI Channel & Angle,
GI Top Bracket



Note:- The Drawing is for Tender Purpose Only.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS:

SL. NO.	TECHNICAL PARTICULARS	To Be Furnished By The Bidder			
		100X50X5 mm	75X40x4.8 mm	65X65X6 mm	50X50X6 mm
1	Material				
2	Relevant Standard				
4	Make				
5	Grade of Steel				
6	Minimum Tensile Strength in Mpa				
7	Yield Stress in Mpa				
8	Percentage Elongation (Min.) at Gauge Length				
9	Bend Test (Internal Dia)				
10	Mass of Zinc Coating				

SL. NO.	TECHNICAL PARTICULARS	To Be Furnished By The Bidder			
		100X50X5 mm	75X40x4.8 mm	65X65X6 mm	50X50X6 mm
11	Zinc Coating Thickness & No of Dips				
12	Standard length of supply for channel and angles only				
13	Tolerances				

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

Specification Name:

Technical Specification For Disc Insulator
Hardware Fittings (70KN, 90KN &120KN)

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20. SCHEDULE "B" DEVIATIONS

1. SCOPE

The Specification covers the design, manufacture, testing preferably at manufacturer's works before supply and delivery of combined unit of hardware fittings for string insulators suitable for use in 33kV and 11kV overhead power lines.

The combined units offered shall be complete with all components which are necessary (excepting disc insulator) or usual for their effective performance and easy maintenance and inter changeability at site. Such parts shall be deemed to be within the scope of contract.

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	Description
IS 2486 (Part 1) IS 2486 (Part 2) IS 2486 (Part 3)	Specification for metal fittings of insulators for overhead power lines with nominal voltage greater than 1000 V. Specification for Insulator fittings for overhead power lines with nominal voltage greater than 1000V. (dimensional requirements) Specification for Insulator fittings for overhead power lines with nominal voltage greater than 1000 V. (locking devices)
IS 4759	Specification for hot-dip zinc coatings on structural steel and other allied products.
IS : 6745	Determination of mass of zinc coating on zinc coated iron and steel articles.
IS : 2633	Method for testing uniformity of coating on zinc coated.
IS 6603	Stainless Steel Bars and Flats
IS 2016	Plain washers
IS:1573	Specification for electroplated coatings of zinc on iron and steel.
IS 209	Specification of Zinc
IS 6639, BS:916	Specification for Hexagonal bolts and nuts

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITIONS	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) All ferrous parts including fasteners shall be hot dip galvanized, after all machining has been completed. Nuts may however be tapped (threaded) after galvanizing and the threads oiled. Spring washers shall be electro-galvanized. The bolt threads shall be undercut to take care of the increase in diameter due to galvanizing. Galvanizing shall be done in accordance with IS-2629-1985 and shall satisfy the tests mentioned in IS: 2633-1986. Fasteners shall

Specification Name:

Technical Specification For Disc Insulator Hardware Fittings (70KN, 90KN &120KN)

withstand four dips while spring washers shall withstand three dips of one-minute duration in the standard Preece test. Other galvanized materials shall be guaranteed to withstand at least six successive dips each lasting one minute under the Standard Preece test for galvanizing.

- ii) The zinc coating shall be perfectly adherent of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The zinc used for galvanizing shall be of grade Zn 99.95 as per IS 209.

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE		
1	Type	B&S type		
2	Ultimate Strength	70 KN (3 Bolted)	90 KN (4 Bolted)	120 KN (4 Bolted)
3	Suitable for conductor Size	AAAC-80 Sq mm, 100 Sq mm	AAAC-148 Sq mm	AAAC-232 Sq mm
4	Slip strength of tension clamp	95% of UTS	95% of UTS	95% of UTS
5	Referred IS Standard	IS 2486	IS 2486	IS 2486
6	Material Used			
a)	Cross Arm Strap	Mild Steel (HDG)	Mild Steel (HDG)	Mild Steel (HDG)
b)	Ball Eye	16mm Forged Steel	20mm Forged Steel	20mm Forged Steel
c)	Socket Eye	16 mm Forged Steel	20mm Forged Steel	20mm Forged Steel
d)	Bolted Type Tension Clamp and Keeper	Aluminum Alloy	Aluminum Alloy	Aluminum Alloy
e)	Security Clip	Stainless steel	Stainless steel	Stainless steel
f)	Split Pin	Stainless steel	Stainless steel	Stainless steel
g)	Cotter Pin and Bolt	Mild Steel (HDG)	Mild Steel (HDG)	Mild Steel (HDG)
h)	Nuts	Mild Steel (HDG)	Mild Steel (HDG)	Mild Steel (HDG)
i)	Spring Washer	Electro- galvanized	Electro- galvanized	Electro- galvanized
j)	Plain Washer	Mild Steel (HDG)	Mild Steel (HDG)	Mild Steel (HDG)
k)	Zn confirming to grade	IS 209	IS 209	IS 209
m)	Size of U Bolt	M16	M16	M16
7	Galvanizing	Min 705 g/sq meter/100 microns 6 dips	Min 705 g/sq meter/100 microns 6 dips	Min 705 g/sq meter/100 microns 6 dips
8	Tolerance	+/-5%	+/-5%	+/-5%

5. GENERAL CONSTRUCTIONS:

5.1 Fittings for Strain Insulators with clamp

- i) Cross arm strap confirming to IS 2486 (Part 2). Forged Steel ball eye for attaching the socket end of the Disc insulator to the cross arm strap. Dimensions shall be in accordance with IS: 2486 (Part-2) unless otherwise specified.
- ii) Cross-arm straps shall be manufactured from MS Flat hot dip galvanized and to connect the cross-arm/bracket of the structure at one end and the Ball Clevis at the other end.
- iii) It should be complete with hexagonal bolts, nuts, spring washers and Cotter pin at the threaded end to lock the unit. Minimum Threaded portion of the bolt shall be 30mm.
- iv) Aluminum alloy thimble socket made of permanent high strength aluminum alloy for attaching the disc insulator at one end and for accommodating the loop of conductor at the other end. The thimble socket shall be attached to the disc insulator with the help of locking pin as per the dimensions given in IS:2486 (Part 2).
- v) The tension hardware with three bolts and four bolts strain hardware shall have minimum slip strength not less than 95% of the strength of respective conductor.
- vi) All forgings & castings shall be of good finish and free from flaws or any other defects which may cause decrement of efficiency while in operation. The edges on the outside of the fittings such as at the ball socket & holes and the grooves shall be smooth & rounded. Sharp radius of curvature, ridges etc. which may lead to localized pressure or cause damage to the conductors in service shall be avoided. The clamp shall permit the conductor to slip before the failure of conductor occurs.
- vii) All parts of different fittings which provide for interconnection shall be made such that sufficient clearance is provided at the connection point to ensure free movement. All ball and socket connections shall be free in this manner, but care shall be taken that too much clearance between ball and socket is avoided.
- viii) All ferrous fittings and the parts other than those of stainless steel, shall be galvanized. Small fittings like spring washers, nuts, etc. should be electro-galvanized-Coating thickness as per IS: 1573.
- ix) The nominal dimensions of the ball and sockets, ball eye and cross-arm straps are as per the IS:2486 (Part 2).

5.2 FASTENERS: Bolts, Nuts & Washers:

- i) All bolts and nuts shall conform to IS-6639. U bolt, Hexagonal Bolt, Nut, Plain Washer and all other ferrous parts shall be Hot dip Galvanized. In case of Hot Dip Galvanization, minimum Value of Mass of zinc coating should be 705 g/m². All bolts and nuts shall have

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Technical Specification For Disc Insulator Hardware Fittings (70KN, 90KN &120KN)

hexagonal heads, the heads being truly concentric, and square with the shank, which must be perfectly straight.

- ii) Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro-galvanized. The thickness of washers shall conform to IS-2016.
- iii) The split pin to be used on the cotter pin shall be of Humpback type & shall be made of Stainless Steel conforming to IS: 6603 with a minimum hardness of 160 HV.
- iv) Locking devices (R Type) for ball and socket lockers shall be of Stainless Steel conforming to IS: 6603 with minimum hardness of 160 HV. The dimension shall conform to IS: 2486.

6. MARKING:

Each Hardware fittings shall be legibly and indelibly marked (embossing/engraved) to show the following:

- a) Name & Trade mark of the manufacturer
- b) Year of manufacturing
- c) Minimum failing load in KN
- d) "TPCODL/TPNODL/TPWODL/TPSODL"

7. TESTS

The bidder shall be required to submit complete set of the following test reports along with the offer: -

7.1 ACCEPTANCE TESTS

For Clamps

- i) Visual Examination Test
- ii) Chemical Composition Test
- iii) Verification of dimensions
- iv) Mechanical Test
- v) Ultimate Strength Test
- vi) Galvanizing Test
- vii) Electrical resistance test

On Insulator string fittings

- i) Visual Examination
- ii) Chemical Composition Test
- iii) Verification of dimensions
- iv) Ultimate Strength Test
- v) Galvanizing Test

7.2 ROUTINE TESTS

- i) Visual Examination Test
- ii) Mechanical Routine Test

7.3 TYPE TESTS

For Clamps

- i) Visual Examination
- ii) Verification of dimensions
- iii) Slip strength tests
- iv) Ultimate Strength test
- v) Electrical resistance test
- vi) Heating Cycle test
- vii) Galvanizing/ Electroplating Test

On Insulator string fittings except Clamps

- i) Visual Examination
- ii) Verification of dimensions
- iii) Mechanical Test
- iv) Galvanizing Test
- v) Chemical Composition Test

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 Government Labs** as per the relevant IS/IEC. 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:

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.

Specification Name:Technical Specification For Disc Insulator
Hardware Fittings (70KN, 90KN &120KN)**12. PACKING:**

Supplier shall ensure that all the material 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. Fittings for different sizes of conductors shall be packed in different boxes/gunny bags and shall be complete with their minor accessories fitted in place and colour codes on tags/fittings shall be marked to identify suitability for different sizes. 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 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 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

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18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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 Lightning 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 arrester 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	Disconnecter (optional)	
a	Disconnecter 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 arrester 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 arrester shall be supplied along with the insulating base/Mounting bracket, terminal connector, insulating terminal cap (Polyolefin) and necessary hardware. 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 arrester construction shall be suitable to withstand seismic loading, short circuit forces, wind load, the force exerted on the arrester 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 arrester. 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 arrester 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 arrester failure, consequent to uneven voltage gradient across the stack in the event of contamination of the arrester 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 arrester.

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 disconnecter 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 disconnecter under the specified service conditions. Disconnectors shall give the visible indication of the failed arrester. The Lightning Arrester with disconnecter shall be suitable for bracket type mounting. Disconnecter shall be suitable for screwing directly to LA with terminal of M10.

b) The corresponding units of Lightning Arrester with disconnecter 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 disconnecter 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 disconnecter 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",



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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 arrester 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 arrester or arrester 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 arrester 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 arrester 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



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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



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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 lightning arrester.
- d) Sectional drawing showing internal blocks etc.



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- 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 Lightning 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	



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Specification Name: Technical Specification for 11KV Lightning Arrester (10 KA)

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	Disconnecter (optional)	
a	Disconnecter 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

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20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the design, manufacture, testing and supply of 11kV GI V Cross Arm to be used in Structures. 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 2062	Hot Rolled Medium and High Tensile Structural Steel
IS 1852	Rolling and Cutting Tolerances for Hot Rolled Steel products
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
IS 6745	Method for determination of mass of zinc coating on zinc coated iron and steel articles

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

SL.NO.	CONDITONS	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

SL.NO.	CONDITIONS	VALUES
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:

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Materials	75X40X4.8 mm Channel , 50X50X6 mm GI Plate
2	Galvanisation process	Hot-Dip Galvanized
3	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
4	Make	SAIL, JINDAL, RINL & TATA (Billet with re rolling not allowed)
5	Weight of Cross Arm	10.5 KG (Approx.)
6	Grade of Steel	E 250 A
7	Minimum Tensile Strength	410 N/mm ²
8	Yield Stress	250 N/mm ²
9	Percentage Elongation (Min.) at Gauge Length	23%
10	Bend Test (Internal Dia)	Min-2t
11	Mass of Zinc Coating	Min 705 gm/m ²
12	Zinc Coating Thickness	Min 100 micron (6 Dip)
13	Chemical composition	Grade: E 250 A (As per IS: 2062)
14	Tolerances	As per IS 1852 latest amendments

5. GENERAL CONSTRUCTION:

The Chemical composition and Physical properties of the finished material shall be as per the equivalent standards. Chemical Composition and Physical Properties shall conforming to IS: 2062.

The approved makes are SAIL, JINDAL, RINL & TATA (Billet with re rolling not allowed).

5.1 CHEMICAL COMPOSITION

Chemical composition for 250 A 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%

5.2 Galvanization:

All 11kV V Cross Arms 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 (Min 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.
- f) 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.
- g) Quality of Hot Dip Galvanization should comply with IS 2629, ISO 1461 & should be guaranteed for any type of damage due to harsh climatic condition for 5 Years. These V Cross Arms are to be used in coastal areas of Odisha where climate is hot, humid & saline. These areas are prone to flood & frequent rainfall.

6. MARKING:

Following distinct non-erasable embossing is to be made on each Channel and Angles to be supplied to TPCODL/TPWODL/TPNODL/TPSODL under this Tender.

a) Manufacturer Name/ Trade Mark

Engraved Marking (Punching before galvanization)

a) "TPCODL/TPWODL/TPNODL/TPSODL"

b) Year of manufacturing

c) PO Number

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) Chemical Composition
- ii) Mechanical Properties
- iii) Dimension Test & Weight (kg/M) Visual Examination,
- iv) Test in respect of Hot Dip Galvanization i.e. Thickness of zinc coating in microns

7.2 ROUTINE TESTS

Same as Acceptance Test

7.3 TYPE TESTS

- i) Chemical Composition
- ii) Mechanical Properties
- iii) Test in respect of Hot Dip Galvanization i.e. thickness of zinc coating in microns

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 Govt. Lab** as per relevant IS. However, 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/ 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 12 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.

Galvanization Guarantee- Quality of Hot Dip Galvanization should be guaranteed for any type of

damage due to harsh climatic condition for 5 Years.

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:

The Bidder shall provide 1 no. sample of the product. The product will be accepted only if it meets all specifications as defined in the document.

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 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.

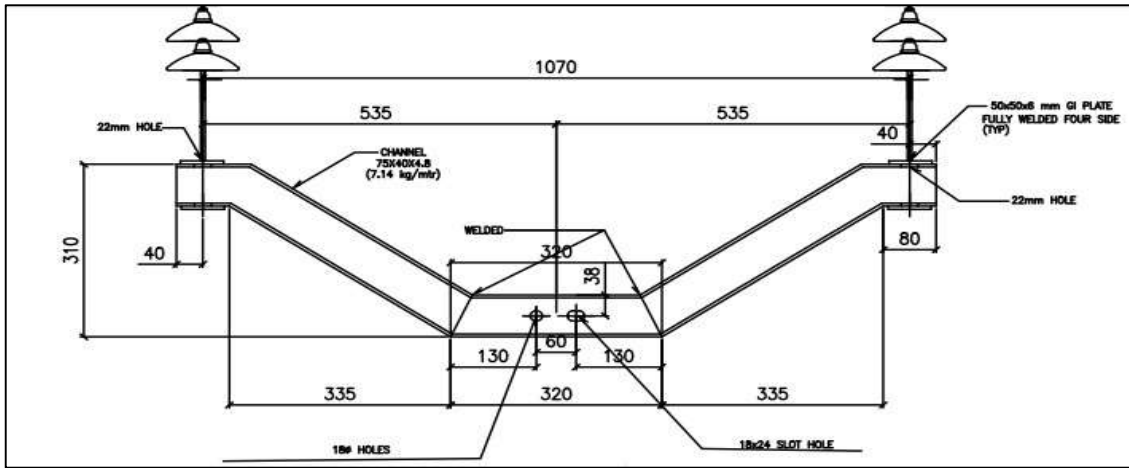
17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

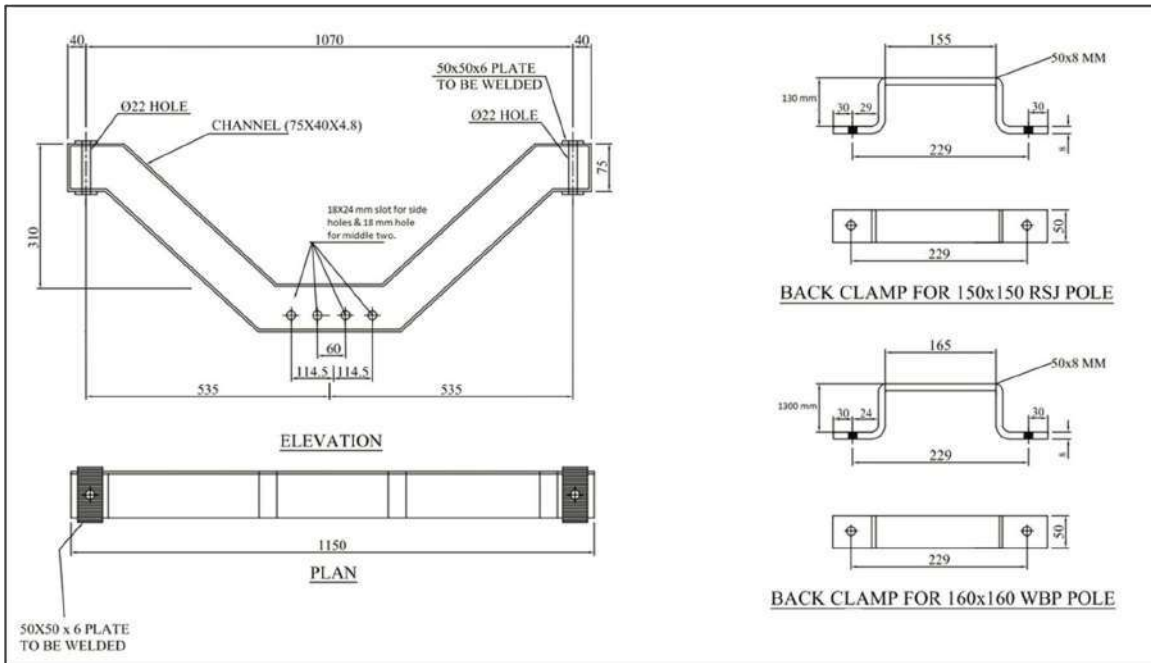
18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be submitted in line with the requirement of Tender specifications:

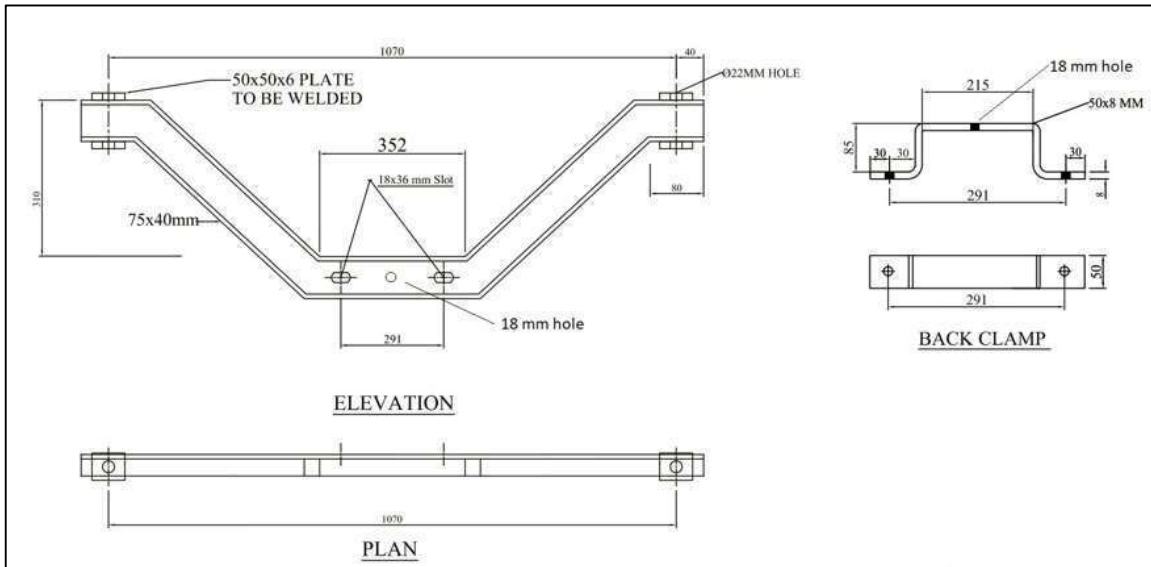
- a) Completely filled–in clause wise compliance of the specification
- b) Schedule “B” Deviations
- c) Work Experience details
- d) Type test certificates.
- e) Drawing 1 set of Hard Copy & Soft copy PDF File containing complete information about manufacturing.



OPTION1:- Arrangement in WPB Pole



OPTION2:- Arrangement in WPB and RSJ Pole



OPTION3:- Arrangement in 9 Mtr. PSC Pole

Note:- The drawing is for tender purpose only and indicative in nature & will be finalized during detailed engineering.

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.

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19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

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.	CONDITONS	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:

$$\pm (0.04d + 1.5) \text{ mm when } d \leq 300 \text{ mm}$$

$$\pm (0.025d+6) \text{ mm when } d > 300 \text{ mm}$$

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



Document No: ENG-HV-2036

Document Title: Specification GI Coil Earthing

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Initiator		HOG (Plant Engineering)	
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1.0 SCOPE

The scope of this document is to give design & constructional features, inspection, supply and transportation guidelines for GI Coil Earthing for TPCODL/TPNODL/TPWODL/TPSODL.

