



**TP CENTRAL ODISHA DISTRIBUTION LIMITED**  
(A Tata Power & Odisha Govt. joint venture)  
Procurement Department  
2nd Floor, IDCO Tower, Janpath Bhubaneswar, Odisha 751022  
Tender No.: TPCODL/P&S/1000000106/2021-22

## **Open Tender Notification**

**for**

**SITC (Supply, installation, testing & commissioning) for Conversion  
of existing overhead line to UG cable system around Lord  
Jagannath Temple and connecting roads, Puri**

**Tender Enquiry No.: TPCODL/P&S/1000000106/2021-22**  
**Due Date for Bid Submission: 08.10.2021 [15:00 Hrs.]**

**TP Central Odisha Distribution Limited**  
(A Tata Power & Odisha Government joint venture)  
Purchase department  
2nd Floor, IDCO Towers, Janpath, Bhubaneswar-751022



**TP CENTRAL ODISHA DISTRIBUTION LIMITED**  
(A Tata Power & Odisha Govt. joint venture)  
Procurement Department  
2nd Floor, IDCO Tower, Janpath Bhubaneswar, Odisha 751022  
Tender No.: TPCODL/P&S/1000000106/2021-22

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

-: Steps for E-tender submission:-

Tender Enquiry No	Work Description	EMD Amount (Rs.)	Tender Participation Fee (Rs.)	Last Date and Time for payment of Tender Participation Fee
TPCODL/P&S/1000000106/2021-22	SITC (Supply, installation, testing & commissioning) for Conversion of existing overhead line to UG cable system around Lord Jagannath Temple and connecting roads, Puri	42 Lakhs	5,000/-	25.09.2021, 15.00 Hrs

Please note that corresponding details mentioned in this document will superseded any other details mentioned anywhere else in the Tender Document.

### Step 1:

The bidder can get primary information about the tender from the NEWSPAPER advertisement / TPCODL website (in case of open tender) / invitation through e-mail (in case of limited tenders)

### Step 2:

First the prospective Bidder who intends to participate in an open tender should deposit the requisite tender fee as mentioned in the tender document through NEFT/ RTGS in the a/c of TPCODL as mentioned in the tender document. Deposit of the Tender fee should be made within the scheduled time for such deposit as indicated in the Tender document.

### Step 3:

After deposit of the tender fee, the bidder should furnish the following information through e-mail to the contact person indicated in the tender document.



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Sl No	Description	Bidder's Response
1	Tender Enquiry No.	
2	Description of materials / Works Tendered	
3	Name of the bidding company	
4	Place & Detail Address of the Company	
5	Postal Code (PIN Code)	
6	Name of the authorized contact person of the Bidder	
7	Contact No./Mobile No. authorized person	
8	E-mail Id of the contact person	
9	Tender Fee details (Bank Name / Amount/NEFT-RTGS UTR No/ Date)	
10	GST No.	

**Step 4:**

After receipt of the above information through e-mail, Vendor will get an invitation e-mail from ARIBA System which is the e-tendering platform of TPCODL. In this mail there will be an online link as Click Here to participate in the tender.

**Step 5:**

Click "Click Here" to access this event.

**Step 6:**

If you are 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.

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

**Step 7:**

Click Continue. The simple one-page registration screen will open for first time user. All\* mark mandatory field to be filled in.

**Step 8:**

You will be able to see the RFQ ( i.e Detail Tender document).

**Step 9:**



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After review and downloading of all documents click on "Accept Review Pre-requisites" i.e acceptance of terms and conditions.

**Step 10:**

Review and accept "Bidder Agreement".

**Step 11:**

You can see attached tender document in PDF format 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.)

**Step 13:**

Uploading of Price Bid

Price schedule is attached in envelope.3.1 of ARIBA. 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. For Price Bid put all the unit price and taxes and duties in provided field. Put "0" (ZERO) in not applicable field.

In addition, the bidder has to upload the editable form of the price bid in EXCEL format in envelope 3.2 of ARIBA system.