2.0 APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest editions of the following standards/IEC and shall conform to the regulations of local statutory authorities.

- a) IS: 280 - Mild steel wire for general engineering purposes.
- b) IS: 4826 - Specification for hot-dipped galvanized coatings on round steel wires.
- c) IS: 7887 - Mild steel wire rods for general engineering purposes.
- d) IS: 2629 - Recommended practice for hot-dip galvanizing of iron and steel
- e) IS: 1521 - Method for tensile testing for steel wires
- f) IS: 1755 - Method for wrapping testing for wire
- g) IS: 6745 - Methods for determination of mass of zinc coating on zinc coated iron and steel

3.0 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 Speed	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.

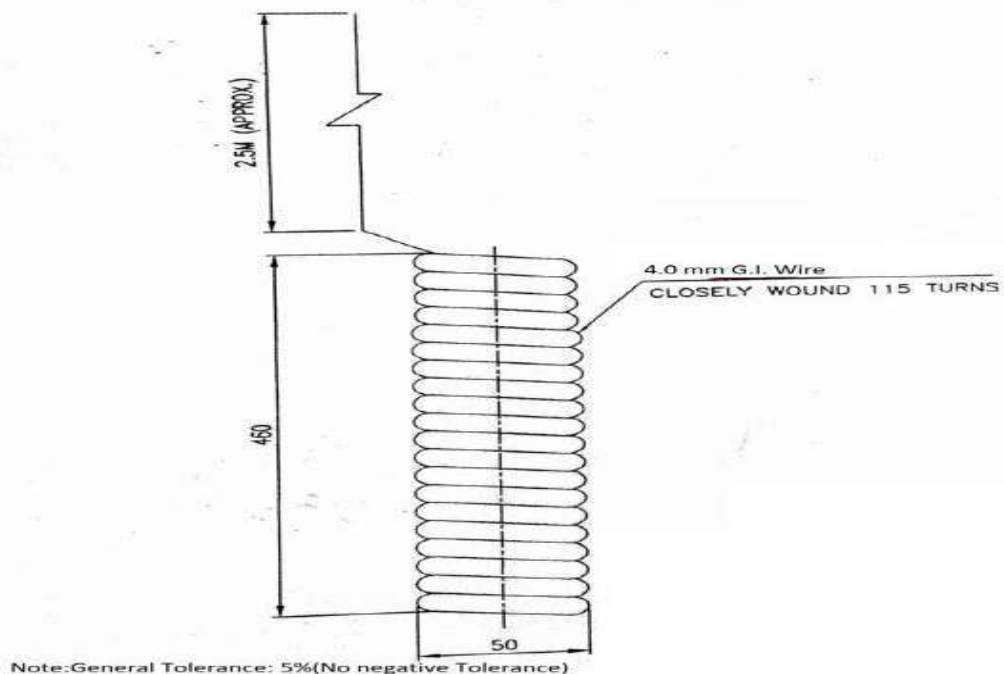
4.0 GENERAL CONSTRUCTION:

The material shall be-

- a) Heavy class as per IS- 1239/IS 1161-1979.
- b) Galvanizing to be done after fabrication as per IS: 4826
- c) The design shall be suitable for the climatic condition stated above.
- d) Tolerance in Dimensions & Weight should be $\pm 2.5\%$ unless otherwise specified
- e) Dimensional tolerance shall be as per IS 1852-1985
- f) Zinc electroplated/painted material will not be accepted, should be properly galvanized.
- g) No Rusting is acceptable.

5.0 GENERAL TECHNICAL REQUIREMENTS:

Sr. No.	DESCRIPTION	REQUIREMENT
1	Material of earthing coil	GI wire
2	Confirming Standard	IS 280, IS 7887, IS 4826
3	Nominal diameter of Wire	4.00mm with tolerance $\pm 2.5\%$
4	No. of Turns	115 Nos. (Min)
5	External dia of Coil	50mm (Min)
6	Length of Coil	460mm / 450mm (Min)
7	Free Length of G.I wire of earthing coil	2500mm
8	Mass of Zinc Coating	280gm/Sq.mm (Before Coiling) & 266gm/Sq. mm (After Coiling)
9	Total Weight of Coil	1.850 Kgs. (Min)
10	Tolerance in Dimensions & Weight	$\pm 2.5\%$





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6.0 MARKING:

The unit shall be appropriately marked as "**PROPERTY OF TPCODL/TPNODL/TPWODL/TPSODL**" and with the name of the vendor and year of manufacturing at suitable location.

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

Tests	IS to be referred
Visual test	As a routine test
Dimensional tests	As per the drawing
Tensile test	IS 280
Wrapping test	IS 280
Hot dip galvanizing	IS 4826
Determination of mass of zinc coating on zinc coated iron and steel	IS 4826

8.0 TYPE TEST CERTIFICATE

The bidder shall furnish the type test certificates of the Specification for GI Coil Earthing for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA/NABL accredited as per the relevant standards. Type test 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 type tests, if any) not carried out, same shall be carried out without any cost implication to TPCODL/TPNODL/TPWODL/TPSODL.

9.0 PRE DISPATCH INSPECTION

Equipment shall be subjected to inspection by a duly authorized representative of 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 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)

10.0 INSPECTION AFTER RECEIPT AT STORES



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The material received at TPCODL/TPNODL/TPWODL/TPSODL, Berhampur, 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 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 Company 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. 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 earlier, supplier shall be liable to undertake to replace/rectify such defects at his own costs.

12.0 PACKING

Bidder shall ensure that all 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

Not Applicable.

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/TPNODL/TPWODL/TPSODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier'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 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

NA

18.0 DRAWINGS

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

- a) Completely filled-in Technical Parameters (refer Cl. 5)
- b) General description of the equipment and all components including brochures
- c) General arrangement drawings
- d) Type Test Certificates.
- e) Experience List
- f) Manufacturing schedule and test schedule after 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.



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Following Drawings/Documents shall be submitted after the award of the contract:
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	Bill Of Material	√		√
4	Instruction for Use		√	√
5	QA &QC Plan	√	√	√
6	Routine, Acceptance & Type Test Certificates	√	√	√

All the documents & drawings shall be in English language.

19.0 SCHEDULE OF DEVIATIONS

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

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18. DRAWINGS AND DOCUMENTS
19. SCHEDULE "A" GUARANTEED TECHNICAL PARTICULARS
20. SCHEDULE "B" DEVIATIONS

1. SCOPE:

This specification covers the technical requirements of design, manufacture, test at manufacturer's works, packing & forwarding, supply and unloading at store/site and performance of LT ABC cable for trouble free and efficient operation. The specific requirements are covered in the enclosed technical data sheet.

The sizes specified in the specifications are tabulated below:

SI.No	Phase Conductor (No. of Cores x Size in sqmm)	Insulated Messenger (No. of Cores x Size in sqmm)	Streetlight (No. of Cores x Size in sqmm)
1	3C x 95	1C x 70	1C x 16
2	3C x 70	1C x 50	1C x 16
3	3C x 50	1C x 35	1C x 16
4	3C x 35	1C x 25	1C x 16
5	1C x 35	1C x 25	—
6	3C x 50	1C x 35	—
7	3C x 35	1C x 25	—

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-398 (Part IV)	Aluminum conductor for overhead transmission purposes- Part IV Aluminum alloy stranded conductor
IS-5216	Guide for safety procedures and practices in electric works
IS-7098 (part-I)	Specification for Cross-linked_ polyethylene insulated PVC sheathed cables- Part I for working voltage up to and including 1100 volts.
IS-8130	Specification for Conductor for insulated electric cables & flexible cords.
IS-10418	Specification for drums for electric cables
BS-5468	Cross-linked polyethylene insulation of electric cables
IEC-540	Test methods for insulations and sheaths of electric cables and cords
IEC-60228/3	Conductor for insulated cables
IEC-60502-1	Power cables with extruded insulation and their accessories for rated voltages from 1kV (Um=1.2kV), up-to 30kV(Um=36kV)-Part 1:Cables for rated voltages of 1 kV /Um=1,2kV) and 3kV/Um=3.6kV)
ASTM G-53/DIN 56687	UV testing of XLPE insulation
SANS 1713	South African Standard for Aerial Bunched conductor
IS14255	Aerial Bunched conductors for working voltages up to and including 1100 volts

3. CLIMATIC CONDITIONS:

SL.NO.	CONDITIONS	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 as mentioned above.





 	 	Specification No: ENG-LV-3002 Specification Name: Specification for LT AB cable 3 Cores insulated messenger street light
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4. GENERAL TECHNICAL REQUIREMENTS:

SL NO	DESCRIPTION	UNITS	3C×95 mm ² (P)+1C×70mm ² (M)+1CX16 mm ² (StreetLight)	3C X 70 mm ² (P)+ 1C X 50 mm ² (M) +1C x 16 mm (Street Light)	3C×50 mm ² (P)+1C×35mm ² (M)+1CX 16mm ² (Street Light)	3C X 35 mm ² (P) + 1C X 25(M)+ 1C x 16 mm ² (StreetLight)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase and streetlighting core twisted around the insulated neutral cum messenger wire			
2	Size of Aerial Bunched cable		3C×95 mm ² (P)+1C×70 mm ² (M)+1CX 16 mm ² (Street Light)	3C X 70 mm ² (P)+ 1C X 50 mm ² (M) +1C x 16 mm (Street Light)	3C×50 mm ² (P)+1C×35 mm ² (M)+1C X16 mm ² (Street Light)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)+ 1C x16 mm ² (Street Light)
3	Rated Voltage	kv	1.1	1.1	1.1	1.1
4	System Voltage	kv	0.415- 0.433	0.415 - 0.433	0.415 - 0.433	0.415 - 0.433
5	Nominal Area of Phase Conductor	mm ²	95	70	50	35
6	Nominal Area of Messenger	mm ²	70	50	35	25
7	Phase Core		Stranded compacted circular aluminum conductor, Extruded XLPEinsulated			
8	Neutral core & MessengerWire		Stranded compacted circular aluminum alloy conductor, Extruded XLPEinsulated			
9	Maximum conductor temperature during continuous operation	Deg C	90	90	90	90
10	Maximum conductor temperature during short circuit	Deg C	250	250	250	250
11	Phase Core RYB insulated					
a)	Conductor					
(i)	Material		EC Grade Aluminum of H4Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4Grade to IS: 8130:1984	EC Grade Aluminum of H4Grade to IS: 8130:1984

 	 	Specification No: ENG-LV-3002 Specification Name: Specification for LT AB cable 3 Cores insulated messenger street light
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(ii)	No. of Cores & Nominal Size	mm ²	3Cx95	3Cx70	3Cx50	3Cx35
(iii)	Minimum number of strand wires		15	12	6	6
(iv)	Diameter		Shall be suitably selected to meet conductor DC resistance as per IS 8130			
(v)	Max. DC Resistance of phase conductor at 20 deg.C	Ω/km	0.32	0.443	0.641	0.868
(vi)	Shape of Conductor		Stranded Compacted Circular			
(vii)	Short Circuit current rating of conductor for 1 sec	kA	8.93	6.58	4.7	3.29
(viii)	Continuous current rating in air at 40Deg. C	A	230	200	149	125
b)	Insulation					
i)	Material		XLPE Insulation as per IS 14255:1995			
ii)	Nominal Thickness	mm	1.5	1.5	1.5	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255			
12	Street light core					
a)	Conductor					
i)	Material		EC grade aluminum of H4 grade to IS: 8130:1984			
ii)	Nominal size	mm ²	16	16	16	16
iii)	Nominal no. of wire		7	7	7	7
iv)	Max DC resistance at 20 deg. C	Ohm/km	1.91(As per IS 8130:1984)	1.91(As per IS 8130:1984)		
v)	Shape of conductor		Stranded compacted circular			
b)	Insulation					
i)	Material		As per IS: 14255:1995			
ii)	Nominal thickness	mm	1.2	1.2	1.2	1.2
iii)	Tolerance in Insulation Thickness		XLPE Insulation as per IS 14255:1995			
13	Neutral Cum Messenger Wire					
a)	Messenger wire					
i)	Material		Aluminum Alloy Wire			
ii)	Nominal size	mm ²	70	50	35	25

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iii)	No. and Nominal Dia. of each strand	No./m m	7/3.57	7/3.02	7/2.54	7/2.14
iv)	Calculated Maximum resistance at 20 deg C	ohm/k m	0.492	0.689	0.986	1.38
v)	Shape of conductor		Stranded circular-compacted			
vi)	Short circuit rating for 1 sec	kA	6.58	4.7	3.29	2.35
vii)	Material of insulation		XLPE Insulation as per IS 14255			
viii)	Thickness of insulation	mm	1.5	1.5	1.2	1.2
ix)	Min Breaking load of messenger wire	KN	19.7	14	9.8	7
14	Core Identification		RIDGES for Phase identification: 1 ridge for R phase 2 ridges for Y phase 3 ridges for B phase For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.			
15	Formation of cable		3 phase cores & 1 street lighting core xlpe insulated are laid up over insulated messenger with R-H direction of Lay			
17	Maximum conductor temperature during continuous operation (RYBN)	Deg C	90	90	90	90
18	Maximum conductor temperature during Short circuit (RYBN)	Deg C	250	250	250	250
19	Standard Drum Length	Mtr	500	500	500	500
20	Tolerance in Drum length	%	+/-5%	+/-5%	+/-5%	+/-5%
21	Reference Standard		IS 14255			
22	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100V, size of cable, ISI, month & year of manufacturing, Property of TPCODL/TPNODL/TPWODL/TPSODL, PO number & date.			





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Specification No: [ENG-LV-3002](#)

Specification Name:
Specification for LT AB cable 3
Cores insulated messenger street
light

SL NO	DESCRIPTION	UNITS	1C X 35 mm ² (P) + 1C X 25 mm ² (M)	3C×50 mm ² (P)+1C×35 mm ² (M)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase core twisted around the insulated neutral earth cum messenger wire		
2	Size of Aerial Bunched cable		1C X 35 mm ² (P) + 1C X 25 mm ² (M)	3C×50 mm ² (P)+1C×35 mm ² (M)	3C X 35 mm ² (P) + 1C X 25 mm ² (M)
3	Rated Voltage	kV	1.1	1.1	1.1
4	System Voltage	kV	0.415-0.433	0.415-0.433	0.415-0.433
5	Nominal Area of Phase Conductor	mm ²	35	50	35
6	Nominal Area of Messenger	mm ²	25	35	25
7	Phase Core		Stranded compacted circular Aluminum Conductor, Extruded XLPE Insulated		
8	Neutral core & Messenger Wire		Stranded compacted circular aluminum alloy conductor, Extruded XLPE insulated		
9	Maximum conductor temperature during continuous operation	Deg C	90	90	90
10	Maximum conductor temperature during shortcircuit	Deg C	250	250	250
11	Phase Core RYB insulated				
a)	Conductor				
(i)	Material		EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984	EC Grade Aluminum of H4 Grade to IS: 8130:1984
(ii)	No. of Cores & Nominal Size	mm ²	1C*35	3C*50	3C*35
(iii)	Minimum number of Strand wires		6	6	6
(iv)	Diameter		Shall be suitably selected to meet conductor DC resistance as per IS 8130		

 	 	Specification No: ENG-LV-3002 Specification Name: Specification for LT AB cable 3 Cores insulated messenger street light
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(v)	Max. DC Resistance of phase conductor at 20 deg. C	Ω/km	0.868	0.641	0.868
(vi)	Shape of Conductor		Stranded Compacted Circular		
(vii)	Short Circuit current rating of conductor for 1 sec	kA	3.29	4.7	3.29
(viii)	Continuous current rating in air at 40Deg.C	A	125	149	125
b)	Insulation				
i)	Material		XLPE Insulation as per IS 14255:1995		
ii)	Nominal Thickness	mm	1.2	1.5	1.2
iii)	Tolerance in Insulation Thickness	mm	XLPE Insulation as per IS 14255:1995		
c)	Messenger wire				
i)	Material		Aluminum Alloy Wire	Aluminum Alloy Wire	Aluminum Alloy Wire
ii)	Nominal size	mm ²	25	35	25
iii)	No. and Nominal Dia. of each strand	No./m m	7/2.14	7/2.54	7/2.14
iv)	Calculated Maximum resistance at 20 degC	ohm/k m	1.38	0.986	1.38
v)	Shape of conductor		Stranded circular-compacted	Stranded circular-compacted	Stranded circular-compacted
vi)	Short circuit rating for 1sec	kA	2.35	3.29	2.35
vii)	Material of insulation		XLPE Insulation as per IS 14255	XLPE Insulation as per IS 14255	XLPE Insulation as per IS 14255
viii)	Thickness of insulation	mm	1.2	1.2	1.2
ix)	Min Breaking load of messenger wire	KN	7	9.8	7



Specification No: [ENG-LV-3002](#)

Specification Name:
Specification for LT AB cable 3
Cores insulated messenger street
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12	Core Identification		RIDGES for Phase identification: 1 ridge for R phase 2 ridges for Y phase 3 ridges for B phase. For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.		
13	Formation of cable		1 phase core XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay
14	Continuous current rating in air at 40DegC of phase conductor	A	125	149	125
15	Maximum conductor temperature during continuous operation (RYBN)	Deg C	90	90	90
16	Maximum conductor temperature during short circuit (RYBN)	Deg C	250	250	250
17	Standard Drum Length	Mtr	500	500	500
18	Tolerance in Drum length	%	+/-5%	+/-5%	+/-5%
19	Reference Standard		IS 14255		
20	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100V, size of cable, ISI, month & year of manufacturing, Property of TPCODL/ TPNODL/ TPWODL/ TPSODL, PO number & date.		

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5. GENERAL CONSTRUCTION

5.1 Conductors:


- 5.1.1 All conductors shall be Class 2, Stranded, compared circular, High electrical conductivity, Aluminum, Grade H2/H4 as per IS 8130:1984.
- 5.1.2 Before stranding, the conductor shall be circular in cross section, uniform in quality, solid, smooth and free from scale, sharp edges and other defects.
- 5.1.3 Conductor shall conform to the standards for permissible number of joints in any one of the single wires forming every complete length of conductor, for location of joints in same layer of conductors and for method of making such joints. No joint shall be made in any conductor after it is stranded.
- 5.1.4 All conductors shall be of high electrical conductivity Aluminum as specified, conforming to requirement of relevant standards.

5.2 INSULATION

- 5.2.1 The insulating material shall be Cross Linked Polyethylene (XLPE) applied by extrusion as per latest IS:14255 and its latest amendments.
- 5.2.2 The insulation shall be both heat and moisture resistant and shall be suitable for continuous operation at conductor temperature of 90 Degree Centigrade, rising momentarily to 250 Degree Centigrade under short circuit conditions.
- 5.2.3 It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. The XLPE insulation shall be ultraviolet protected for operation in direct sunlight.
- 5.2.4 It shall be free from any foreign material or porosity visible to unaided eye. The insulation shall be so applied that it fits closely to the conductor and it shall be possible to remove insulation without damaging the conductor. Average thickness of the insulation shall not be less than nominal value specified in latest IS:14255 with latest amendments. The tolerance on the thickness shall be as specified in latest IS:14255.
- 5.2.5 The insulating material shall have excellent electrical properties with regard to resistivity, dielectric constant and loss factor and shall have high tensile strength and resistance to abrasion. This shall not deteriorate at elevated temperatures or when immersed in water. The insulation shall be preferably fire resistant and resistant to chemicals like acids, alkalis, oils and ozone.

5.3 MESSENGER WIRE

The insulated messenger wire shall be made of aluminum alloy, generally conforming to latest IS:14255. The conductor shall be of heated aluminum-magnesium-silicon alloy wires containing approximate 0.5% magnesium and approximately 0.5% silicon conforming to IS 398(Part 4). Insulation shall be as per IS 14255.

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5.4 CORE IDENTIFICATION

The following shall be embossed on the one side of the core:

RIDGES REQUIRED for Phase identification:

- 1 ridge for R phase
- 2 ridges for Y phase
- 3 ridges for B phase

For neutral core identification non-contact type laser printing or ink jet printing to be provided with 'N' printed on it at every span of 1 mtr.

5.5 LAYING OF CORES

Cores shall be laid up with a right-hand lay, and shall have a lay length not exceeding $28(d1+d2)$, where;

d1 is the core diameter, including sheath, in mm.

d2 is the diameter of the messenger, including the outer protective covering where applicable, in mm.

5.6 STRANDING

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfy all the relevant requirements of IS 398(Part-IV): 1994. The lay ratio of the different layers shall be within the limits given in IS 398(Part-IV): 1994. The successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded. The lay ratio of any layer shall not be greater than the lay ratio of layer immediately beneath it.


5.7 CABLE DRUM

Cables shall be furnished in the specified reels or coil lengths of 500 meters. Drums shall be of non-returnable wooden drums as per IS 10418:1982 and the drums should be free from defects such as through cracks, knots, warps and split. The ends of the cables shall be suitably sealed by means of non-hygroscopic sealing. The tolerance on the Drum length shall be +/- 5% / as per PO terms.

6. MARKING:

The cable shall carry the following information either stenciled on the drum or contained in a label attached to it:

- a) Reference to the Standards.
- b) Manufacturer's name.
- c) Type of cable.
- d) Voltage grade.
- e) Number of cores.
- f) Nominal cross-section area of the conductor.
- g) Length of the cable on the drum.
- h) Length of the cable perm.

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- i) Marking of PO
- j) Direction of rotation of the drum.
- k) Gross mass.
- l) Country of manufacture.
- m) Year of manufacture.
- n) ISI Certification mark.

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 shall also be type tested_ as per the relevant standards. Following tests shall be necessarily conducted on the LT ABC cables in additions to others specified in the IS/IEC/SANS Standards.

7.1 ACCEPTANCE TESTS

- i) Tensile test (for phase/street light conductor)
- ii) Wrapping Test (for phase/street light conductor)
- iii) Breaking load test for messenger conductor
- iv) Elongation test for messenger conductor
- v) Conductor Resistance test for messenger and phase conductor.
- vi) Test for thickness of insulation
- vii) Hot set test for XLPE insulation
- viii) Tensile strength and elongation test at break for test of insulation
- ix) High voltage test.
- x) Insulation resistance (volume resistivity test).
- xi) UV test for XLPE insulation (black carbon content and dispersion test).


7.2 ROUTINE TESTS

- i) Conductor resistance test
- ii) High voltage test

7.3 TYPE TESTS

- i) Tests on phase/street light Conductor
 - a) Tensile test
 - b) Wrapping test
 - c) Resistance test
- ii) Tests on messenger Conductor
 - a) Breaking load test
 - b) Elongation test.
 - c) Resistance test.

iii) Physical Test for XLPE Insulation:

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- a) Tensile strength and elongation at break
- b) Ageing in air oven
- c) Hot test
- d) Shrinkage test
- e) Water absorption (gravimetric)
- f) Carbon black:
 - 1) Content
 - 2) Dispersion.
- g) Insulation resistance (Volume resistivity) test.
- iv) Test for thickness insulation.
- v) High voltage test.

7.4 OPTIONAL TESTS

- i) Bending Test

8. TYPE TEST CERTIFICATES:


The Bidder shall furnish the type test certificates of the cable for the tests as mentioned as 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 in certified Test laboratories 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, or any/all type tests (including additional 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 manufacturing 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

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- 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 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 30 months from the date of commissioning or 36 months from the date of last supplies made under the contract, whichever is earlier, (the time scale of 30/36 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.

The 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:

The cable shall be wound on wooden drums and packed in line with requirements of IS 10418-1982. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.


Bidder shall ensure that all 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. TENDER SAMPLE:

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/ TPNODL/ TPSODL/ TPWODL).

14. QUALITY CONTROL:

The bidder shall submit Quality Assurance Plan (QAP) indicating the various stages of inspection,

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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.

17. SPARES, ACCESSORIES AND TOOLS

The bidder shall provide a list of complete set of accessories and tools required for erection and maintenance of LT ABC along with the installation procedure.





18. DRAWINGS AND DOCUMENTS:

Following drawings and documents shall be prepared based on TPCODL/ TPNODL/ TPSODL/ TPWODL 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 brochure.

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.

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SL.No	Description	For Approval	For Review information	Final Submission
1	Technical Particulars	✓		✓
2	Manual/Catalogues/drawings for all components		✓	
3	Technical details and test certificates of XLPE compound		✓	✓
4	Cross sectional area of the cable		✓	✓
5	Installation instructions		✓	✓
6	Instructions for use		✓	✓
7	Transport/shipping dimension drawing		✓	✓
8	QA & QC Plan	✓	✓	✓
9	Routine, Acceptance and type test certificates	✓	✓	✓
10	Fault level calculation for armor and manual	✓	✓	✓

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.

19. SCHEDULE- "A" GUARANTEED TECHNICAL PARTICULARS: (To be furnished by bidder)

All clauses and points in the specification to be complied as per **Clause Number 4.0(GENERAL TECHNICAL PARAMETERS) & Clause Number 5.0 (GENERAL CONSTRUCTION)**

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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

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Specification No: [ENG-EHV-1032](#)

Specification Name:
Specification for- Mid Span compression joint
(ACSR conductors)

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Specification No: ENG-EHV-1032

Specification Name:

Specification for- Mid Span compression joint (ACSR conductors)

1.0 SCOPE

This specification covers the manufacture testing at works, supply and delivery of Mid Span Joint for ACSR Dog, Wolf, Panther & Zebra Conductor as per the following technical specification and the enclosed data sheet.

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 conform to the regulations of the local authorities:

IS 2121 (Part 2)	Conductors and earth wire accessories for overhead power lines: Part 2 Mid span joints and repair sleeves for conductors.
IS 2633:1986	Methods for testing uniformity of coating of zinc coated articles.
IS 4826:1979	Hot dipped galvanized coatings on round steel wires.
IS 2629	Recommended practice for hot-dip galvanizing of iron and steel.

3.0 CLIMATIC CONDITIONS OF THE INSTALLATION

SL.NO.	CONDITONS	VALUES
1	Max. altitude above sea level	1200 m
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 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. The design of equipment and accessories shall be suitable to withstand seismic forces as men.

4.0 GENERAL TECHNICAL REQUIREMENTS

Sr.No	Description	Units	Requirement			
			Dog	Wolf	Panther	Zebra
1	Suitable for(conductor size):	Sq. mm	100	150	232	400
2	Minimum failing /Slipping load	Kg	95% of ultimate strength of conductor	95% of ultimate strength of conductor	95% of ultimate strength of conductor	95% of ultimate strength of conductor
3	Material					
4	Outer Sleeve		Extended Aluminum tube of 99.5% purity	Extended Aluminum tube of 99.5% purity	Extended Aluminum tube of 99.5% purity	Extended Aluminum tube of 99.5% purity
5	Inner Sleeve		High strength steel	High strength steel	High strength steel	High strength steel
6	Electrical Resistance At20 Deg C	Ohm	75% of measured resistance of equivalent length of conductor	75% of measured resistance of equivalent length of conductor	75% of measured resistance of equivalent length of conductor	75% of measured resistance of equivalent length of conductor

7	Ferrous Parts		Hot dip galvanized	Hot dip galvanized	Hot dip galvanized	Hot dip galvanized
8	Outside diameter of sleeves					
8.1	Aluminum	Mm	30	33	38	43
8.2	Steel	mm	12.2	15.2	18	19.2
9	Dia. of sleeves Across Flat (After compression)					
9.1	Aluminum	mm	25	28	32	36
9.2	Steel	mm	10.1	12.2	15.1	16.1
10	Length of sleeve					
10.1	Aluminum	mm	510	560	610	712
10.2	Steel	mm	159	178	204	240
11	Weight of Sleeve (Approx.)					
11.1	Aluminum	Kg	To be Provided by bidder	To be Provided by bidder	To be Provided by bidder	To be Provided by bidder
11.2	Steel	Kg	To be Provided by bidder	To be Provided by bidder	To be Provided by bidder	To be Provided by bidder
12	Breaking strength of Mid-span joint	kN	Not less than 95% of ultimate tensile strength of conductor	Not less than 95% of ultimate tensile strength of conductor	Not less than 95% of ultimate tensile strength of conductor	Not less than 95% of ultimate tensile strength of conductor
13	Min. Conductivity of compression joint	Amps	350	450	550	750
14	Galvanizing					
14.1	Minimum weight of zinc coating per sq. m of uncoated wire surface	gms	610	610	610	610

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Specification No: [ENG-EHV-1032](#)

Specification Name:

Specification for- Mid Span compression joint
(ACSR conductors)

5.0 GENERAL CONSTRUCTION

Mid span compression joint shall be used for joining two lengths of conductors. The joint shall have a resistivity less than 75% of the receptivity of equivalent length of conductor. The joint shall not permit slipping off, damage to or failure of the complete conductor or any part thereof at a load less than 95% of the ultimate tensile strength of the conductor.

Compression type mid-span straight joints offered should be suitable for making joints in the ACSR conductor. The joints offered should conform to IS: 2121/1981 (with latest amendment).

The joint shall be so designed, that when installed, no air space is left within the finished joint. The joint shall have conductivity as specified above but the mechanical strength shall not be less than 95% of the ultimate tensile strength of the conductor.

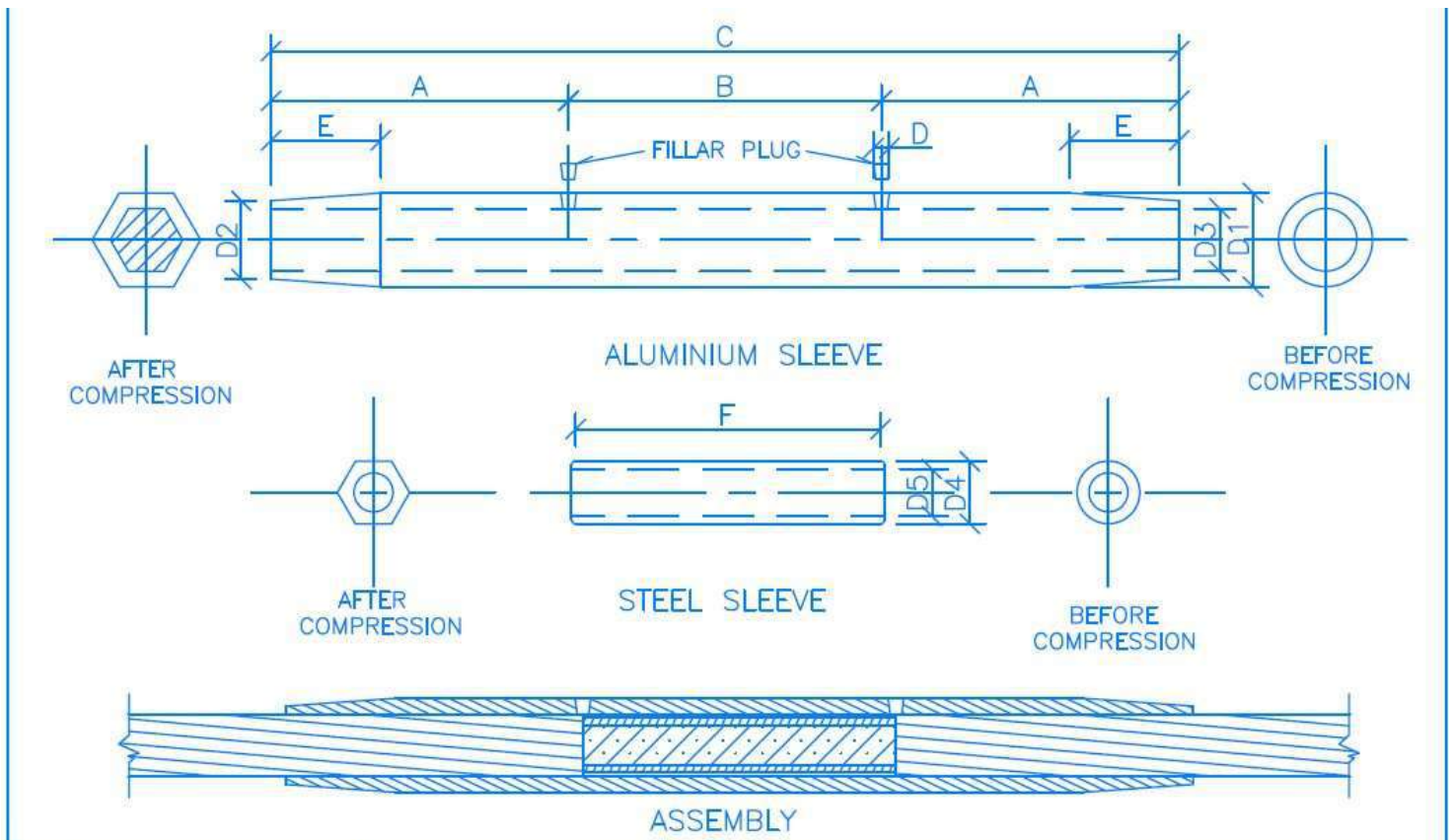
The aluminum sleeve shall be made from extruded aluminum tube of aluminum of purity not less than 99.5%. The steel sleeve shall be of high strength steel.

The joint shall be made of steel and aluminum sleeves for jointing the steel core and aluminum wires respectively. The steel sleeve should not crack or fail during compression. The Brinell Hardness of steel sleeve shall not exceed 200. The steel sleeve shall be hot dip galvanized. Tapered aluminum filler plugs shall also be provided on the line of demarcation between compression and non-compression zone.

ACSR Full Tension Compression Mid Span Joints are manufactured from an Aluminium outer extrusion, and an inner steel tubular core. The two-piece design ensures a design strength equivalent to the conductor onto which the fitting is applied.

Each fitting is manufactured with internal and external tapers, to eliminate stresses associated with compression, and reduce corona discharge.

DIAGRAM OF MID SPAN JOINT IN BELOW:



6.0 NAME PLATE AND MARKING

The Mid span joint shall be marked with the following:

- a) Reference to the Standards.
- b) Manufacturer's name
- c) Size and the type of conductor mid span joint
- d) Net weight of the Mid span joint (in kg)
- e) Gross weight of the Mid span joint (in kg)
- f) Length of the Mid span joint (in mm).
- g) Marking of PO.
- h) Country of manufacture.
- i) Year of manufacture.
- j) ISI Certification mark.



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7.0 TESTS

All routine, acceptance & type tests for Mid Span joint 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 on the MS joint as specified in the IS standards:

7.1 The following Routine / **Acceptance tests** shall be carried out on MS joints as per IS: 2121 (part-II) / 1981 (with latest amendment).

- a) Visual examination.
- b) Dimensional verification.
- c) Failing load test.
- d) Galvanizing test.
- e) Electrical resistance test.

7.2 Type Tests

- a) Visual examination.
- b) Verification of dimension
- c) Failing load test
- d) Electrical resistance test.
- e) Heating cycle test.
- f) Galvanizing test.
- g) Radio interference voltage test
- h) Corona test

8.0 TYPE TEST CERTIFICATES

The bidder shall furnish the type test certificates of the mid span joint for the tests as mentioned as above as per the corresponding standards. All the tests shall be conducted at **CPRI/ERDA/Approved Labs by TATA ODISHA DISCOMs** as per the relevant standards. Type test 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 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/TPNODL/TPSODL/TPWODL.



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9.0 PRE-DESPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPWODL. The inspection shall be carried out as per TPCODL/TPNODL/TPSODL/TPWODL specification and relevant IS standards. 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) 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 contracts & 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 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

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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

The mid span shall be supplied in the packing box. of standard dimension as per relevant IS.

13.0 TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPCODL/TPNODL/TPSODL/TPWODL).

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 manufacturer's/sub-supplier's works to carry out inspections.

Rejection and Retest

During inspection if any one of the test pieces first selected fail to pass the tests, three further samples from the same batch shall be selected as per IS, one of which shall be from the length from which the original test sample was taken, unless that length has been withdrawn by the supplier.

If all of the three test pieces from these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard.

In case, the test

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pieces from any of the three additional samples fail, the batch represented shall be deemed not to comply with the standard.

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 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 provide a list of complete set of accessories and tools required for erection and maintenance of mid span joint along with the installation procedure.

18.0 DRAWINGS AND DOCUMENTS

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:

Completely filled in Technical Particulars.

General description of the equipment and all components including brochures.

Type test Certificates

Experience List.

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.



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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	Manual/Catalogues/drawings for all components.		√	
3	Technical details and test certificates of the Mid Span Joint.		√	√
4	Cross sectional area of the Mid Span Joint.		√	√
5	Installation Instructions		√	√
6	Instructions for use		√	√
7	Transport/shipping dimension drawing		√	√
8	QA & QC Plan	√	√	√
9	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 (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.

19.0 GUARANTEED TECHNICAL PARTICULARS

Sr.No	Description	Units	Requirement			
			Dog	Wolf	Panther	Zebra
1	Suitable for (conductor size):	Sq. mm				
2	Minimum failing /Slipping load	Kg				
3	Material					



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4	Outer Sleeve					
5	Inner Sleeve					
6	Electrical Resistance At20 Deg C	Ohm				
7	Ferrous Parts					
8	Outside diameter of sleeves					
8.1	Aluminum	Mm				
8.2	Steel	mm				
9	Dia. of sleeves Across Flat (After compression)					
9.1	Aluminum	mm				
9.2	Steel	mm				
10	Length of sleeve					
10.1	Aluminum	mm				
10.2	Steel	mm				
11	Weight of Sleeve (Approx.)					
11.1	Aluminum	Kg				
11.2	Steel	Kg				
12	Breaking strength of Mid-span joint	kN				
13	Min. Conductivity of compression joint	Amp s				
14	Galvanizing					
14.1	Minimum weightof zinc coating per sq. m of uncoated wire surface	gms				



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20.0 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

Annexure VII

General Condition of Contract

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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 TPCODL, 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 TPCODL 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.

All members of Team TPCODL, Associates and Stakeholders are requested to submit any grievance on ethics violation to Mr. Rajeev Kharyal, Chief Ethics Counselor.

3.0 CONTRACT PARAMETERS

3.1 Issue/Award of Contract

TPCODL 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

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On receipt of the contract, the associate shall return to TPCODL 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 TPCODL.

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.

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- 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 TPCODL, 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

TPCODL 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.

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 TPCODL'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.

TPCODL 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

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Contract by submitting a request in writing to the Associate. The Associate shall, within fifteen days of receipt of such request from the TPCODL, provide Purchaser with a reasonably detailed estimate of the cost of the change outlined in the request.

In the event, TPCODL 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 TPCODL.

4.1 Technical Evaluation

TPCODL reserves the right to assign scores to different parameters including but not limited to the following while evaluating the bids. TPCODL reserves the right to change the parameters and score without prior information to the associates:

S. No.	Evaluation Parameter	Max. Score
A	Bidders already Registered with TPCODL	100
	Quality of the Products & Services	
	a. <u>For Supply Part:</u> No Material Rejections in last 2 years Deduction of 3 marks for each PO/ RO (for same product category) with major rejections in last 2 years. (Major rejection shall be considered when material is taken back by the vendor for rectification and the quantity of rejected material is more than 10%).	12
A.1.	b. <u>For Service Part:</u> No violation of statutory compliances in last 1 year. Deduction of 2 marks for each instance of violation in last 1 year.	12
	c. <u>Safety</u> Deduction of 2 marks for each instance of safety violation in last 1 year. Deduction of 4 marks for each reported Non-Fatal Accident in last 1 year. In case of any reported fatal accident: ZERO MARKS	16
A.2.	Timely Execution of Contracts Total Achieved Score = {30 – 3 x (Avg. %age LD deductions in last 2 years)}	30
A.3.	Legal Issues with TPCODL Zero instances of Arbitration procedures / Court Cases / PBG forfeitures in last 2 years: 30 marks else 'Zero' marks	30
B	Bidders new to TPCODL	100
	Visits <u>For Supply Part:</u> Factory Visit and Evaluation. <u>For Service Part:</u> Client Site Visit where the bidder is providing similar services.	30
B.1.	The visits as above shall be arranged by the bidder. However all costs towards conveyance, lodging, boarding etc. shall be borne by TPCODL. The score assigned by TPCODL based on the above visits shall be final and binding on the bidder.	
	Safety:	20

S. No.	Evaluation Parameter	Max. Score
	Score achieved against the BA safety Management System questionnaire.	
B.2.	<p>Client Referrals At least 3 nos. Customer References for similar products/ services in last 3 years. All customer references shall be either of the following:</p> <ul style="list-style-type: none"> ▪ Govt. Organizations/ PSUs/ Power Distribution Utilities. ▪ Private Organizations with an annual turnover of \geq 500 cr. PO copies or Completion Certificates are admissible. <p>Each reference: 10 marks</p>	30
B.3.	<p>Blacklisting Information Not blacklisted by any reputed organization / utility in last 2 years: 20 marks else 'Zero' marks.</p>	20

- Bidder shall be considered as technically qualified if they are able to achieve a technical score of >70 marks on the above parameters. 'A' or 'B'.
- The bidder must have the PF and ESI registration. In case it is not there (provided the bidder is not exempted from the PF and ESI), bidder shall not be evaluated on the above parameters and will be considered as disqualified.

4.2 Indemnity

Associates shall undertake to fully indemnify TPCODL (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 TPCODL, 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.

4.3 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.

4.4 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.

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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 TPCODL.
- 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.

4.5 Deployment of Work Force

Associate shall deploy adequate labour, as considered necessary by TPCODL for execution of the contract including Sundays and Holidays whenever required to do so with no extra cost to TPCODL. 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.

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TPCODL 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.

4.6 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.

4.7 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.

4.8 Company's Right To Use Works

If Taking Over Certificate is delayed for any reason, for which TPCODL'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.

4.9 Rights of TPCODL to vary the scope work

TPCODL 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 TPCODL with a reasonably detailed estimate of the cost of the change in scope outlined in the TPCODL 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 TPCODL.

Any change in the Scope of Work and/or Terms & Conditions of the order shall be intimated by TPCODL 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

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Unless specified elsewhere in the contract document, the prices/rates are inclusive of cost of finished product for which MDCC will be issued by TPCODL, packaging and forwarding charges, freight and transit insurance charges covering loading at Associate's works, transportation to TPCODL store/site & unloading & delivery at TPCODL stores/TPCODL 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 TPCODL 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 TPCODL 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 TPCODL 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 TPCODL 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 TPCODL.

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.

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- 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 TPCODL 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 prorata 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 TPCODL, 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 TPCODL.
- 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 TPCODL, 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 TPCODL.