**Step 14:**

After uploading successfully Techno commercial offer and price part then click on "Submit Entire Response"

Note: Once user ID and password created, bidder can also login to ARIBA site through the following URL:

<https://service.ariba.com/Sourcing.aw/124997008/aw?awh=r&awssk=oxt0s1BN&dard=1>



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## 1.0 Event Information

### 1.1 Scope of work

Open Tenders are invited through e-tender bidding process from interested Bidders for entering into a Contracts as defined below :

Tender Enquiry No	Work Description	EMD (Rs.)	Tender Participation Fee (Rs.)	Last Date and Time for payment of Tender Participation Fee
TPCODL/P&S/ 1000000106/ 2021-22	SITC (Supply, installation, testing & commissioning) for Conversion of existing overhead line to UG cable system around Lord Jagannath Temple and connecting roads, Puri	42 Lakhs	5,000/-	25.09.2021, 15.00 Hrs

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 15.09.2021 Onwards
(b)	Date by which Interested and Eligible Bidder to pay Tender Fee and confirm participation as mentioned in "Procedure to Participate in Tender"	25.09.2021, 15:00 Hrs
(c)	Last Date of receipt of pre-bid queries, if any	29.09.2021 up to 15:00 Hours
(d)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	05.10.2021
(e)	Last date and time of receipt of Bids through AIBA E-Tender Portal	08.10.2021 up to 15:00 Hours

**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.

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#### **1.4 Mandatory documents required along with the Bid**

- 1.4.1 EMD of requisite value and validity
- 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 signed and stamped 'Schedule of Deviations' as per Annexure III on bidder's letter head.
- 1.4.6 Duly signed and stamped 'Schedule of Commercial Specifications' as per Annexure IV on bidder's letter head.
- 1.4.7 Duly signed and stamped "Acceptance Form for participation in Reverse Auction" As per Annexure VI on bidder's letter head.
- 1.4.8 Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.

***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:-

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

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

#### **1.7 Qualification Criteria**

1. The bidder should have average annual turnover of **Rs. 50 Crore** in last three years. Audited balance sheet, profit and loss account and auditors report from the statutory auditors of the company required.



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2. Work Experience: Bidder should have work experience of executing minimum on turn-key basis of 33 kV / 11 kV and LT UG cable with a cumulative length of minimum **25 km** and 33/11 KV grid substation of minimum **01 No** in any utility/companies within last 5 years.
3. The bidder must have executed similar jobs in any Power utility/companies for a total value of **Rs. 40 Cr. of one single order** or **two orders of Rs. 20 Cr.** each or **three orders of Rs 15 Cr.** each during last 5 financial years.
4. Bidder must have all statutory compliance like valid PAN, ESI registration, EPF registration and GSTN registration.
5. Bidder should have a valid HT 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. In such case, they shall submit an undertaking that, in case they are successful bidder, license shall be obtained before execution of contract. However, the bidder shall produce a copy of such application & receipt of Fees deposited for such license before the Competent Authority to TPCODL within 7 days of issue of PO in their favour. Such bidder shall ensure that such statutory License is obtained early for timely completion of the assigned contract without affecting the scheduled completion time.

TPCODL reserves the right to relax qualification criteria without assigning any reason thereof. In case bidder has previous association with TPCODL for similar products and services, the performance feedback for that bidder by TPCODL's user group shall be considered.

### 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 the compliance to tender terms and conditions.





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- The bids will be evaluated commercially on **overall all-inclusive price of tender BOQ** as calculated in Schedule of Items [Annexure I]. TPCODL reserves the right to split the order line item wise and / or quantity 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 bidder prior to technical qualification. 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



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2<sup>ND</sup> 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).



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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. Arabinda Sahu, DM- Procurement

Contact No: 9438319343

E-Mail ID: [arabinda.sahu@tpcentralodisha.com](mailto:arabinda.sahu@tpcentralodisha.com)

#### Escalation Matrix

Name: Mr. Sudhakar Behera, GM-Procurement

Contact No: 9437282663

E-Mail ID: [sudhakar.behera@tpcentralodisha.com](mailto: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



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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

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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 /



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

In case any supplier is found unsatisfactory during the delivery process, the award will be cancelled and TPCODL reserves the right to award other suppliers 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 (Annexure-VIII)
5. Technical specification (Annexure-II)
6. Acceptance form for participation in reverse auction (Annexure VII)
7. General Conditions of Contract (Annexure- IX)

### **7.0 Post Award Contract Administration**

#### **7.1.1 PRICE & TAXES**

After finalization of tender, work order shall be issued on successful bidder. Prices shall remain firm till validity of contract. Within the validity of contract and as per requirement of material, release order shall be issued time to time.