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 TPCODL'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 TPCODL's Engineer-in-charge

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- 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) located at IDCO Towers, Janpath, Bhubaneswar.

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 TPCODL's notice, TPCODL will be entitled to deduct 30% of estimated wages plus 20% of wages as TPCODL's overheads. Associates would be obliged to provide the copy of monthly wage sheet in any case, failing which no payment shall be made. TPCODL at their sole discretion may deposit the PF etc. with statutory authorities. TPCODL 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

TPCODL 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 TPCODL'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) located at IDCO Towers, Janpath, Bhubaneswar.

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.

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6.5 Quantity Variation

Payment will be made on the basis of actual quantity of supplies/actual measurement of works accepted by TPCODL 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, TPCODL 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 TPCODL Engineer-in-Charge before raising any bill of work done. In the event Associate fails to do so, TPCODL 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 TPCODL 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 TPCODL 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 TPCODL. Alternatively, Associate may extend the

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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 TPCODL indemnified always till completion of contracts.

9.2 Social Accountability

TPCODL 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

TPCODL 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**

TPCODL 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 TPCODL 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

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****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 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 TPCODL shall pay the wages to BA employees on behalf of BA. Apart from deducting the amount of wages paid, TPCODL shall deduct an additional service charge equivalent to 25% of the wages paid from the payment due to BA.

9.5 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 road side 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.

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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 TPCODL/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 TPCODL.

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 TPCODL 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 TPCODL. 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 TPCODL, 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 TPCODL. All such products and equipment shall be used or installed in strict accordance with original manufacturer's recommendations, unless otherwise directed by the TPCODL. In any

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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 TPCODL'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

TPCODL 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 TPCODL during contract execution time.

All inspections and participations shall be carried out within maximum of two weeks of TPCODL 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 TPCODL'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 TPCODL's Engineers.

The Associate shall provide free of charge office accommodation, office facilities, secretarial services, communication facilities, general and drawing office stationary, etc. as may be reasonably required by the TPCODL'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.

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The Associate shall be responsible for the safety of employees of TPCODL/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 TPCODL inspectors are not satisfied with the safety arrangements at the plant, TPCODL 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 TPCODL along with the inspection call, for scrutiny of TPCODL.

The Associate and TPCODL 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 TPCODL for receiving clearance for dispatch of materials.

12.3 Third Party Nomination

TPCODL 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 TPCODL as far as conducting the inspection.

12.4 Waiver of Inspections

TPCODL 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 TPCODL 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 TPCODL. Material delivered at TPCODL stores or at project site without a valid MDCC issued by the designated official of TPCODL 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 TPCODL, 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 utilised 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 Bhubaneswar	12 days
2	Within Bhubaneswar	5 days
3	Waiver*	3 working days

* Associate is expected to raise the inspection call assuming that Inspection shall be carried out by TPCODL. The decision for waiver of inspection shall be on sole discretion of TPCODL.

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 TPCODL and have to supply back the material within next 30 days or within the timeframe mutually decided by Associate and TPCODL.

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, Materials/Goods/Equipment shall be consigned to "Stores-In-Charge", TPCODL Bhubaneswar.

13.4 Submission of mandatory documents on Delivery

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Following documents shall be mandatorily submitted by BA along with supply of material to TPCODL 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	TPCODL material code and material description shall be mentioned in invoice and on material.
3	"Property of TPCODL" 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 TPCODL, Bhubaneswar", Guarantee period and Associate's name.
8	In case of manual unloading, supplier / transporter shall deploy sufficient Labour for unloading the material at TPCODL central store. For heavy item(s), crane will be provided by TPCODL [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

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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 TPCODL 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, TPCODL will be at liberty to get the same done at Associate's risks and costs and recover all such expenses plus the TPCODL'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 TPCODL. However, if replacement of the Equipment is required, Associate shall notify the same to TPCODL within 7 days of reporting the issue by TPCODL. 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.

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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, TPCODL 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 TPCODL. 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, TPCODL 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 TPCODL 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 TPCODL 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/outsourced the schedule of activities of contract TPCODL enters with the associate, in part or full, without TPCODL's prior written approval.

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However outsourcing of materials/equipment/services by Associate to make the integrated product for which TPCODL'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 TPCODL 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 TPCODL 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 TPCODL's interest failing which appropriate action (legal or otherwise) may be taken against the Associate by the TPCODL, 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 TPCODL in connection with the performance of the contract shall be held confidential by the Associate and shall remain the property of the TPCODL 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 TPCODL.

18.2 Geographical Data

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Maps, layouts and photographs of the unit/plant including its surrounding regions showing vital installation for national security of country or those of TPCODL shall not be published or disclosed to the third parties or taken out of the country without prior written approval of the TPCODL and upon execution of confidentiality agreements satisfactory to the TPCODL 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. TPCODL 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 TPCODL. 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 TPCODL under the Contract shall be passed on to the TPCODL. The TPCODL 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 TPCODL.

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 TPCODL. All rights, with respect to, or arising from such intellectual property, as afore mentioned, shall solely vest in TPCODL.

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

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arising from any legal proceeding/s, or otherwise. No liability of TPCODL shall arise in this respect, and any costs, damages, expenses, compensation payable by TPCODL 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 TPCODL 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 TPCODL is held liable for by any court judgement. In this connection, the TPCODL 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 TPCODL 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 TPCODL 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 TPCODL.

The TPCODL 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.***

TPCODL 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

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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

TPCODL 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.

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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 TPCODL, 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 TPCODL, 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.

TPCODL 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 TPCODL and not due to any breach of contract conditions by the associate, TPCODL 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 TPCODL.

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 TPCODL 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 TPCODL in case of breach of the contract by the Associate which shall include but not be limited to the following:

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- 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 TPCODL 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 TPCODL 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 TPCODL.

If the default or breach as specified under clause 24 (except sub clause g thereof) be committed by the associate for the first time, TPCODL 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 TPCODL then TPCODL 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, TPCODL shall have the right to terminate all the contracts TPCODL is having with the Associate by issuing termination notice which shall be without prejudice to the other rights of TPCODL available to it under law.

Without prejudice to its right to terminate for breach of contract, TPCODL 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 TPCODL 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.

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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 into with third parties for due discharge of its obligations under the contract with TPCODL.

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 TPCODL 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 TPCODL 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 TPCODL 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 against by the associate.

In case of termination of the contract the parties agree to be governed inter alia by the following:

a) In case TPCODL 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 TPCODL 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, TPCODL 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 TPCODL 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 TPCODL 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 TPCODL against the amount recoverable from him on this ground. The same shall be without prejudice to other rights available to TPCODL 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 , TPCODL shall be entitled to bar the associates its agents , affiliates from undertaking any negotiation / tendering, bidding, participation activities concerning TPCODL for a period of two years from date of such termination. The same shall be without prejudice to other rights available to TPCODL.

24.2 Termination for convenience of Associate

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Associate at its convenience may request for termination of contract, clearly assigning the reason for such request. TPCODL 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 TPCODL, Associate will have to pay TPCODL a 'termination convenience fee' equivalent to 5% of unexecuted contract value.

24.3 Termination for Convenience of TPCODL

TPCODL at its sole discretion may terminate the contract by giving 30 days prior notice in writing or through email to the Associate. TPCODL 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 Bhubaneswar. 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 TPCODL or suspended by the arbitrator. Further, TPCODL 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 Bhubaneswar 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

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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 TPCODL 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 TPCODL 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. TPCODL shall stand fully indemnified in this respect.

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 TPCODL or not. However any error in design/drawing arising out of any incorrect data/written information from TPCODL 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 TPCODL after Commissioning and complete handing over-taking over.

However, such passing of title of ownership and property to the TPCODL 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 TPCODL.

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 TPCODL; 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.tpcentralodisha.com to provide your feedback according to the guidelines mentioned below:

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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.tpcentralodisha.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

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ANNEXURE-A

PROFORMA FOR BID SECURITY BANK GUARANTEE

**TP Central Odisha Distribution Ltd,
Bhubaneswar**

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 The TP Central Odisha Distribution Limited (TPCODL) in the sum of _____ for which payment well and truly to be made to the TPCODL 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 TPCODL during the period of bid validity fails or refuses to furnish the Contract Performance Bank Guarantee, in accordance with the Instructions to Bidders.

We the Bank or our local Branch at Bhubaneswar(detail address & code No..... of local branch to be specified) undertake to pay the TPCODL upto the above amount upon receipt of its first written demand, provided that in its demand the TPCODL 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 upto 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)

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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

TP Central Odisha Distribution Limited

Bhubaneswar

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

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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 Bhubaneswar branch and claim will also be payable at Bhubaneswar Branch **(to be confirmed by Bhubaneswar 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 upto 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

- | | |
|----------|--|
| 1. _____ | Bank's rubber stamp
Banks full address |
| 2. _____ | Designation of Signatory
Bank official number |

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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 Central Odisha Distribution Limited

Bhubaneswar

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

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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 Bhubaneswar branch and claim will also be payable at Bhubaneswar Branch (to be confirmed by Bhubaneswar Branch by a letter to that effect in case BG is from the branch outside Bhubaneswar)
9. Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs. _____ (Rupees _____) only and the guarantee will remain in force upto 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

- | | |
|----------|--------------------------|
| 1. _____ | Bank's rubber stamp |
| | Banks full address |
| 2. _____ | Designation of Signatory |
| | Bank official number |

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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 TPCODL 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 TPCODL, in respect of our aforesaid Order No _____ dated _____ including amendments, if any, issued by TPCODL to our entire satisfaction and we further confirm that we have no claim whatsoever pending with TPCODL 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 favour of TPCODL, with full knowledge and with our free consent without any undue influence, misrepresentation, coercion etc.

Dated

Signature

Place

Name

Designation

(Company Seal)

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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. TPCODL 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 severally and respectively for the above payment only to be paid to M/s. TPCODL.

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. TPCODL 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, Labour Laws, Local Municipal dues, Electricity dues etc. We have entered into the above written bond for the indemnity to M/s. TPCODL against all losses from the acts or default of the said Associate in respect of compliance of the Local Sales Tax Laws, Local Laws, Labour 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. TPCODL 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)

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ANNEXURE-F

**PROFORMA FOR APPLICATION FOR ISSUANCE OF CONSOLIDATED TDS
CERTIFICATE**

To be printed on the letterhead

To,

TP Central Odisha Distribution Limited,

Bhubaneswar

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

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ANNEXURE - G

SERVICE LEVEL AGREEMENT

(To be adhered to by Business Associates (BAs) in TPCODL on Human Resource Issues)

1.0 The following shall be adhered to by the Business Associates during his / its association with TPCODL:

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 TPCODL would also ensure adherence of these values by his employees / persons deployed by him in connection with his works undertaken in TPCODL.

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:

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- 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 TPCODL.
- 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 TPCODL 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 / TPCODL authorities.
- g) Payment of wages shall be made only in presence of and with certification of authorized representative of TPCODL 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 TPCODL 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 TPCODL 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 / encashing security deposit / Bank Guarantee as the case may be. If there is any further shortfall TPCODL 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

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TPCODL 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 TPCODL business.

5.0 The 'Statutory Compliance Enforcement System' in TPCODL 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 TPCODL 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 Requirements for 'Clearance for Commencement of Work' (CCW):

- 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 Requirements during execution of work:

- 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/TPCODL authorities.
- f) Certification of wage disbursement by authorized representative of TPCODL.
- g) Copy of 'Labour Welfare Fund' deposit certificate / Challan.
- h) Insuring safe working practices at the work place.

8.0 Requirements for 'No Objection Certificate' (NOC) for closure of work:

- 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).

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- 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

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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 TPCODL : 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 TPCODL 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 TPCODL Premises on my behalf.

Date:

**(Signature of the Business Associate
 or his Authorized Representative)**

This Business Associate is / will be engaged in TPCODL.

**(Signature and seal of
 Officer I/c of the Work)**

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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:

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Form XI

Undertaking

With reference to the contract job awarded by M/s TP Central 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, Bhubaneswar 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 it's own and such liability will be borne by M/s _____

3. That M/s _____ hereby indemnify M/s TPCODL from any future liability i.r.o. any statutory obligation in respect of said contract.

Date:

()
Authorized Signatory

For M/s _____

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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 : _____

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(iii) Drinking water : _____

(iv) Crèches : _____

(v) First Aid : _____

Signature of contractor

Place _____

Date _____

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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

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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 "TPCODL 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

Bhubaneswar Within 200 kms from Bhubaneswar More than 200 kms from Bhubaneswar

Your nearly turnover with TPCODL

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	2	3	4	5	Remarks/ Suggestion
		Do Not Agree	Slightly in Agreement	In Fair Agreement	Mostly in Agreement	Fully Agree	
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	TPCODL demonstrate willingness to be flexible in administration of Contract / Purchase Order						
7	We provide timely responses / clarifications to your queries						
8	TPCODL representative you interact / coordinate with is adequately empowered to support you in meeting contractual obligations						
9	TPCODL provide you all necessary infrastructure support for timely and quality completion of work (including AMC)						
10	TPCODL Engineer-in-Charge timely certifies the jobs executed/ material supplied						

S. No.	Parameters	1	2	3	4	5	Remarks/ Suggestion
		Do Not Agree	Slightly in Agreement	In Fair Agreement	Mostly in Agreement	Fully Agree	
11	TPCODL 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						
13	Our approach for Inspection and Quality Assurance effective to expedite project completion?						
14	TPCODL never defaults on contractual terms						
15	In TPCODL 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	TPCODL Employees follow Ethical behaviour						

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 TPCODL 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 TPCODL in comparison to your other clients in terms of fairness of treatment and transparency with its Business Associates?						
3	How would you rate TPCODL in comparison to your other clients in terms of processes and systems to manage partnership with its Business Associates						
4	How would you rate TPCODL in comparison to your other clients in terms of building long term & mutually relationship 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 TPCODL, would you like to continue your relationship with TPCODL?					
2	If someone asks you about TPCODL, would you talk "positively" about TPCODL?					
3	Would you refer TPCODL 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 TPCODL, that truly represents your overall satisfaction with us (please tick appropriate box) -

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

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SECTION – E

Please ✓ mark in the relevant box and give your remarks / suggestions / information for our improvement.

Please spare your thoughts for TPCODL'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 TPCODL to adopt. Please give your valuable salient recommendations.

Please spare your thoughts for TPCODL's improvement in particular areas of major concerns for you. We also welcome your suggestions to adopt any best practices, attitudes that you have observed / experienced elsewhere in Indian/ International organization.

Recommendation	<i>Please tick (✓) your top 5 expectations out of the following 10 points listed below -</i>	
(Please list down improvement you expect from TPCODL)	<i>Timely payment</i>	
1	<i>Flexibility in Contracts/PO</i>	
	<i>Clarity in PO,s & Contracts</i>	
2	<i>Timely response to quarries</i>	
	<i>Timely certification of works executed</i>	
3	<i>Clarity in Specs, drawings, other docs etc.</i>	
	<i>Adequate information provided on website for tender notification, parties qualified etc.</i>	
4	<i>Timely receipt of material at site for execution</i>	
	<i>Performance Guarantee/EMD released in time</i>	
5	<i>Inspection & quality assurance support for timely job completion</i>	

We thank you for your time and courtesy!!

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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 more fair and transparent, TPCODL 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. TPCODL 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. TPCODL will make every effort to make the bid process transparent. However, the award decision by TPCODL would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPCODL, 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 TPCODL.
6. In case of intranet medium, TPCODL shall provide the infrastructure to bidders. Further, TPCODL 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 TPCODL.
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 TPCODL 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 TPCODL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

Signature & Seal of the Bidder

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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 TPCODL well in time at our own. Further, we kept TPCODL 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, TPCODL 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.

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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, AML, 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 TPCODL work. The BA shall make all necessary arrangements for getting their workforce safety trained and competency checked from the concerned official of TPCODL 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 TPCODL. After getting the clearance from concerned official, BA cell and receiving temporary I-card issued by TPCODL, Business Associate shall commence the working.

Safety Representative of Business Associates will formally become the nodal point for safety concerns for TPCODL. **BA shall not frequently transfer or terminate the services of any of the safety representatives appointed for TPCODL work site. BA needs to ensure**

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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.** TPCODL 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 TPCODL. 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 TPCODL. 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 TPCODL 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 Central 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 TPCODL

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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 street lights, 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 TPCODL.
- 5.5.2 Safety Talk / tool box 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 TPCODL as mentioned in TPCODL Safety standard and O & M and concerned function's manual.
- 5.5.6 Safety inspections / audits as per the process of TPCODL
- 5.5.7 Working in close coordination SAFETY Group of TPCODL.
- 5.5.8 Reporting of unsafe acts, unsafe conditions, near miss, incident or accident to Engineer In-Charge and SAFETY Group of TPCODL 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 work place / 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 TPCODL, are not deployed at TPCODL worksites/ voluntarily left the job by workers/ used somewhere else other than TPCODL 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 TPCODL*)

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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 TPCODL 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 TPCODL finds that BA has not provided the adequate / appropriate PPE to their staff, TPCODL 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 TPCODL 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 TPCODL.

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 TPCODL 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

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- 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 TPCODL 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 TPCODL.
- 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. <i>(Automatically generated if Site audit done through Mobile App.)</i>	Engineer In-charge/ NSO / SC / SAFETY Group /CSI/ ASO/ Any authorised TPCODL official.
↓	
Entry of the violation in the master record and sending the information to concerned Manager, HoG, HoD, Head and Chief (O &S). <i>(Automatically generated if Site audit done through Mobile App.)</i>	SAFETY Group
↓	
Forwarding the information Centralized Account Payable (CAPS) for amount deduction from the current bill of the BA,	Engineer In-charge

<i>if any.</i>	
↓	
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 TPCODL 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				Subsequent Violations
S.No.	Safety Violation	1st	2nd	3rd	4th	
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	A	B	C	D	Will attract the same penalty 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	Penalty Amount (in Rs.)		The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.	
A	Warning letter	Engineer Incharge	Nil			
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)-Penalty Matrix for Safety violation (Applicable for Minor Contracts)

Consequence of Safety Violation Observed (Not related to Incident/ Accident)		Violation				Subsequent Violations
S.No.	Safety Violation	1st	2nd	3rd	4th	
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	B	C	D	D	Will attract the same penalty 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	Penalty Amount (in Rs.)		The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.	
A	Levy of Penalty	Engineer Incharge	5,000			
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)-Penalty 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.

TPCODL encourages the reportage of the safety violation during the contract work by BA. Any TPCODL 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 TPCODL 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 than 48 Hrs)	F	G	G	H	
3	Major injury (Bone injury or burn or Hospitalization more than 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.)	<i>The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.</i>		
F	Memo to BA and levy of penalty	Engineer Incharge	5,000/-			
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 <u>MINOR</u> 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 than 48 Hrs)	L	M	M	N	
3	Major injury (Bone injury or burn or Hospitalization more than 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.)	<i>The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.</i>		
L	Memo to BA and levy of penalty	Engineer Incharge	5,000/-			
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:

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 TPCODL. 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. 10 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 TPCODL 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 TPCODL. 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

TPCODL	TP Central 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

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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 -

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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
<i>Safety Policy and Management</i>				
- 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			
<i>Safe Work Practices and Procedures</i>				
- 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			
<i>Safety Training</i>				
- 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			
<i>Safety Monitoring</i>				
- Is there an officer / supervisor responsible for monitoring workplace / worksite safety?	1			

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Certification				
- If yes provide details				
<i>Safety Performance Monitoring</i>				
- 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 TPCODL site in past	NO Marks (Negative mark ONE for each case)			
- Has there been any fatal accident of employee at TPCODL 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		
<i>Company Reference</i>				
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 TPCODL 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.

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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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Mandatory compliance of TPCODL Road Safety policy W07(COR-P-12)

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Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
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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.

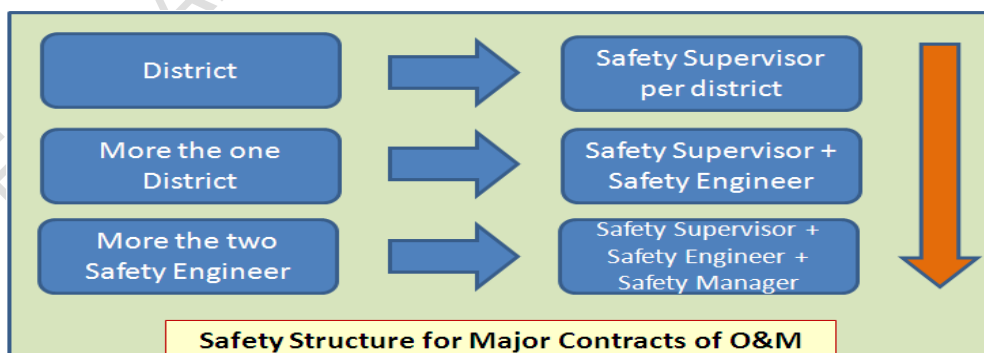
GENERAL CONDITIONS OF CONTRACT

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 TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- 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 TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in *annexure 7*.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- 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.

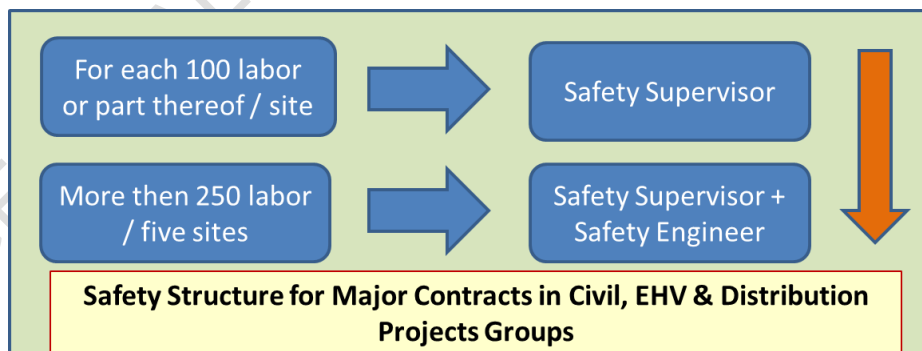


Annexure 3.2 (Refer Para 4.0)

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 TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- 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 TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- 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.

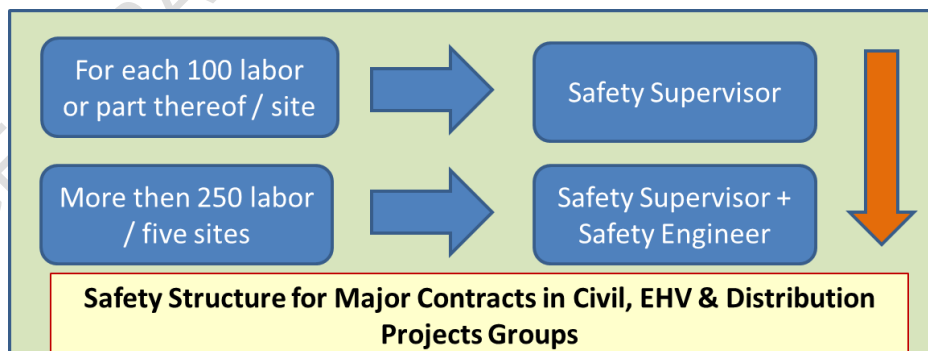


Annexure 3.3 (Refer Para 4.0)

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 TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- 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 TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- 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 TPCODL 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 TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- 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 TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- 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 TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- 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 TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- 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 upto 100 at site) / a safety engineer (for workforce upto 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 TPCODL Safety Manual for details.

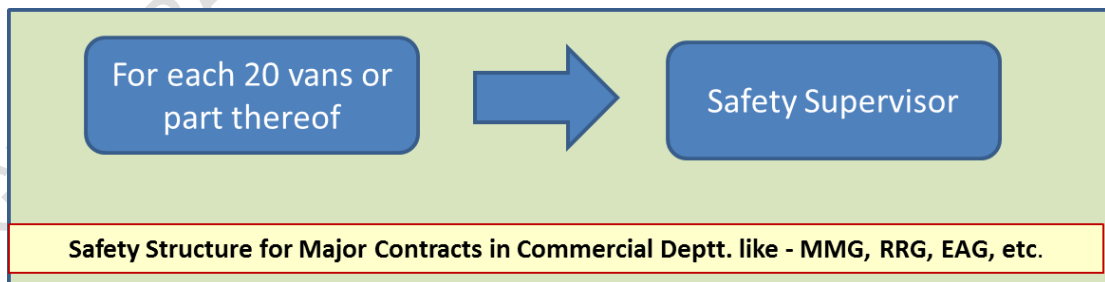


Annexure 3.6 (Refer Para 4.0)

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 TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- 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 TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- 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.



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 TPCODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPCODL.
- 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 TPCODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment PPE as per the TPCODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPCODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPCODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPCODL.
- 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.



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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 TPCODL 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 Central Odisha Distribution Limited (TPCODL) so as enable TPCODL 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 TPCODL specifically. , failing which TPCODL 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.

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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 TPCODL .
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 TPCODL 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 TPCODL / 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 TPCODL or to which TPCODL 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 TPCODL for any near miss or safety violations, accidents, which are attributable to fault of Contractor.

DEPONENT

VERIFICATION

Verified at Bhubaneswar on this _Day of _____20__ that the contents of the above affidavit are true and correct and nothing material has been concealed therefrom

DEPONENT

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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)

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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 TPCODL
 - Identification of Risks associated with the maintenance work and planning for controlling measures by TPCODL supervisor
 - Creation of safety zone by TPCODL 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

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- 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 TPCODL 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 TPCODL.

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	Fire Proof jacket for chest protection		Monthly and visual check every day.		
07	Safety Chain for shorting cum earthing.	As per TPCODL 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 TPCODL.
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. TPCODL 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	Fire Proof jacket for chest protection		
07	Safety Chain for shorting cum earthing.	As per TPCODL standard	
08	Reflective jacket to each workmen	As per TPCODL 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 <i>(Applicable for the BA involved in major construction works and have storage of flammable material at worksite)</i>		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 TPCODL)

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 TPCODL) (both in numbers and in Rs.)	No.	No.	No. of violation letter received and compliance report for the TPCODL.	
	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:

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Date and Location	Brief Description	Name of employee involved	Action Taken

Detail of the Safety Talk / Tool Box 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 TPCODL 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 participation

Signature of the BA Safety Representative
HoG

Signature of ZM /

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 TPCODL may revise the format as and when deemed required.

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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 (PROPRIETARY) Partnership, Pvt. Ltd., Public Ltd. etc. :
	1.3	YEAR OF ESTABLISHMENT :
	1.4	LOCATION OF OFFICE POSTAL ADDRESS 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 :

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		8.3.3 RBI APPROVAL DETAILS	:
		8.3.4 EXPERIENCE LIST OF COLLABORATOR	:
		8.3.5 DURATION OF AGREEMENT	:
	8.4	AVAILABILITY OF STANDARDS / DESIGN PROCEDURES / COLLABORATOR'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		

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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.

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ANNEXURE-N

MANUFACTURER AUTHORIZATION FORM

(To be submitted on OEM's Letter Head)

Date:

Tender Enquiry No.:

To,
Chief (Procurement & Stores)
TP Central Odisha Distribution Limited,
Bhubaneswar

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.

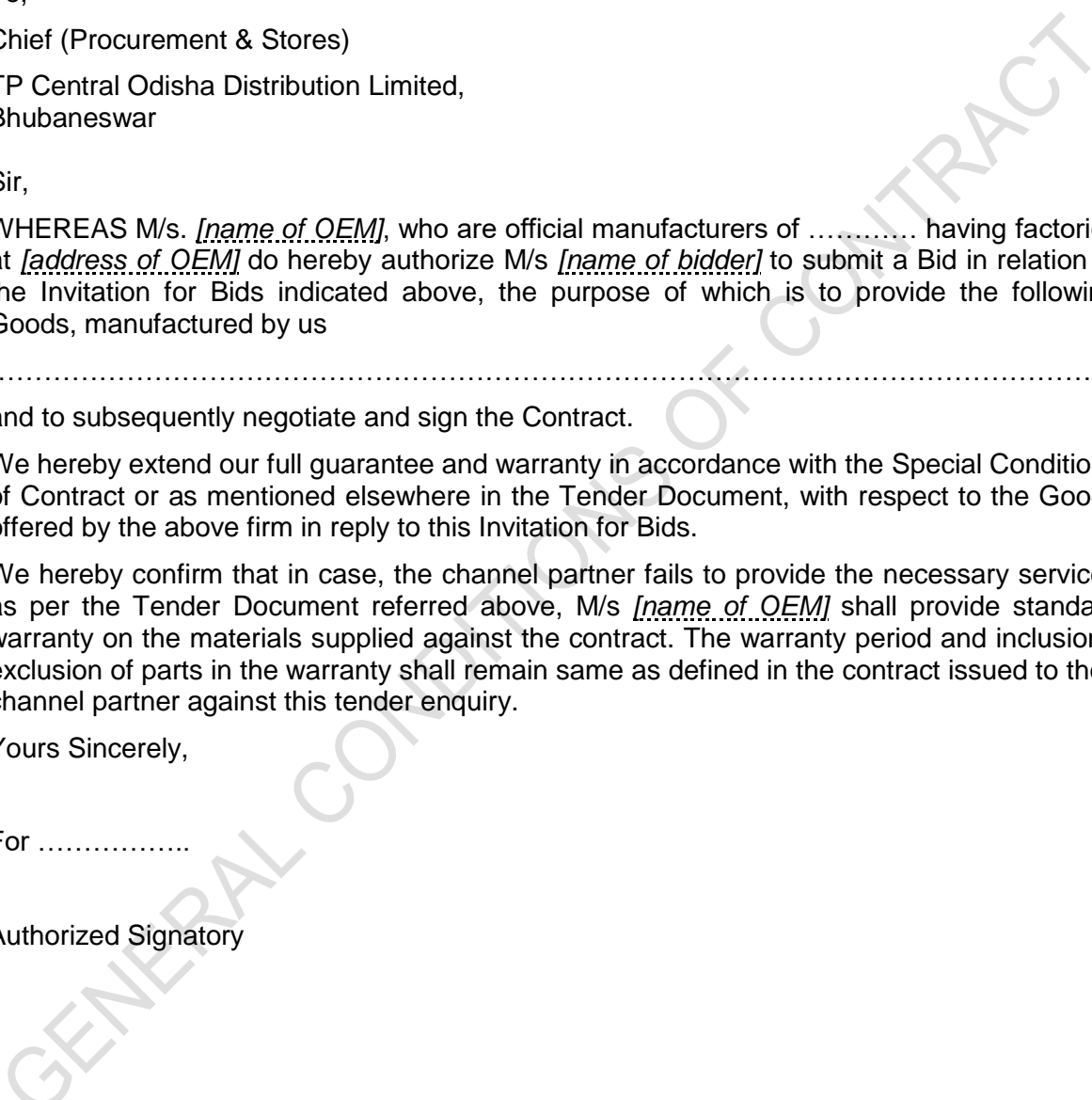
We hereby extend our full guarantee and warranty in accordance with the Special Conditions of Contract or as mentioned elsewhere in the Tender Document, with respect to the Goods offered by the above firm in reply to this Invitation for Bids.

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



Annexure VIII

Safety Policy and Safety Terms and Conditions

The Tata Power Company Ltd



Contractor's Safety Code of Conduct

*Document No.
TPSMS/GSP/CSM/015 REV 05*

*Date of Issue:
30/07/2020*

Contractor's Safety Code of Conduct

Reason for Change	Prepared By	Checked By	Approved by
Revision to accommodate Existing changes in org structure and to simplify the procedure	Rajesh Sharma (Head-Safety Generation)	Suresh Khetwani (Chief - Safety & Environment) Monish Kumar (Chief -Corporate Contract)	V. V. Namjoshi (Chief Generations)

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1. 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.

To ensure reduction in reportable injuries and achieve goal of zero accidents, first edition of contractor safety code of conduct was launched successfully in the year 2014. Since last four years after the launch of CSCC, Tata Power could achieve the objective of reduction in reportable injuries and fatalities.

Over the period, as the system was being matured, a need was felt to make second revision of the CSCC process. Objective of second revision is improve existing CSCC system and make it user friendly.

2. Scope: This procedure applies to all operating and project sites of The Tata Power Company Ltd and Group companies including new businesses like EV charging, Home Automation etc.

3. Definitions

- 3.1. Order Manager:** Order Manager is the Tata Power 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. It will contain the entire job specific safety requirement and will be signed by the contractor.
- 3.3. Contractor:** An individual or a company that provides services to Tata Power under a signed contract.
- 3.4. Emergency:** a serious, unexpected or dangerous situation requiring immediate action, which may result in 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. It must be approved by MB level and 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 turbine overhaul, expert for boiler overhaul, expert for pump and motor, expert for compressor overhaul.

- 3.6. Head of the Division:** Business in charge of the division who is overall custodian of the generating station or transmission division or distribution division.
- 3.7. Category A Vendor:** Vendor eligible to carry out Very High & High risk (as per Tata Power 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 12-CSMF-5 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 12-CSMF-5 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 12-CSMF-5 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 15 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, calculate 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 12 months or more, it is considered as Long duration job
- 3.15. High Value Jobs:** When the value of the job contract is Rs. One Crore or more it will be considered as High value job.

4. Responsibilities

4.1 Order Manager: Order Manager is the Tata Power 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 Supervise and ensure work is carried out as per the Site Safety Management Plan including agreed Risk Assessment (HIRA/JSA) and Method Statement.
- 4.1.3 Conduct audit and evaluate Safety Performance of contractor.
- 4.1.4 Ensure contractors adhere to all statutory provisions.
- 4.1.5 In case any deviation is needed in agreed safety management plan or in CSCC process for execution of job, Management of Change procedure will be applicable, and approval may be obtained from divisional head /Cluster head.

4.2 Contractor: The person, entity or organisation who is executing the job for Tata Power under a contractual agreement and will be responsible for the following

- 4.2.1 To follow all Tata Power Critical Safety Procedure, Rules and guidelines given in Safety Terms and Conditions
- 4.2.2 Undertake job as per Site Safety Management Plan CSM-F10 and method statements agreed with Tata Power.
- 4.2.3 Raise any concerns with regard to their work and its safety with the Tata Power Order Manager.
- 4.2.4 Report all injuries, near misses, unsafe acts/conditions, and occurrences to the Tata Power Order Manager immediately.
- 4.2.5 Ensure that all sub-contractors follow the Tata Power Safety Procedure and agreed Site Safety Management Plan CSM-F10.
- 4.2.6 To follow all statutory requirements as per the laws of the land.
- 4.2.7 All vendors applying for A category jobs or submitting quote for high risk jobs shall obtain certificates of ISO 9001, ISO14001 and ISO45001 before submitting quote for high risk Jobs.

4.3 Safety Concurrence Group: It is Cross Functional Team constituted by Corporate Safety Team, which will have representatives from Execution department, Divisional safety and Corporate / Divisional contracts. SCG will be responsible for the following

- 4.3.1 Assessment of Safety Potential of new vendor before registration as per CSM-F1-Safety Category Qualification Form.
- 4.3.2 Safety Evaluation of the bids as per evaluation format CSM-F-9 Safety Bid Evaluation Criteria
- 4.3.3 Finalization of the Site Safety Management Plan CSM-F-10 submitted by the contractor.

- 4.3.4 Corporate Safety Team / Cluster Safety Head will be part of SCG during Safety Bid Evaluation for following types of jobs
- 4.3.4.1 High-Risk jobs to be carried out in Annual Overhaul / Major Shutdowns and Outages.
 - 4.3.4.2 Capex jobs of High-Risk Category

5.1 Vendor Registration

For Vendor Registration, Corporate Contract will issue following documents for evaluation of contractor's safety capability

- 1) CSM-F1 –Safety Category Qualification Form
- 2) Safety Terms and Conditions

The document Safety Terms and Conditions provides the information about Tata Power safety System to the contractor. Contractor will submit the CSM-F1- 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-F-5 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: 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 Risk" or "Long Duration", then RFQ will be attached with following documents:

- 1) CSM-F7- Blank Safety Competency Form
- 2) CSM-F8 PPE requirements
- 3) Safety Terms and Conditions
- 4) 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.)

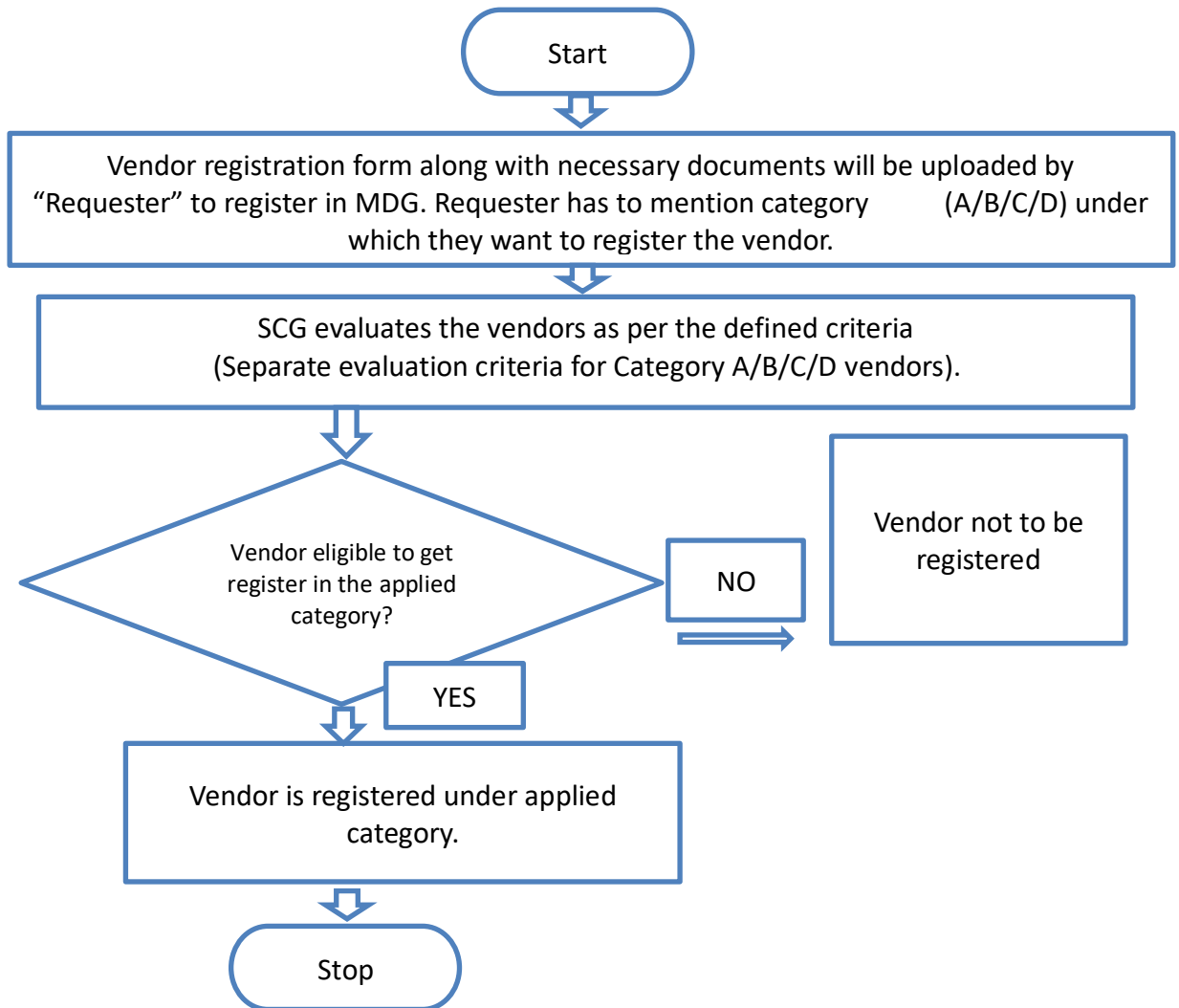
Otherwise the RFQ will be attached only with Safety Terms and Conditions. Long term and low value jobs (see definition) are exempted from the CSCC process.

Corporate Contracts will collect duly filled CSM-F7 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-F9 Safety bid evaluation criteria. If any specific condition related to Contract is required to convey to 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. CC will attach a copy of site safety Management Plan and any specific condition of contract along with PO to the successful bidder. Please refer Appendix 6: Process Flow Chart for issuing RFQ and PO significant health and safety risk associated with it.

5.3 Safety Performance Evaluation

During the time of job execution, regular site inspection will be carried out by the Tata Power officials and violations will be dealt as per CSM-F4 Safety Violation Penalty Criteria. Apart from this, monthly safety performance of the contractor will be evaluated based on the predetermined criteria as per CSM-F11 safety Performance Score and monthly score will be maintained by the Order Manager. Certain percentage of each running bill will be retained as Safety Retention amount and will be released on the basis of Safety Performance Score at certain intervals as defined in CSM- F-3- Safety Performance Evaluation Criteria. Please refer Appendix 10: Process Flow Chart for Safety Performance Evaluation. Percentage of retention amount is mentioned in safety terms and conditions.

Appendix 1: Process Flow Chart for Vendor Registration



Appendix 2: CSM-F-1 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) as per the criteria given in CSM-F-5.
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 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 jobs

Category D vendor: All Consultants, Medical Practitioners or vendors taking job from Tata Power and working from their own premises.

Name of the Vendor:						
Sr. No	Safety Information	Remarks	Attachment			
1	Certified for i. OHSAS 18001/ ISO 45001, ii. ISO: 14001 iii. ISO: 9001 (ISO certificates to be issued from reputed accreditation agencies specified by Tata Power)	i. Y/ N ii. Y/ N iii. Y/ N	Attach copy of the certification			
2	Safety Statistics for Last Three (3) Years - LTIFR - LTISR	Yes/No		Year 1 (Last FY)	Year 2	Year 3
			LTIFR			
			LTISR			
3	Do you have Safety Policy?	Yes/No	Attach copy of the safety policy.			
4	Do you have Safety training process?	Yes/No	Attach safety training process.			
5	Do you have Safety organization structure e.g. Safety Officers and Safety Committees?	Yes/No	Attach copy of the safety organization structure.			
6	Name and address of sites where work is in progress or worked earlier	Yes/No	Site details to be attached for inspection by Officials.			

Signature _____ :

Name and Designation _____ :

Stamp of Organization _____ :

Appendix 3: Safety Terms and Conditions

Please refer the attached document Safety Terms and Conditions.

Appendix 4: CSM- F-3- Safety Performance Evaluation Criteria

1. 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.

Contract Value	Retention Amount (%)
Up to 10 Lakhs	2.5
10 – 50 lakhs	2
0.5 to 10 Cr	1.5
>10 Cr	1

2. The evaluation criteria include Lead Indicators such as CFSA (Contractor Field safety Audit) score, percentage of workers trained in TPSDI, inspection of critical equipment. Lag indicators such as Fatalities, LWDC and man days lost.