Any change in statutory taxes, duties and levies during the contract period shall be borne by TPCODL. However, in case of delay in work execution owing to reasons not attributable to TPCODL, any increase in total liability shall be passed on the BA, whereas any benefits arising owing to such statutory variation in taxes and duties shall be passed on TPCODL. Price shall remain firm and fixed and not subject to escalation till the execution of this contract, even if the completion/execution of the contract takes longer time than the specified period.

#### **7.1.2 SCOPE OF WORK**

The scope of work shall include providing engineering drawing, GTP, shop testing, joint field survey (with TPCODL and Forest department), loading, unloading, transportation, supply of all the materials & equipment and installation, erection, commissioning & dismantling (if any) to complete the works in all respect. The details scope of work is mentioned at schedule of items (Annexure-I) & Scope of Work (Annexure-VIII). The quantities mentioned in schedule of items may vary from either side. In case of any changes envisaged in scope of work, at any given point of time during the contract execution period, prior approval may be taken from the Engineer In Charge. Billing to done as per actual requirement.

#### **7.1.3 COMPLETION PERIOD:**

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Time being the essence of the contract; the work shall be completed **within 6 Months maximum** from the date of issue of work order including supply of all the materials, erection, testing, dismantling (if any), Electrical inspection (if any) & commissioning. The work shall be treated as complete item wise when one item shall be complete in all respects with all mountings, fixtures and standard accessories which are normally supplied even though not specifically detailed in the specification.

**7.1.4. ENGINEER IN CHARGE :-**

Authorized representative of Project Department of TPCODL shall be the Engineer in charge for the Project. All supervision, erection, testing at site and commissioning of the project shall be carried out in coordination with the Engineer in Charge along with project department.

**7.1.5. TERMS OF PAYMENT :-**

- A. **80% (Eighty percent)** of contract price on pro-rata basis along with taxes and duties shall be paid progressively for each portion of proportionally completed items (Supply and erection at site only) of work as per the agreed Bill of Materials subject to certification by Purchaser's Engineer-in-charge.
- B. **Balance 20% (Twenty percent)** payment of the actual executed WO shall be paid after completion of acceptance test and Taking Over of the complete systems specified in the enquiry, including clearance of Electrical Inspection (if any), 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.

**7.1.5.1 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.
- Associate's bills/invoices submitted in triplicate have been certified by Engineer-In-Charge on the basis of actual measurement of works.

**7.1.5.2. Bills & Invoices**

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 TPCODL, Idco Tower, Bhubaneswar

All Bills shall be supported by joint measurement of work done, quality test report, MDCC, Electrical inspection report (in case final bill) 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.



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Bills/ invoices shall mention Associate's Sales, GST 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.

#### **7.1.5.3 Payment & Statutory Deductions**

Payment shall be released within **15 days** from the submission of the bills. The associate shall submit "No Demand Certificate" in the format as per Annexure-D of the tender specification at the time of receipt of full and final payment. 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.

##### **7.1.5.3.1 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.

#### **7.1.6. GUARANTEE:**

The materials to be supplied by the contractor shall be guaranteed for satisfactory operation against defects in design and workmanship for a **period of 60 months** for the work from the date of handing over the completed installations.

#### **7.1.7. RIGHT OF WAY :**

Right of way issues, if any, arising during execution of the works shall have no liability of TPCODL. These issues shall be settled at the sole discretion of the Contractor with compensation (if any). TPCODL shall however extend all possible help to the Contractor including discussion with the local authorities for early resolution of these issues. The BA has to arrange all necessary ROW permission for execution of project. No extra charges will be paid by TPCODL for arranging any permission from Govt authorities or any other agency.

#### **7.1.8. LIQUIDATED DAMAGES**

Liquidated damages @**0.5%** of the total executed contract value per week or part thereof, for the period of delay in integrated completion, subject to maximum **5%** 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. 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.

##### **7.1.8.1 LD Waiver Request**





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Any request of LD waiver shall be submitted within thirty (30) days of deducting LD from final bill. Request submitted beyond the timeline shall not be entertained.

**7.1.9. CONTRACT PERFORMANCE BANK GUARANTEE:-**

Associates shall submit within 30 days from the effective date of issue of PO, Security cum Performance Guarantee (SPBG) in the format as per **Annexure B** of tender document from Nationalized / Scheduled Bank encashable with the Bhubaneswar branch of the issuing bank acceptable to TPCODL for **10% of the total PO value** remain valid till the end of the Guarantee Period of contract basing on the stipulated completion period in the PO, plus additional three months claim period. The B.G validity period shall be extended from time to time as may be required under the contract.

**7.1.10. SAFETY PRECAUTIONS:-**

All jobs are to be executed strictly in compliance to the Safety terms and Conditions of Tata Power. Please refer Safety terms and conditions for details. Violation of Safety norms will result in Penalty as mentioned in the document. Any compensation due on account of any type of accident at site shall be to the contractor's account.

**7.1.11. WORKMAN COMPENSATION:**

The Contractor shall take out a comprehensive insurance policy under the Workman Compensation Act to cover such workers, who will be engaged to undertake the jobs covered under this Work Order and a copy of this insurance policy will be given to Engineer-in-charge solely for their information, reference and records and Official use. The Contractor shall ensure that such insurance policies are kept at all times valid.

**7.1.12. SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT :**

The BA shall provide the following documents to the Project Department

Outline program of survey, production, inspection, testing, delivery, survey, erection, pre-commissioning and commissioning in chart form. Included in the program will be the detailed schedule of drawing to be submitted. Along with, the periodic progress report shall be submitted. The Drawings and Guaranteed Technical particulars (GTP), Type test report, QAP of all bought out material of approved make specified in the tender shall be submitted prior to inspection.

**7.1.12. INSPECTION:**

i) PRE DISPATCH INSPECTION – The BA shall give advance notice for testing of all bought out materials as per approved make. The required DI shall be issued after which the BA shall lift the materials. The total quantity of



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each bought out material shall be inspected and delivered within maximum two lot. The contractor shall ensure that all the inspected materials along with intact seal at site and the same will be again cross checked and certified in the presence of Engineer in charge.

ii) POST DELIVERY & WORK INSPECTION – The Engineer in charge will inspect all required materials delivered at work site and will inspect the execution of work from time to time up to final completion.

iii) INSPECTION OF COMPLETED WORK – The work after due completion under the supervision of “The Engineer in Charge shall be inspect with the competent authority of Electrical Inspectorate, Govt. of Odisha (if any). All arrangement for this inspection shall be the responsibility of the BA. The statutory fees as applicable regarding Electrical Inspection for entire scope of work shall be deposited by BA.

However, such Inspection and Testing shall not relieve Contractor of his obligation to execute the contract by letter of spirit. Any defects pointed out by the Electrical Inspector (if any), shall be corrected or attended by the BA at his own cost.

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

#### **7.6 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.

#### **7.7 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: [pravin.jain@tpcentraodisha.com](mailto:pravin.jain@tpcentraodisha.com)

#### **8.0 Technical Specification and standards:**

Attached in Annexure-II



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## **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.



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**ANNEXURE I**

**Schedule for Items (BOQ)**

Rate to be quoted as per BOQ given below:

**SITC (Supply, installation, testing & commissioning) for Conversion of existing overhead line to UG cable system around Lord Jagannath Temple and connecting roads, Puri**



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Sl. No.	Item Description	Unit	Quantity	Unit Rate (Excluding GST) (Rs./Unit)	Unit GST (Rs./Unit)	Unit Rate (Including GST) (Rs./ Unit)	Total Amount (Rs.)
a	b	c	d	e	f	g= e+f	h= dxg
<b>SUPPLY</b>							
1	CABLE UG 11KV AL 3C X 400 SQMM XLPE ARMoured <i>(Supply of 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable for 11kV)</i>	M	15,000				
2	JT KIT 11KV XLPE ST TH 3 X 400 SQ MM <i>(Supply of 3 core straight through jointing kits, Heat shrinkable type suitable for 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable)</i>	EA	60				
3	INDOOR TERMINATION KIT-11KV 3C x400 SQMM <i>(Supply of indoor 3 Core termination Kit, Heat shrinkable type suitable for 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable)</i>	SET	130				
4	OUTDOOR TERMNATION KIT-11KV 3CX 400SQMM <i>(Supply of Outdoor 3 Core termination Kit, Heat shrinkable type suitable for 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable)</i>	SET	30				