3. The retention amount saved will go to a separate Safety Improvement Fund.

4. 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.

5. Long term jobs with low value (Less than Rs. 1 Cr.) are exempted from the safety retention. Invoice of these type of jobs can be cleared without safety retention.

6. In case of job stoppage due to safety violations / unsafe observations at the site, no time extension shall be given to the contractor, if such delays are attributable to contractor.

7. 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. This charge is over and above the retention amount.

8. The committee will finalize an amount between 5 -50 lakhs based on factors such as advise by statutory authorities, contract value and impact of accident etc.

9. 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 100%.

10. During the progress of the work, concerned Supervisor/Engineer will visit and inspect the work site regularly and evaluate the safety performance of the contractor based on matrix attached herewith and apply the Consequence management policy as applicable.

11. Order Manager, divisional chief and SBU head have the authority to terminate the contract in case of three consecutive serious violations.

Safety Performance Evaluation report- CSM-F-3

	<u>Lead Indicators</u>	<u>Unit Of measurement</u>	<u>Target</u>	<u>weight age</u>
1	% of Employee certified in TPSDI/Authorized agency	%	50%	10
2	CFSA score (Annexure 6.1)	Average Severity of Violations	1.49	20
3	Monthly inspection completed by contractor for Critical Equipment, lifting Tools & Tackles and hand tools used at site as per Tata Power Checklist	%	80	5
4	Revalidation of Condition of tools, tackles and equipment by Order Manger.	%	100	15
	<u>Lag Indicators</u>			
1	Number of Fatalities	No.	0	30
2	Number of Lost workday case (LWDC)	No.	0	10
3	Man-days Lost	No.	0	10

Appendix 5: CSM- F-4 Safety Violation Penalty Criteria

Penalty shall be imposed on the contractors under the following circumstances for breaching the contractual agreements:

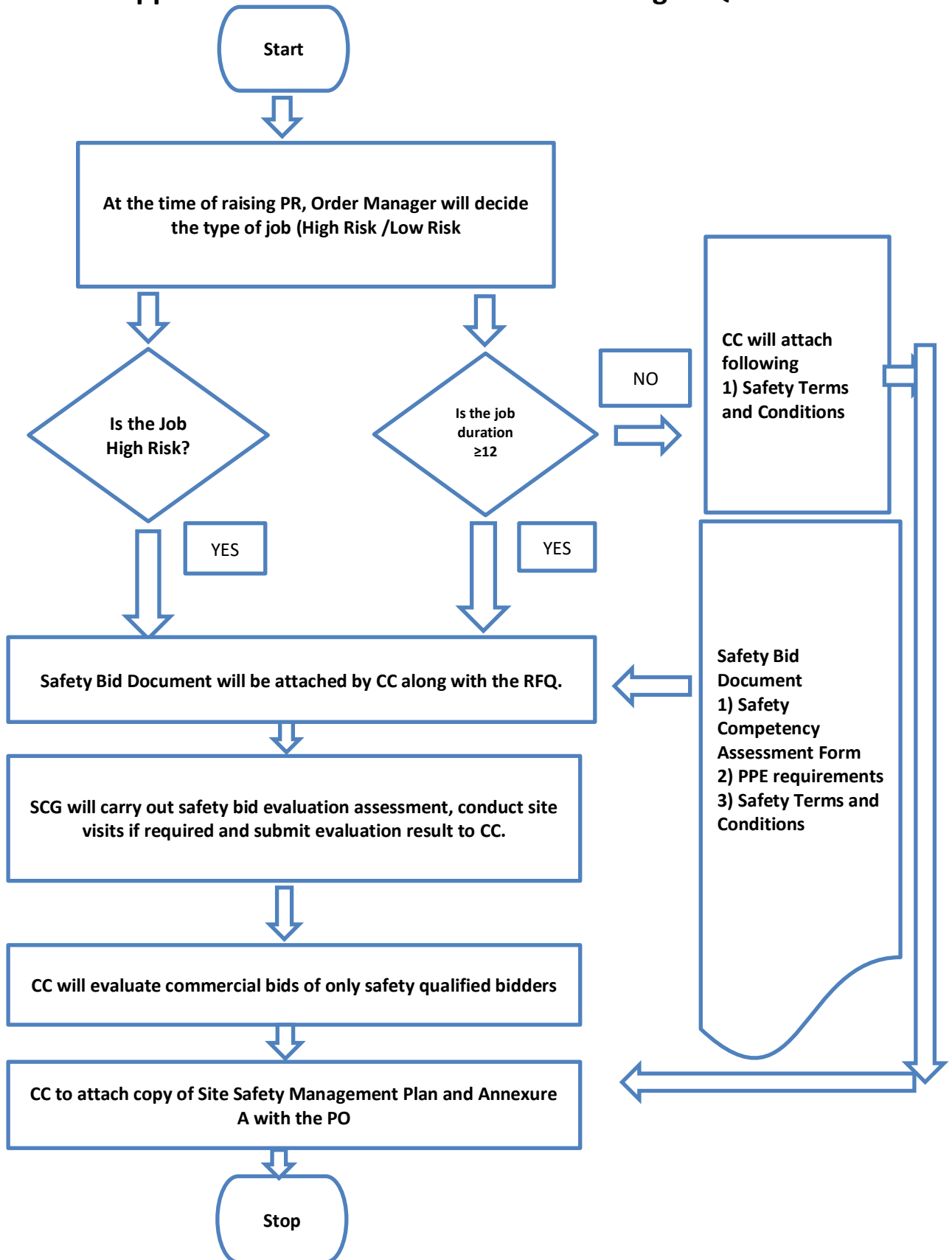
Sr No	Description of violation	Severity	Penalty
1.	Working without Permit	5	5000/-
2.	Untrained (TPSDI) worker on high-risk jobs.	5	5000/-
3.	Unhygienic/Bad condition of PPE	2	250/-
4.	Not following Tata Power Procedure & Standard	4	2000/-
5.	Unsafe Act/Condition of Severity 4	4	2000/-
6.	Unsafe Act/Condition of Severity 5	5	5000/-
7.	No Earthling of Electrical equipment	5	5000/-
8.	Damaged welding cable	5	5000/
9.	Violation of Positive Isolation Procedure (LOTO Not followed)	5	5000/
10.	ELCB of more than 30 mA/ELCB not working	5	5000/
11.	On/Off switch of welding m/c not working	5	5000/
12.	Electric cable tied with metal wire	5	5000/
13.	Leakage found DA hose / cylinder	5	5000/
14.	Use of LPG	5	5000/
15.	Use of IC engine based Three-wheeler at the work site.	5	5000/
16.	Starting the job without Toolbox Talk	5	5000/
17.	Spatter falling on DA hose / Gas-line/ pathways / Equipment	5	5000/
18.	No safety latch in crane hook	5	5000/
19.	Load raised or swung over people or occupied areas of buildings	5	5000/
20.	Persons standing in swing area of construction equipment.	5	5000/
21.	Using damaged slings.	5	5000/
22.	Unstable scaffolding/nonstandard Scaffolding in use	5	5000/
23.	Handrails and mid-rails are missing	5	5000/
24.	Safety Harness not anchored with lifeline/fixed structure	5	5000/
25.	Fall arrestor not provided/ Not being used.	5	5000/
26.	Double lifeline not used for working at height	5	5000/
27.	No rubber mat in Electrical Distribution (DB) room	4	2000/-
28.	Water found accumulated in Electrical Distribution room/near welding machine.	4	2000/
29.	Inserting electric cables into socket, without using plug.	4	2000/
30.	Use of damaged electrical cable/two core cables.	4	2000/
31.	Inflammable material found in Distribution Room / welding areas.	4	2000/
32.	Loose material falling into excavated pit	4	2000/
33.	Water logging into excavated pit /trenches	4	2000/

34.	No / inadequate Barricade	4	2000/
35.	Undercut / cave-in found on sides of excavated pits	4	2000/
36.	Grinding wheel/ Coupling/ Piling winch/other rotating parts without guard	4	2000/
37.	The HMV/Mobile Crane operator does not have a valid HMV driving license.	4	2000/
38.	The loading area is not leveled properly.	4	2000/
39.	Ladder not anchored at top	4	2000/
40.	Opening found in working platform of scaffolding/floor	4	2000/
41.	Inadequate illumination at the working area	4	2000/
42.	Loose material lying on Gantry, platform	4	2000/
43.	Cleaning with Compressed Air.	3	500/-
44.	Gas Cylinders using without cap.	3	500/
45.	Gas Cylinders stored without securing	3	500/
46.	Bringing inside any other chemicals, apart from approved by Safety dept.	3	500/
47.	Using drum for sitting or accessing height.	3	500/
48.	Misusing emergency facilities like fire hydrant line/ hose box/ spray system/ eye wash etc.	3	500/
49.	No provision of Safety net where falling materials or tools may occurs	3	500/
50.	Taking electrical supply from non-designated outlet (other than socket).	3	500/
51.	Restricted gangways due to unwanted materials.	3	500/
52.	Not reporting incident.	3	500/
53.	Entering into restricted area like switch yard/ hazardous storage	3	500/
54.	Work without supervision	3	500/
55.	Parking of vehicle without applying wheel choke at right front-front and left rear-rear wheels other than passenger cars.	3	500/
56.	Heavy Vehicle without helper or co-driver.	3	500/
57.	Not wearing florescent safety jacket at site.	3	500/
58.	People travelling in load body of vehicle.	3	500/
59.	Parking of vehicles at non designated area.	3	500/
60.	Shifting heavy materials without guide ropes.	3	500/
61.	Using other than 24V lamp inside the confined space/Use of other than 24V lamps.	3	500/
62.	Angular loading/ lifting with Crane or hoist.	3	500/
63.	By passing the limit switch/ Safety Interlock.	3	500/
64.	Housekeeping activities on road without proper barricade.	3	500/
65.	Trying to board or alit from running vehicle.	3	500/
66.	Cylinder Valves of Gas cylinders not closed when not in use.	3	500/
67.	Flash-back arrester not used.	3	500/

68.	Hand Trolley wheel found damaged.	3	500/
69.	Guy ropes of required length on both sides of object are not used during movement with load.	3	5/ 00/
70.	Scotch block/wedge not provided, when the vehicle is parked.	3	500/
71.	Suitable Trolley not provided to hold the cylinders.	3	500/
72.	Locked First Aid box	3	500/
73.	Caution boards, danger signs (luminescent /red) along with emergency contact number are not found displayed.	3	500/
74.	Person found jumping barricading tape	3	500/
75.	Stacking of pipes, pile casing, drums without chock blocks/wedges	3	500/
76.	The terrain on which Heavy Equipment/Machinery moves is not reasonably hard.	3	500/
77.	Without Safety Helmet at working sites	4	250/-
78.	Without Crash Helmet (on bikes)	4	500/-
79.	Without Full body double lanyard Safety Harness (for work at height)	5	5000/-
80.	Without Hand gloves - Material Handling, Welding, Cutting,	4	100/-
81.	Without Safety goggles/ face shield - Welding/Cutting /Grinding	5	5000/-
82.	Handling Chemical without PVC Apron	5	5000/-
83.	Smoking in prohibited area (Closed Go-downs, Storage of flammable material, Storage of Gas cylinders)	5	1000/-
84.	Sleeping at Workplace	3	100/-
85.	Driving beyond speed limit	3	1000/-
86.	Seat Belt While Driving (for front seat passengers and driver)	3	500/-
87.	Driving without license	4	1000/-
88.	Heavy Commercial vehicles without reverse horn	3	500/-
89.	Nonfunctional Head light/ taillight and side indicators	3	100/-
90.	Using Mobile Phone During Driving	5	5000/-
91.	Poor visibility of registration number/ without registration number	3	100/-
92.	Broken/ without Side view mirror	3	100/-
93.	Over speeding above specified limit	3	500/-
94.	Broken/ Without Pressure gauge on Oxygen/ LPG / Acetylene cylinder.	3	500/-
95.	Without Flash back arrestor on Industrial Acetylene & Oxygen cylinders.	5	5000/-
96.	Spillage of hazardous material/chemicals during transportation	4	2000/-
97.	Electrical equipment without Earthing/ ELCB/ Double Insulation Cable.	5	5000/-

98.	Lifting Tools & Tackles used without/ expired Test Certificates.	5	5000/-
99.	Housekeeping repeatedly not maintained		
100.	<ul style="list-style-type: none"> • First Time 	3	Warning
101.	<ul style="list-style-type: none"> • Second Time 	4	1000/-
102.	<ul style="list-style-type: none"> • Third Time 	5	5000/-
103.	Serious Violation of House Keeping (after 1st or 2nd warning to be decided by Project Manager depending on the severity)	5	Rs.10000/- and above
104.	Repeat Violation of same nature	5	5 X Penalty for Violation
105.	Appointment of subcontractor without his Safety Bid Evaluation and/or without the permission of engineer in charge or Order manager.	5	5% of Contract Value

Appendix 6: Process Flow Chart for issuing RFQ and PO



Appendix 7: CSM-F-7 Safety Competency 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 : -

Category of Manpower Deployed	Minimum Qualification & Experience	Proposed Numbers against each category month-wise			
		Month 1	Month 2	...	Month n
Project Manager					
Site-In-Charge (Site Manager)					
Shift-in-Charge					
Safety Officers					
Supervisors					
Technicians					
a.....					
b.....					
Highly Skilled Workmen					
a.....					
b.....					
Skilled Workmen					
Semi-Skilled Workmen					
Unskilled Workmen					
Total Manpower					

Instructions to Bidder to fill:

- Bidder to provide the overall site manpower deployment schedule as above.
- Bidder to indicate (through colour code mentioned below) their direct and sub-contracted employees
Direct bidder employee
Partly Direct / Partly sub-contracted
Sub-Contracted
- Against each of the category, bidder to indicate the minimum qualification and experience of the proposed manpower.
- Rows can be added to also identify other specialised manpower e.g. specific details to be included for high risk activities operators
- Columns can be extended to the actual duration of Site activities.
- Bidder to note that if operations is in shifts, then Shift-in-charge / safety officers are required for each shift of 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	Remarks
1					
2					
3					
4					
5					
6					
7					
...					

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 Last 3 Years		
	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 annexure A and sample as attachment B)

5. Management System Certification: -

Sr.	Certification	Yes / No	If Yes, Year of Certification	If No, Target date for Certification
	ISO 9001			
	ISO 14001			
	OSHAS 18001 / ISO 45001			
	Any other (please specify.....)			

Note: Please attach certificates to support above. In case not accredited for above but applied for, application letters may be attached.

Appendix 8: CSM-F-8 PPE requirements

The Contractor shall ensure that the following PPE of Approved standards shall be available at all time and shall be used by his employees with no exception whatsoever.

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	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	Rubber hand gloves & Electrical resistant shoes.
6	Workers engaged in insulation using glass wool etc.	Respiratory mask & leather Hand gloves, goggles.
	Workers engaged in coal handling plant, ash handling plant and working in high dust area.	Dust mask, Hand gloves, protective goggles.
7	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

• PPE shall be conforming to BIS/DGMS/DIN specifications, in good condition and shall be comfortable to his employees, when used.

Appendix 9: CSM- F-10 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)		<u>Signature</u>	<u>Date</u>

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 role and responsibilities of all personnel involved in activity i.e. Site management staff including subcontractors' parties- Main contractor Project/Site Manager, Sub Contractor Site Manager, Project Engineer, Safety officer, Competent Supervisory Staff)

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).








Sr.No	Activity	Details of job sequence	Risk Involved	Control Checks
1.		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).

<p>Fall Protection Measures: (Where Work at height cannot be avoided)</p>							
<p>Control Measures for Electrical Hazards</p>							
<p>Others Hazard if any (please provide details)</p>							
<p>Hazardous Substances to be used in job : (Attach MSDS if required)</p>	 Acute Toxic	 Health Hazard	 Corrosive	 Dangerous For the environment	 Oxidising	 Highly flammable	 Explosives
	Yes /No	Yes /No	Yes /No	Yes /No	Yes /No	Yes /No	Yes /No

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, fire fighting, 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

Required Personnel Protective Equipment:	 Safety Boots	 Hard Hats	 Safety Gloves	 Hearing Protection	 Eye Protection	 Respiratory Protection	Other: 1. Hi-Viz 2. Coveralls 3.
---	---	--	--	---	---	---	--

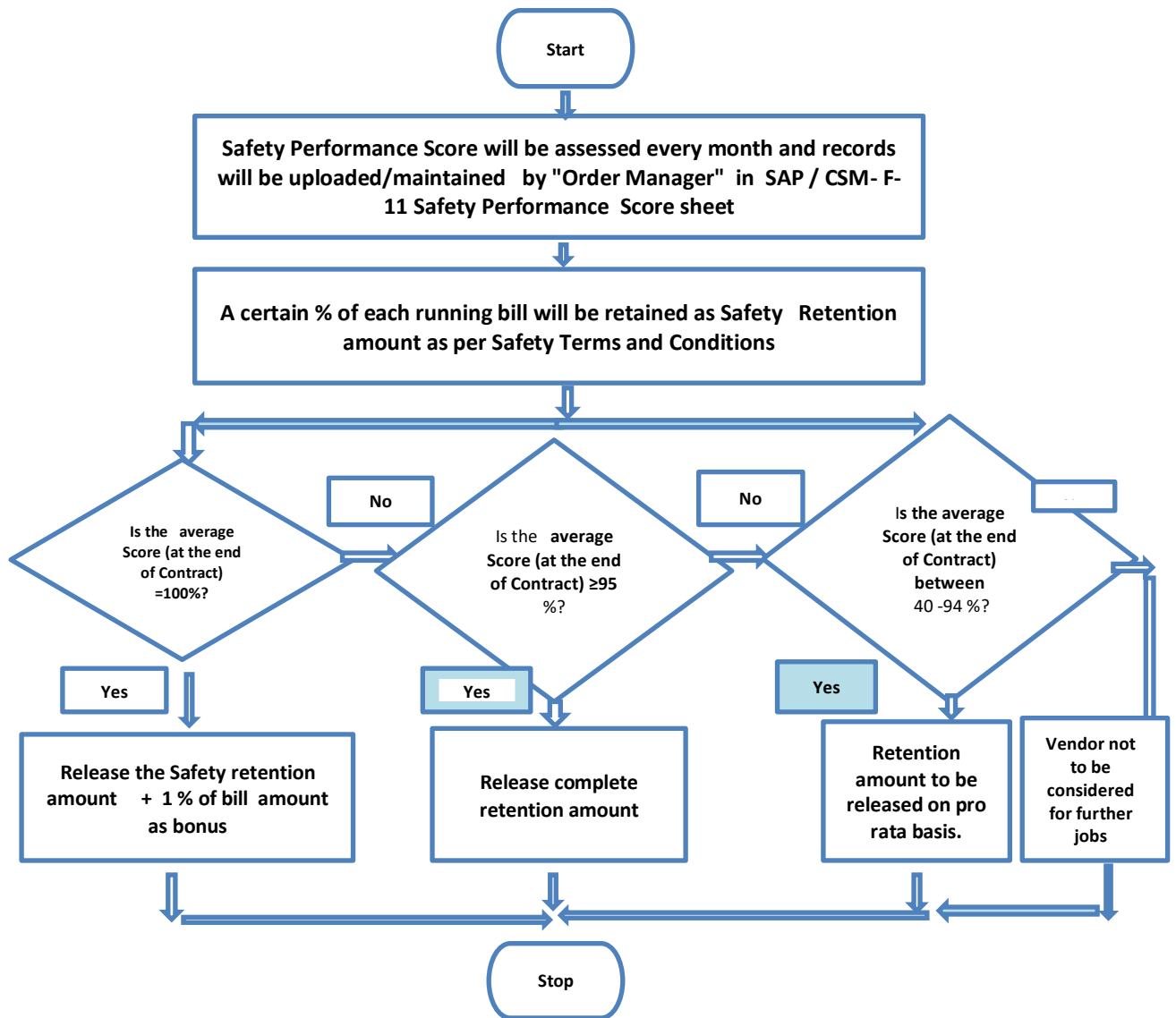
10.0 First Aid facilities and Nearby Hospitals Details

	Name of On-Site First Aider:	
	First Aid Box Location:	
	Location of Nearest Hospital:	

11.0 Occupational Health, Fitness and COVID-19 related Preparedness:

1. Please give a brief writeup / methodology of your organization planned to avoid impact of the COVID-19 pandemic at Tata Power working site.
2. 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: Process Flow Chart for Safety Performance Evaluation



Appendix 11: CSM- F-11 Safety Performance Score

Sr. No	Parameter	Unit of Measurement	Target	Weight age	Actual Performance	Actual Score
Lead Indicator						
1	% of Employee certified in TPSDI/Authorized agency	Number	50%	10		
2	CFSA score (Annexure 6.1)	Average Severity of Violations	1.49	20		
3	Monthly inspection completed for Critical Equipment, lifting Tools & Tackles and hand tools used at site	Number	80%	10		
4	Condition of critical tools, tackles and equipment	Number	100%	10		
Lag Indicator						
1	Number of Fatalities	No	0	30		
2	Number of Lost workday case (LWDC) (reportable)	No	0	10		
3	Man-days Lost	Man-days	0	10		
					Final Score	
					Invoice Value	
					Amount to be released	

Safety Performance Evaluation Criteria

Lead Indicators

	Target			
% of Employee certified in TPSDI/Authorized agency	50%	100%	Less than 100%	
Score		10	5	
	Target			
CFSA score	<=1.49	1.5 to 2.5	2.51 to 3.5	>=3.51
Score	20	15	10	0
	Target			
Monthly inspection completed for Critical Equipment, lifting Tools & Tackles and hand tools used at site	>=80%	79 to 50%	<50%	
Score	10	7	0	
	Target			
Condition of critical tools, tackles and equipment	100%	<100%		
Score	10	0		

Lag Indicators

Number of Fatalities	0	>0	
Score	30		0
Number of LWDC (reportable)	0	>0	
Score	10		0
Number of man days lost	0	1 to 5	>5
Score	10	5	0

Appendix 12: CSM-F-5 Safety Potential Evaluation Criteria for Vendor Registration

At the time of vendor registration, vendor will be registered under 3 categories

- 1) **Category A**- Vendors eligible to carry out High risk Jobs
- 2) **Category B**- Vendors eligible to carry out technical jobs that are 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**, a safety potential evaluation will be carried out based on following parameters.

Sr. No	Description	Weight	Actual	Remarks
		age (%)	Score	
1	Does the contractor have a valid ISO 45001/ OHSAS 18001/ Certification?	30		
2	During site visit check for safety adequacy at site	30		Annexure - 12.1
3	Check the Safety statistics of Contractor	10		Annexure - 12.2
4	Check the Safety orientation & training process of Contractor	15		Annexure 12.3
5	Check the organizational structure for safety professionals & engineers / supervisors.	10		Annexure - 12.4
6	Certified/skilled workers as a percentage of overall workforce	5		
	Total	100		

Evaluation Criteria for Category B

Sr. No	Description	Weight	Actual	Remarks
		age (%)	Score	
1	Does the contractor have a valid ISO 9001 certification?	30		
2	During site visit check for safety adequacy at site	30		Annexure -12.1
3	Check the Safety statistics of Contractor	10		Annexure -12.2

4	Check the Safety orientation & training process of Contractor	15		Annexure -12.3
5	Check the organizational structure for safety professionals & engineers / supervisors.	10		Annexure -12.4
6	Certified/skilled workers as a percentage of overall workforce	5		
	Total	100		

Evaluation Criteria for Category C

Sr. No	Description	Weight age (%)	Actual Score	Remarks
2	Check the Safety statistics of Contractor	40		Annexure - 12.2
3	Check the Safety orientation & training process of Contractor	20		Annexure - 12.3
	Total	100		

Annexure 12.1: Evaluation Criteria for Category D:

Category D does not require any evaluation as it is for outsourced job outside the Tata Power company premise.

Annexure 12.2

Check List – Adequacy of Safety Statistics of Service Provider			Actual Marks obtained	Remarks
Sr. No	Description	Marks		
1	Check the safety statistics for last 3 years (LTIFR and LTISR)	Statistics available	5	
		Statistics not available	0	
2	Check the trend LTIFR for last 3 years	LTIFR value	Marks	
		0 to 0.2	5	
		0.21 to 0.3	2.5	
		>0.3	0	
3	Check the trend of LTISR last 3 years	LTISR value	Marks	
		0 to 2	5	
		2 to 3	2.5	
		>3	0	
4	Has there been any Prosecution/Conviction for any contravention with regard to Safety & Health provisions under the Factories Act /Electricity Act/ BOCW Act and Rules framed there under?	No Prosecution	10	
		Prosecution	0	
		To be provided in written on letter head		
	Total		25	

Annexure 12.3

Check List – Adequacy of Safety orientation & training process of Service provider			Actual Marks obtained	
1	Records of safety trainings provided to safety officer/supervisor/workmen during last 1 year as percentage(%) of total employed by service provider	Safety Officer	Marks	
		≥80% of employees	5	
		50 to 79 % of employee	2.5	
		<50%	0	
		Safety Supervisor	Marks	
		≥80% of employees	10	
		50 to 79 % of employee	6	
		<50%	0	
		Workmen	Marks	
		≥80% of employees	10	
		50 to 79 % of employee	6	
		<50%	0	
Total			25	

Annexure 12.4

Check List – Adequacy of organizational structure for safety professionals & engineers / supervisors.			Actual Marks obtained	
1	Check availability of number of safety officers from government recognized institute as per workforce strength.		Marks	
		1 in 50 employees	10	
		1 in 100 employee	6	
		Any other	0	
3	Check availability of qualified workforce from government recognized institute/TPSDI.		Marks	
		100% of safety officers qualified	5	
		50 – 99% of safety officers qualified	3	
		<50	0	
Total			15	

Appendix 13: CSM-F-9 Safety Bid Evaluation Criteria.

The User has to select whether the job is high risk/ long duration at time of raising the PR.

- 1) The decision whether job is “**high risk**” or not has to be made by order manager on the basis of Risk involved (Risk Priority Number in HIRA) of the Jobs. An indicative list of high-risk jobs is attached as annexure
- 2) If a technical job is of low risk with estimated duration of the contract is 1 year or more the job should be treated as “**long duration**”.
- 3) All Safety bids will be evaluated by Safety Concurrence Group. Structure of SCG will be declared by Corporate safety. Corporate 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 Corporate Contract team in existing tracing sheet along with other jobs.
- 5) For Safety Bid Evaluation will be based on following parameters.

		Minimum Requirement	Weight age (%)	Score Obtained
Manpower	Safety Officer (1 per 500 workers)	<p>Qualification- Officer shall possess Advance Diploma In Industrial Safety by state technical board.</p> <p>Experience- Minimum 1-year experience in relevant field as mentioned in the job in PR.</p>	5	
	Safety Supervisor (1 per work site up to max. 50 workers)	<p>Qualification- Supervisor shall possess ITI/ Diploma in relevant field.</p> <p>Experience- Minimum 2-year experience in relevant field as mentioned in the job in PR.</p> <p>Training – Trained and certified by TPSDI or equivalent institute in relevant safety procedures.</p> <p>Note: On request of the contractor/Users -TPDSI should vet & certify the skilled & experienced</p>	5	

		Technician if Technical Qualification is not adequate.		
	Technician (Skilled workers as electrician, rigger, fitter, welder, cable jointer, line men etc)	Experience- Minimum 2 year experience 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.	30	
Safety Records	Safety Records	Safety Records for last 3 years (as per vendor or as per our knowledge) – Recommendation?	15	
Safety Plan	HIRA/Contract Job Safety Plan	Adequacy of HIRA and Job Safety Plan with respect to relevant job. More weight age will be given to vendor for using mechanized work and advanced tools and equipment	20	
Accredited Bodies certificate	ISO-9001	ISO-9001	2	
	ISO-14001	ISO-14001	3	
	OHSAS 18001 ISO 45000	OHSAS 18001/ISO 45000	15	
Total Score				

6) Vendor entitled to carry out the job only when qualified for the safety evaluation as follows:

Contractor is qualified in safety bid only if his total score is more than 70% in all category 1 jobs such as high risk/long duration.

- 7) The Corporate Contract has to ensure that the vendor provides the filled "Safety Competency Form" along with the quotation.
- 8) Corporate Contract will forward the Safety Competency Form received from the contractor to the Safety Concurrence Group for evaluation.
- 9) In case SCG wants to visit the site, the Safety Competency will be based on evaluation at the time of site visit Annexure 13.1

Annexure -13.1:

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: CSM-F-11.1 CFSA Format

CONTRACTOR FIELD SAFETY AUDIT												
Project Name :												
Date:												
Description of Severity rating:						Audit Team:						
1 = Untidy area, minor issues, sets poor example												
2 = Restricted access, unacceptable trash, disorderly												
3 = Rule or procedure violation, potential injury												
4 = Unsafe condition, serious injury potential												
5 = Immediate serious injury potential, stop activity immediately and correct		Audit Time:						10:00hrs -11:30 hrs				
Weather:						cloudy						
Area	Description	Responsible		Number Personnel Observed		Violations			Remarks	Leading Indicators		
		Engineer	Contractors	Good Citizens	Violators	Number of Violations	Severity	Violations x Severity		4 & 5	PPE	Unsafe Act
1												
	Sub Totals			0	0	0	0	0		0	0	0
	% of Observed People Working Safely											
	Number of Violations											
	Average Severity of Violations											
	Number of Severity 4 & 5 Violations											
	% of 4 & 5 Violations											
	Approximate Number of Workers Observed											
	Number of People on Site											
	% of Workers Observed											

Appendix 15: Indicative List of High-Risk Jobs

To access the exhaustive list of High-risk jobs, please refer the following documents

- 1) High Risk Jobs- Generation
- 2) High Risk Jobs- T&D
- 3) High Risk Jobs- Renewable

Indicative List of High-Risk Jobs -Generation Cluster

Sl. No.	Jobs				
1	Demolition / Painting of Chimney				
2	Survey Sounding Jobs in Sea				
3	Dredging at Coal Birth Jetty				
4	Maintenance / Testing and Replacement of Extra High Voltage (132 KV etc.) Switchyard equipment				
5	Maintenance of EOT Cranes				
6	Deep excavation (5 feet or more) near existing buildings /Structure s				
7	Working inside confined spaces (entry through manhole)				
8	Operation Maintenance of elevators				
9	Working on Live control Circuits for identification of faults				
10	Cable laying and termination Jobs				

Indicative List of High-Risk Jobs - T&D Cluster

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	Installation of Lifts				
6	Installation of EOT Cranes				
7	Tower Dismantling				
8	Working on H Frame /Pole mounted Transformers				
9	Excavation in operational Area heaving power cables in receiving station				
10	Identification and spiking of cable / disconnection of cables from poles				



Indicative List of High-Risk Jobs - Renewable Cluster

Sl. No.	Jobs				
1	Working on Electrical Panels				
2	Hi Potting of Equipment				
3	Battery commissioning and maintenance				
4	Working on the nasal of Wind Turbine				
5	Working on live electrical switchyard, material Handling and Equipment installation				
6	Roof Top Solar Panels Installation and maintenance				
7	Working in live Electrical Switchyard, Material Handling, equipment installation				
8	All maintenance activities that requires climbing on Towers /Structures / Transformer/ GODs				
9	Loading and Unloading of Solar Panels on trucks				
10	Structural Repair /Dismantling work at height.				

Annexure IX

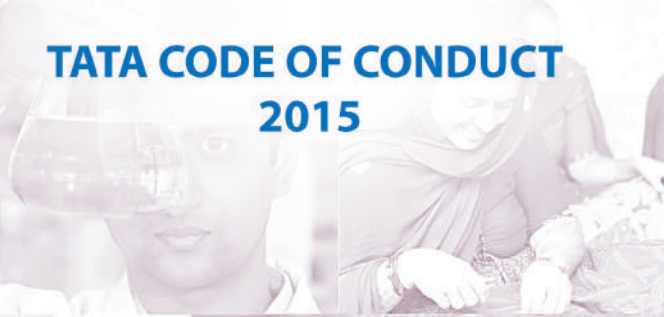
Tata Code of Conduct (TCoC)

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-mailID: pravin.jain@tpcentralodisha.com.



**TATA CODE OF CONDUCT
2015**



LEADERSHIP THAT INSPIRES

For over 100 years, the Tata group has been led by visionaries who have stayed true to the vision of the founder, Jamsetji Tata.

A vision that placed the greater good of society at par with business growth.

A vision that put into practice pioneering social initiatives that changed the way responsible business was run.

And a vision that brought into the group a strong social conscience.



We do not claim to be more unselfish, more generous or more philanthropic than other people. But we think we started on sound and straightforward business principles, considering the interests of the shareholders our own, and the health and welfare of the employees, the sure foundation of our success.

Jamsetji Tata
Founder of the Tata group
Chairman (1868 – 1904)

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FOREWORD

Tata companies have consistently adhered to the values and ideals articulated by the Founder for over 150 years. The Tata Code of Conduct was first formalized by Mr Ratan Tata. It articulates the Group's values and ideals that guide and govern the conduct of our companies as well as our colleagues in all matters relating to business. Today, the Code is a bedrock on which we base our individual, as well as leadership commitments to core Tata values.

The Tata Code of Conduct outlines our commitment to each of our stakeholders, including the communities in which we operate, and is our guiding light when we are sometimes faced with business dilemmas that leave us at ethical crossroads. The Code is also dynamic in that it has been periodically refreshed in order to remain contemporary and contextual to the changes in law and regulations. However it remains unaltered at its core.

Our stellar reputation and success as a business entity has been defined by the powerful commitment and adherence to the core values and principles expressed in this Code, by all our employees, directors and partners. I trust every Tata colleague and Tata company will continue to not only comply with the laws and regulations that govern our business interests around the world, but will continue to set new standards of ethical conduct that will generate deep respect and inspire emulation by others.

N. Chandrasekaran

21st February, 2017



A. OUR VALUES

TATA has always been values-driven. The five core values that underpin the way we conduct our business activities are:



INTEGRITY

We will be fair, honest, transparent and ethical in our conduct; everything we do must stand the test of public scrutiny.

UNITY

We will invest in our people and partners, enable continuous learning, and build caring and collaborative relationships based on trust and mutual respect.

RESPONSIBILITY

We will integrate environmental and social principles in our businesses, ensuring that what comes from the people goes back to the people many times over.

PIONEERING

We will be bold and agile, courageously taking on challenges, using deep customer insight to develop innovative solutions.

EXCELLENCE

We will be passionate about achieving the highest standards of quality, always promoting meritocracy.

These universal values serve as the foundation for the Tata Code of Conduct. They find expression within the value system of every Tata company.

B. SCOPE AND PURPOSE OF THIS CODE

1. This Code sets out how we behave with:
 - our employees, or those who work with us;
 - our customers;
 - the communities and the environment in which we operate;
 - our value-chain partners, including suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents;
 - our joint-venture partners or other business associates;
 - our financial stakeholders;
 - the governments of the countries in which we operate; and
 - our group companies.
2. In this Code, “we or us” means our company, our executive directors, officers, employees and those who work with us, as the context may require.
3. The term “our group companies” in this Code typically means companies Tata Sons intends for this Code to apply to, and / or to whom Tata Sons has issued this Code.
4. This Code sets out our expectations of all those who work with us. We also expect those who deal with us to be aware that this Code underpins everything we do, and in order to work with us they need to act in a manner consistent with it.

REMEMBER...

It is our commitment to protect our reputation and our brand equity by adhering to the values and principles set out in this Code. By doing so, we strengthen our unique culture and identity.

OUR CORE PRINCIPLES



The Tata philosophy of management has always been, and is today more than ever, that corporate enterprises must be managed not merely in the interests of their owners, but equally in those of their employees, of the consumers of their products, of the local community and finally of the country as a whole.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

C. OUR CORE PRINCIPLES

1. We are committed to operating our businesses conforming to the highest moral and ethical standards. We do not tolerate bribery or corruption in any form. This commitment underpins everything that we do.
2. We are committed to good corporate citizenship. We treat social development activities which benefit the communities in which we operate as an integral part of our business plan.
3. We seek to contribute to the economic development of the communities of the countries and regions we operate in, while respecting their culture, norms and heritage. We seek to avoid any project or activity that is detrimental to the wider interests of the communities in which we operate.
4. We shall not compromise safety in the pursuit of commercial advantage. We shall strive to provide a safe, healthy and clean working environment for our employees and all those who work with us.
5. When representing our company, we shall act with professionalism, honesty and integrity, and conform to the highest moral and ethical standards. In the countries we operate in, we shall exhibit culturally appropriate behaviour. Our conduct shall be fair and transparent and be perceived as fair and transparent by third parties.
6. We shall respect the human rights and dignity of all our stakeholders.
7. We shall strive to balance the interests of our stakeholders, treating each of them fairly and avoiding unfair discrimination of any kind.
8. The statements that we make to our stakeholders shall be truthful and made in good faith.
9. We shall not engage in any restrictive or unfair trade practices.
10. We shall provide avenues for our stakeholders to raise concerns or queries in good faith, or report instances of actual or perceived violations of our Code.
11. We shall strive to create an environment free from fear of retribution to deal with concerns that are raised or cases reported in good faith. No one shall be punished or made to suffer for raising concerns or making disclosures in good faith or in the public interest.
12. We expect the leaders of our businesses to demonstrate their commitment to the ethical standards set out in this Code through their own behaviour and by establishing appropriate processes within their companies.
13. We shall comply with the laws of the countries in which we operate and any other laws which apply to us. With regard to those provisions of the Code that are explicitly dealt with under an applicable law or employment terms, the law and those terms shall take precedence. In the event that the standards prescribed under any applicable law are lower than that of the Code, we shall conduct ourselves as per the provisions of the Code.

REMEMBER...

“Good faith” means having a reasonable belief that the information you have provided is truthful. It does not mean having ‘all the evidence’ about the potential violation or case reported.

OUR EMPLOYEES



Once you got the best people, the people who shared our values and ideals, we left them free to act on their own. We do not fetter them. We encourage them and give them opportunities for leadership.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

D. OUR EMPLOYEES

Equal opportunity employer

1. We provide equal opportunities to all our employees and to all eligible applicants for employment in our company. We do not unfairly discriminate on any ground, including race, caste, religion, colour, ancestry, marital status, gender, sexual orientation, age, nationality, ethnic origin, disability or any other category protected by applicable law.
2. When recruiting, developing and promoting our employees, our decisions will be based solely on performance, merit, competence and potential.
3. We shall have fair, transparent and clear employee policies which promote diversity and equality, in accordance with applicable law and other provisions of this Code. These policies shall provide for clear terms of employment, training, development and performance management.

Q&A

A job requirement entails extensive travel. One of the candidates has excellent relevant experience and qualifications. However, this candidate is a single parent. As a result, I feel such a situation would significantly hinder this candidate's ability to cope with the job requirement. What should I do?

In accordance with the Code, the decision to recruit an employee should be based upon merit. We cannot make a presumption that the candidate would not be able to meet the travel requirements of the job. All eligible candidates should be provided with equal opportunity to demonstrate or justify that they can cope with the travel requirements of the job. Being a single parent cannot be a ground to be discriminated against at any stage of recruitment or ongoing employment in our company.

REMEMBER...

We do not tolerate harassment in any form and therefore we expect every employee to discourage such misdemeanours in the workplace.

Dignity and respect

4. Our leaders shall be responsible for creating a conducive work environment built on tolerance, understanding, mutual cooperation and respect for individual privacy.
5. Everyone in our work environment must be treated with dignity and respect. We do not tolerate any form of harassment, whether sexual, physical, verbal or psychological.
6. We have clear and fair disciplinary procedures, which necessarily include an employee's right to be heard.
7. We respect our employees' right to privacy. We have no concern with their conduct outside our work environment, unless such conduct impairs their work performance, creates conflicts of interest or adversely affects our reputation or business interests.

Human rights

8. We do not employ children at our workplaces.
9. We do not use forced labour in any form. We do not confiscate personal documents of our employees, or force them to make any payment to us or to anyone else in order to secure employment with us, or to work with us.

Bribery and corruption

10. Our employees and those representing us, including agents and intermediaries, shall not, directly or indirectly, offer or receive any illegal or improper payments or comparable benefits that are intended or perceived to obtain undue favours for the conduct of our business.

REMEMBER...

Violation by even a single employee of any law relating to anti-bribery, anti-corruption, anti-competition, data privacy, etc. could result in severe financial penalties and cause irreparable reputational damage to the company.

Gifts and hospitality

11. Business gifts and hospitality are sometimes used in the normal course of business activity. However, if offers of gifts or hospitality (including entertainment or travel) are frequent or of substantial value, they may create the perception of, or an actual conflict of interest or an 'illicit payment'. Therefore, gifts and hospitality given or received should be modest in value and appropriate, and in compliance with our company's gifts and hospitality policy.

Freedom of association

12. We recognise that employees may be interested in joining associations or involving themselves in civic or public affairs in their personal capacities, provided such activities do not create an actual or potential conflict with the interests of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

REMEMBER...

As a general rule, we may accept gifts or hospitality from a business associate, only if such a gift:

- has modest value and does not create a perception (or an implied obligation) that the giver is entitled to preferential treatment of any kind;
- would not influence, or appear to influence, our ability to act in the best interest of our company;
- would not embarrass our company or the giver if disclosed publicly.

The following gifts are never appropriate and should never be given or accepted:

- gifts of cash or gold or other precious metals, gems or stones;
- gifts that are prohibited under applicable law;
- gifts in the nature of a bribe, payoff, kickback or facilitation payment*;
- gifts that are prohibited by the gift giver's or recipient's organisation; and
- gifts in the form of services or other non-cash benefits (e.g. a promise of employment).

(*'Facilitation' payment is a payment made to secure or speed up routine legal government actions, such as issuing permits or releasing goods held in customs.)

Working outside employment with us

13. Taking employment, accepting a position of responsibility or running a business outside employment with our company, in your own time, with or without remuneration, could interfere with your ability to work effectively at our company or create conflicts of interest. Any such activity must not be with any customer, supplier, distributor or competitor of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

Integrity of information and assets

14. Our employees shall not make any wilful omissions or material misrepresentation that would compromise the integrity of our records, internal or external communications and reports, including the financial statements.
15. Our employees and directors shall seek proper authorisation prior to disclosing company or business-related information, and such disclosures shall be made in accordance with our company's media and communication policy. This includes disclosures through any forum or media, including through social media.
16. Our employees shall ensure the integrity of personal data or information provided by them to our company. We shall safeguard the privacy of all such data or information given to us in accordance with applicable company policies or law.
17. Our employees shall respect and protect all confidential information and intellectual property of our company.
18. Our employees shall safeguard the confidentiality of all third party intellectual property and data. Our employees shall not misuse such intellectual property and data that comes into their possession and shall not share it with anyone, except in accordance with applicable company policies or law.
19. Our employees shall promptly report the loss, theft or destruction of any confidential information or intellectual property and data of our company or that of any third party.

Q&A

I am an accountant in the finance department of my company. Due to my artistic skills, I received an offer to pen cartoons for a children's publication for which I would receive compensation. I plan to undertake this activity during week-ends. What should I do before accepting this offer?

Before accepting the offer, you should ascertain whether the company policies and rules require you to make a disclosure to your supervisor so that the company may determine whether your undertaking this activity adversely affects our company's interests. On confirmation from the company that it does not do so, you would be free to take up the activity. It is also your duty to bring to the attention of the company whenever there is any change in the situation you have disclosed.

20. Our employees shall use all company assets, tangible and intangible, including computer and communication equipment, for the purpose for which they are provided and in order to conduct our business. Such assets shall not be misused. We shall establish processes to minimise the risk of fraud, and misappropriation or misuse of our assets.
21. We shall comply with all applicable anti-money laundering, anti-fraud and anti-corruption laws and we shall establish processes to check for and prevent any breaches of such laws.

Insider trading

22. Our employees must not indulge in any form of insider trading nor assist others, including immediate family, friends or business associates, to derive any benefit from access to and possession of price sensitive information that is not in the public domain. Such information would include information about our company, our group companies, our clients and our suppliers.

Q&A

Our company has recently announced the launch of a new business initiative. In connection with this, your friend who is a journalist with a leading business newspaper has asked you to provide some information that he could cover in his forthcoming article. He has promised not to quote you, or reveal your identity. Should you be giving him this information?

No. You should not be sharing information of this nature with the media, even if it is assured that the source would remain anonymous. Only authorised personnel in the company are permitted to speak to the media and provide information of this nature.

Our company has a “Use of Social Media” policy that lays down the “dos and don’ts” for use of social media even if you may access such media on your own time. Why is there such a policy?

External communication is a serious matter. It must be carefully managed because information put out with reference to our company or its businesses needs to be clear, truthful and not violate any undertakings we have given to other parties. In each business there are managers nominated to authorise and make different types of statements to the outside world. These managers should be consulted about any request for information you may receive or information you think we should give out.

In using social media, in particular blogs or social networking sites, you should exercise great caution while talking about our company or the business we do. It may feel like you are chatting with friends or expressing a personal opinion but even while doing so you cannot share any confidential information of our company.

REMEMBER...

We must respect the property rights of others by never misusing their assets, intellectual property or trade secrets, including the copying or downloading of unauthorised software, trademarks, copyrighted material or logos. We should never make unauthorised copies of computer software programs or use unlicensed personal software on company computers.

Prohibited drugs and substances

23. Use of prohibited drugs and substances creates genuine safety and other risks at our workplaces. We do not tolerate prohibited drugs and substances from being possessed, consumed or distributed at our workplaces, or in the course of company duties.

Conflicts of interest

24. Our employees and executive directors shall always act in the interest of our company and ensure that any business or personal association *including close personal relationships* which they may have, does not create a conflict of interest with their roles and duties in our company or the operations of our company. Further, our employees and executive directors shall not engage in any business, relationship or activity, which might conflict with the interest of our company or our group companies.
25. Should any actual or potential conflicts of interest arise, the concerned person must immediately report such conflicts and seek approvals as required by applicable law and company policy. The competent authority shall revert to the employee within a reasonable time as defined in our company's policy, so as to enable the concerned employee to take necessary action as advised to resolve or avoid the conflict in an expeditious manner.
26. In the case of all employees other than executive directors, the Chief Executive Officer / Managing Director shall be the competent authority, who in turn shall report such cases to the Board of Directors on a quarterly basis. In case of the Chief Executive Officer / Managing Director and executive directors, the Board of Directors of our company shall be the competent authority.

Q&A

You are responsible for maintaining our company's customer database. One of your friends is starting a business venture and requests you to share a few particulars from this database for marketing purposes of his business. He assures you that he would keep the data as well as his source confidential. Should you do so?

No. You should respect the confidentiality of customer information and not share any part of the database with any person without due authorisation.

You have access to revenue numbers of different business units of our company. While having a conversation with you over evening drinks, your friend enquires about the financial performance of our company. You do not share detailed information with your friend, but share approximate revenue figures. Is this conduct of yours correct?

No, it is not. You are not permitted to share financial information of our company with others who do not need to know this information. Financial information should always be safeguarded and disclosed only on a need-to-know basis after obtaining requisite approvals. Sharing of any price sensitive information that is not generally available with the public could also lead to violation of applicable insider trading laws.

27. Notwithstanding such or any other instance of conflict of interest that exists due to historical reasons, adequate and full disclosure by interested employees shall be made to our company's management. At the time of appointment in our company, our employees and executive directors shall make full disclosure to the competent authority, of any interest leading to an actual or potential conflict that such persons or their immediate family (including parents, siblings, spouse, partner, children) or persons with whom they enjoy close personal relationships, may have in a family business or a company or firm that is a competitor, supplier, customer or distributor of, or has other business dealings with, our company.

REMEMBER...

A conflict of interest could be any known activity, transaction, relationship or service engaged in by an employee, his/her immediate family (including parents, siblings, spouse, partner, and children), relatives or a close personal relationship, which may cause concern (based upon an objective determination) that the employee could not or might not be able to fairly perform his/her duties to our company.

Examples of Potential Conflicts of Interest

A conflict of interest, actual or potential, arises where, directly or indirectly, an employee or executive director:

- (a) engages in a business, activity or relationship with anyone who is party to a transaction with our company;
- (b) is in a position to derive an improper benefit, personally or for any family member or for any person in a close personal relationship, by making or influencing decisions relating to any transaction;
- (c) conducts business on behalf of our company or is in a position to influence a decision with regard to our company's business with a supplier or customer where a relative of, or a person in close personal relationship with, an employee or executive director is a principal officer or representative, resulting in a personal benefit or a benefit to the relative;
- (d) is in a position to influence decisions with regard to award of benefits such as increase in salary or other remuneration, posting, promotion or recruitment of a relative or a person in close personal relationship employed in our company or any of our group companies;
- (e) undertakes an activity by which the interest of our company or our group companies can be compromised or defeated; or
- (f) does anything by which an independent judgement of our company's or our group companies' best interest cannot be exercised.

28. If there is a failure to make the required disclosure and our management becomes aware of an instance of conflict of interest that ought to have been disclosed by an employee or executive director, our management shall take a serious view of the matter and consider suitable disciplinary action as per the terms of employment. In all such matters, we shall follow clear and fair disciplinary procedures, respecting the employee's right to be heard.

Examples of activities normally approved (post-disclosure) as per applicable company policy

Acceptance of a position of responsibility (whether for remuneration or otherwise) in the following cases would typically be permitted, provided the time commitments these demand do not disturb or distract from the employee's primary duties and responsibilities in our company, and are promptly disclosed to the relevant competent authority:

- (a) Directorships on the Boards of any of our group companies, joint ventures or associate companies.
- (b) Memberships/positions of responsibility in educational/professional bodies, where such association will promote the interests of our company.
- (c) Memberships or participation in government committees/bodies or organisations.

Q&A

You are in a relationship with a colleague who has been recently moved into your team and would now be reporting to you. What should you do?

Romantic or close personal relationships with another employee where a reporting relationship exists and one is responsible for evaluating the other's performance, is likely to create a conflict of interest. In such a situation, you would need to report the potential conflict to your supervisor.

Your company is submitting a proposal to a company in which you were previously employed. You have confidential information pertaining to your previous employer, which you believe will help your present employer in winning the contract. Should you share this information?

No. You should not share this information with your company since it relates to confidential information of a third party. Your company respects its employees' duty to protect confidential information that they may have relating to their previous employers.

You are the purchasing manager in the procurement department of your company. You receive an invitation from a supplier to attend a premier sporting event as her guest. This particular supplier is one of the vendors who has submitted a proposal for an open tender issued by your company. Should you accept the invitation?

No. You should not accept the invitation in this instance. Since you are in a key decision-making role for the tender, any unusual benefit that you receive could be perceived as an inducement that could compromise your objectivity.

OUR CUSTOMERS



We have continued to enjoy prosperity, even with adverse times to fight against. Our relations with all concerned are the most friendly. We have maintained the same character for straight-forward dealing with our constituents and customers. Our productions have continued to be of the same high quality, and therefore command the best reputation and realise the highest prices. ... I mention these facts only to point out that with honest and straight-forward business principles, close and careful attention to details, and the ability to take advantage of favourable opportunities and circumstances, there is a scope for success.

Jamsetji Tata

Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

E. OUR CUSTOMERS

Products and services

1. We are committed to supplying products and services of world-class quality that meet all applicable standards.
2. The products and services we offer shall comply with applicable laws, including product packaging, labelling and after-sales service obligations.
3. We shall market our products and services on their own merits and not make unfair or misleading statements about the products and services of our competitors.

Export controls and trade sanctions

4. We shall comply with all relevant export controls or trade sanctions in the course of our business.

Fair competition

5. We support the development and operation of competitive open markets and the liberalisation of trade and investment in each country and market in which we operate.
6. We shall not enter into any activity constituting anti-competitive behaviour such as abuse of market dominance, collusion, participation in cartels or inappropriate exchange of information with competitors.
7. We collect competitive information only in the normal course of business and obtain the same through legally permitted sources and means.

Dealings with customers

8. Our dealings with our customers shall be professional, fair and transparent.
 9. We respect our customers' right to privacy in relation to their personal data. We shall safeguard our customers' personal data, in accordance with applicable law.
-

Q&A

You are the Regional Sales Manager of our company. You have become a member of an “informal group”, on an instant messaging service, whose members are the regional sales heads of our company’s competitors. The administrator of the group has requested an in-person meeting to informally discuss market conditions and brainstorm on “pricing strategy” from an industry perspective. What should you do?

Any meeting with competitors, especially to discuss “pricing strategy”, could be an attempt to promote an anti-competitive practice or manipulate prices. You should respond by declining this invitation and exiting the “informal group”. You should also report this incident to your supervisor and your Legal department.

You are attending a customer meeting with a colleague, and your colleague makes an untruthful statement about the company’s services. What should you do?

You should assist your colleague in correcting the inaccuracy during the meeting if possible. If this is not possible, raise the issue with your colleague after the meeting to enable him/her or the company to correct any misrepresentation made to the customer.

While working on a customer project, you receive a call from your colleague. He used to manage that customer account before you took over his role. He recalls that he had worked with the customer on developing a new ordering system which he thinks would be beneficial for another customer and requests you to send him the project details. What should you do?

You must not share this information without specific approval of the customer; you are not permitted to use a customer’s assets, including software, for another customer or for any personal use.

REMEMBER...

Striving for excellence in the standards of our work and in the quality of our goods and services is a core Tata value. It is the unwavering practice of this value that builds and sustains customer trust in our brand.

OUR COMMUNITIES AND THE ENVIRONMENT



In a free enterprise, the community is not just another shareholder in business but is in fact the very purpose of its existence.

Jamsetji Tata

Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

F. OUR COMMUNITIES AND THE ENVIRONMENT

Communities

1. We are committed to good corporate citizenship, and shall actively assist in the improvement of the quality of life of the people in the communities in which we operate.
2. We engage with the community and other stakeholders to minimise any adverse impact that our business operations may have on the local community and the environment.
3. We encourage our workforce to volunteer on projects that benefit the communities in which we operate, provided the principles of this Code, where applicable, and in particular the 'Conflicts of Interest' clause are followed.

The environment

4. In the production and sale of our products and services, we strive for environmental sustainability and comply with all applicable laws and regulations.
5. We seek to prevent the wasteful use of natural resources and are committed to improving the environment, particularly with regard to the emission of greenhouse gases, consumption of water and energy, and the management of waste and hazardous materials. We shall endeavour to offset the effect of climate change in our activities.

OUR VALUE-CHAIN PARTNERS



“If we had done some of the things that some other groups have done, we would have been twice as big as we are today. But we didn’t, and I would not have it any other way.”

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

(on the pace of expansion of the Tata group in the 1960s and 70s)

G. OUR VALUE-CHAIN PARTNERS

1. We shall select our suppliers and service providers fairly and transparently.
2. 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.
3. Our suppliers and service providers shall represent our company only with duly authorised 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.
4. 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.
5. We respect our obligations on the use of third party intellectual property and data.

Q&A

You head the procurement function in our company. You have tight budgetary constraints for a project that you are working on. In order to complete the project within the targeted costs, you intend to request your supplier to provide you an exceptional discount on this project order on the understanding that you would “make it up to him” in future orders. Would you be violating the Code?

Yes, you would. Inducement in any form, including future benefits to the supplier, could compromise your ability to act objectively and in the best interests of the company and therefore must be avoided.

REMEMBER...

Our value-chain partners would include our suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents; joint-venture partners and other business associates.

OUR FINANCIAL STAKEHOLDERS



Ethical behaviour in business – in every sphere and with all constituents – has been the bedrock on which the Tata group has built, and operates, its enterprises. This has been an article of faith for the group ever since its inception, a fundamental element of our cherished heritage and the essence of our way of life.

Ratan Tata

Chairman, Tata Sons (1991 – 2012)

H. OUR FINANCIAL STAKEHOLDERS

1. We are committed to enhancing shareholder value and complying with laws and regulations that govern shareholder rights.
 2. We shall inform our financial stakeholders about relevant aspects of our business in a fair, accurate and timely manner and shall disclose such information in accordance with applicable law and agreements.
 3. We shall keep accurate records of our activities and shall adhere to disclosure standards in accordance with applicable law and industry standards.
-

GOVERNMENTS



Business, as I have seen it, places one great demand on you; it needs you to impose a framework of ethics, values, fairness and objectivity on yourself at all times. It is not easy to do this; you cannot impose it on yourself forcibly because it has to become an integral part of you.

Ratan Tata

Chairman, Tata Sons (1991 – 2012)

I. GOVERNMENTS

Political non-alignment

1. We shall act in accordance with the constitution and governance systems of the countries in which we operate. We do not seek to influence the outcome of public elections, nor to undermine or alter any system of government. We do not support any specific political party or candidate for political office. Our conduct must preclude any activity that could be interpreted as mutual dependence/favour with any political body or person, and we do not offer or give any company funds or property or other resources as donations to any specific political party, candidate or campaign.

Any financial contributions considered by our Board of Directors in order to strengthen democratic forces through a clean electoral process shall be extended only through the Progressive Electoral Trust in India, or by a similar transparent, duly-authorized, non-discriminatory and non-discretionary vehicle outside India.

Government engagement

2. We engage with the government and regulators in a constructive manner in order to promote good governance. We conduct our interactions with them in a manner consistent with our Code.
3. We do not impede, obstruct or improperly influence the conclusions of, or affect the integrity or availability of data or documents for any government review or investigation.

OUR GROUP COMPANIES



I do not think anyone was on par with Jamsetji as an industrial visionary. But that is not the sole reason why I have been an admirer of Jamsetji. The major reason was his sense of values, sterling values, which he imparted to this group. If someone were to ask me, what holds the Tata companies together, more than anything else, I would say it is our shared ideals and values which we have inherited from Jamsetji Tata.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

J. OUR GROUP COMPANIES

1. We seek to cooperate with our group companies, including joint ventures, by sharing knowledge, physical resources, human and management resources and adopting leading governance policies and practices in accordance with applicable law including adherence to competition law, where relevant.
2. We shall strive to achieve amicable resolution of any dispute between us and any of our group companies, through an appropriate dispute resolution mechanism so that it does not adversely affect our business interests and stakeholder value.
3. We shall have processes in place to ensure that no third party or joint venture uses the TATA name/brand to further its interests without proper authorisation.
4. Our Board of Directors shall consider for adoption policies and guidelines periodically formulated by Tata Sons and circulated to group companies.

Q&A

You are in the process of selecting potential vendors for an IT project in our company. In the final shortlist of two companies, one is a new start-up with limited references and a lower price-quotation, while the other is a Tata company with thirty years of implementation experience and good references, but a marginally higher quote for the same job. With all other parameters of choice being nearly equal, which company should you select for the job?

While price is undoubtedly an important criterion for decision making, it is clearly not the only one to be evaluated. You may also need to consider good customer references, proven track record and shared value systems in order to decide on your IT partner.

You are in the process of selecting potential vendors for a project. One of the three finalists is a group company. In reviewing the final proposals, you rank the group company second out of the three proposals based on pricing and total cost of ownership, and select the first-ranked vendor. Is this the right decision?

Yes. You should select the vendor that, on its own merits, is the vendor that is most appropriate for your company's requirements. You should not select a group company only because of its affiliation.

RAISING CONCERNS

We encourage our employees, customers, suppliers and other stakeholders to raise concerns or make disclosures when they become aware of any actual or potential violation of our Code, policies or law. We also encourage reporting of any event (actual or potential) of misconduct that is not reflective of our values and principles.

Avenues available for raising concerns or queries or reporting cases could include:

- immediate line manager or the Human Resources department of our company
- designated ethics officials of our company
- the 'confidential reporting' third party ethics helpline (if available)
- any other reporting channel set out in our company's 'Whistleblower' policy.

We do not tolerate any form of retaliation against anyone reporting legitimate concerns. Anyone involved in targeting such a person will be subject to disciplinary action.

If you suspect that you or someone you know has been subjected to retaliation for raising a concern or for reporting a case, we encourage you to promptly contact your line manager, the company's Ethics Counsellor, the Human Resources department, the MD/CEO or the office of the group's Chief Ethics Officer.

Q&A

My supervisor has asked me to do something which I believe may be illegal. I am afraid if I do not do what I am told, I could lose my job. Should I do it?

No. Breaking the law is never an option. Discuss the situation with your supervisor to be certain that you both understand the facts. If your concerns are not resolved, contact a higher level supervisor, the Ethics Counsellor, the Legal department or report them via the company's confidential reporting system, if available.

I feel that my supervisor is treating me unfairly for reporting a concern to the Ethics Counsellor. What should I do?

Retaliation against anyone who raises a concern is a violation of the Code. You should therefore promptly report this action of your supervisor to the Ethics Counsellor or the MD/CEO of your company or via the company's confidential reporting system, if available.

ACCOUNTABILITY

This Code is more than a set of prescriptive guidelines issued solely for the purpose of formal compliance. It represents our collective commitment to our value system and to our core principles.

Every person employed by us, directly or indirectly, should expect to be held accountable for his/her behaviour. Should such behaviour violate this Code,

they may be subject to action according to their employment terms and relevant company policies.

When followed in letter and in spirit, this Code is 'lived' by our employees as well as those who work with us. It represents our shared responsibility to all our stakeholders, and our mutual commitment to each other.

SPEAK UP...

If you are unsure whether a particular action you are about to take is consistent with the principles set forth in the Code, ask yourself:

- Could it directly or indirectly endanger someone or cause them injury?
- Is it illegal/unlawful or out of line with our policies and procedures?
- Does my conscience reject it? Does it conflict with my personal values?
- Would I feel uncomfortable if the story appeared in the media? Would it shame my company, spouse, partner, parent or child?
- Does it 'feel' wrong?

If the answer to any of these questions is "Yes", please stop and consult your reporting manager, the Ethics Counsellor, the Human Resource department, the Legal department or any member of the senior management team, to assist you in making the decision.

When faced with a dilemma: Stop, Think, Act Responsibly

NOTE

The Code does not provide a comprehensive and complete explanation of all expectations from a company standpoint or obligations from a stakeholder standpoint.

Our employees have a continuing obligation to familiarise themselves with all applicable law, group-level advisories and policies, company-level policies, procedures and work rules as relevant. For any guidance on interpretation of the Code, we may seek support from our company's Ethics Counsellor or from the group's Chief Ethics Officer, as appropriate.

All joint ventures are encouraged to adopt the Tata Code of Conduct (TCOC) or a code of conduct that incorporates all elements of the TCOC.

This version of the Tata Code of Conduct supersedes all earlier versions and associated documents and stands effective from 29th July, 2015.

For any query or clarification on the Code, please contact the office of the group's Chief Ethics Officer via email at: ethicsoffice@tata.com.



TATA CODE OF CONDUCT – 2015

I acknowledge that I have received the Tata Code of Conduct.

I have read the Tata Code of Conduct and I acknowledge that as a Tata employee, I am required to comply with the guidelines described therein and failure to do so may subject me to action as per my employment terms and relevant company policies.

If I have a concern about a violation, or a potential violation of the Tata Code of Conduct, I understand that there are channels available to me in my company to report such concerns. By making use of these channels when necessary, I will play my part in maintaining the high ethical standards to which we hold ourselves.

Signature: _____

Date: _____

Name: _____

Department: _____

Address: _____

(Please submit this declaration to your Ethics Counsellor or the Human Resource department of your company.)



For further information on the Code please contact:
 The Ethics Office,
 Tata Sons Ltd.,
 Bombay House,
 24, Homi Mody Street,
 Mumbai – 400001, India.
 Email: ethicsoffice@tata.com

Annexure X

Environment & Sustainability Policy

ENVIRONMENT & SUSTAINABILITY POLICY



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

A handwritten signature in blue ink, appearing to read 'Praveer Sinha', with a horizontal line underneath.

(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!