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5	PIPE HDPE 160MM DIA PN8 PE 80 (Supply of HDPE PE 80-PN8 pipe of 160 mm dia for 400 sq.mm HT cable laying)	M	15,000				
6	RMU 11KV 4WAY 2* 630A BKR O/D (Supply of 4-Way ,630A SF6,11KV RMU with 2 LBS 630A + 2VCB 630A Suitable to connecting 11KV 3C 400 sq.mm Cable)	EA	25				
7	GI PIPE 40MM DIA 3M LENGTH (Supply of Material for pipe earthing : 3 Mtr length , 40 mm dia heavy gauge GI pipe for earthing of RMU)	EA	50				
8	G.I. FLATS 50 X 6 MM (Supply of GI Flat 50X6 for earthing of RMU)	KG	2,500				
9	G.I. FENCING 2MTR HEIGHT (Supply Material for fencing : Galvanized Fencing around each RMU with height 2mtr for external protection .The Dimension will be 4Mtr length x 2Mtr Width. Total Running meter will be 12Mtr.Refer the drawing attached in Specification)	EA	25				
10	COMPACT SUBSTATION 630KVA, 11/0.433KV (Supply of 11kv/433V , 630 KVA CSS with 630 KVA Cast Resin Transformer as per attached specification. Primary side with 3 Way RMU (2 LBS and 1 SF6 CB), Secondary side with one 2000A ACB and 6nos 630A MCCB. All equipments housed in single encloser made of electronically Galvanized sheet as per attached Specification)	EA	1				



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11	COMPACT SUBSTATION 750KVA, 11/0.433KV (Supply of 11kV/433V , 750 KVA CSS with 750 KVA Cast Resin Transformer as per attached specification. Primary side with 3 Way RMU (2 LBS and 1 SF6 CB), Secondary side with one 2000A ACB and 6nos 630A MCCB. All equipments housed in single encloser made of electronically Galvanized sheet as per attached Specification)	EA	12				
12	COMPACT SUBSTATION 1000KVA,11/0.433KV (Supply of 11kV/433V , 1000 KVA CSS with 1000 KVA Cast Resin Transformer as per attached specification. Primary side with 3 Way RMU (2 LBS and 1 SF6 CB), Secondary side with one 2000A ACB and 6nos 630A MCCB. All equipments housed in single encloser made of electronically Galvanized sheet as per attached Specification)	EA	2				
13	GI PIPE 40MM DIA 3M LENGTH (Supply of Material for pipe earthing : 3 Mtr length , 40 mm dia heavy gauge GI pipe for earthing of CSS)	EA	105				
14	G.I. FENCING 2MTR HEIGHT (Supply Material for fencing : Galvanized Fencing around each CSS with height 2mtr for external protection. The Dimension will be 6Mtr length x 5Mtr Width. Total Running meter will be 22Mtr.Refer the drawing attached in Specification)	EA	15				
15	G.I. FLATS 50 X 6 MM (Supply of GI Flat 50X6 for earthing of CSS)	KG	5,250				



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16	CABLE 1.1KV AL 4CX240 SQMM XLPE ARMORED (Supply of 1.1kV , 4core , 240 sq.mm, Al, XLPE, armoured UG cable for LT UG cable Ring feeder between CSS through LT feeder pillar box)	M	25,000				
17	JT. KIT ST.TH.1.1KV XLPE 4X240 HS (Supply of straight through jointing kits Heat shrinkable type suitable for 240 sq.mm, 4 core ,1.1 kV, LT, XLPE UG cable)	EA	50				
18	HS I/D TERM.KIT 1.1KV XLPE UG 4CX240SQMM (Supply of Heat shrinkable Indoor termination kit heavy duty , long Aluminium terminals suitable for 240 sq.mm ,4core , 1.1 kV LT XLPE UG cable)	SET	390				
19	PIPE HDPE 110MM DIA PN10 PE 80 (Supply of HDPE PE 80-PN10 pipe of 110 mm dia for 240 sq.mm LT cable laying)	M	12,500				
20	CABLE 1.1KV AL 4CX240 SQMM XLPE ARMORED (Supply of 1.1kV , 4core , 240 sq.mm, Al, XLPE, armoured UG cable for LT UG cabling from existing DT to LT panel)	M	9,700				
21	HS I/D TERM.KIT 1.1KV XLPE UG 4CX240SQMM (Supply of Heat shrinkable Indoor termination kit heavy duty , long Aluminium terminals suitable for 240 sq.mm ,4core , 1.1 kV LT XLPE UG cable)	SET	246				





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22	HS.O/D TERM.KIT 1.1KV XLPE UG 4Cx240SQMM (Supply of heat shrinkable Outdoor termination kit heavy duty, long Aluminium terminals suitable for 240 sq.mm, 4core 1.1 kV LT XLPE UG cable)	EA	230				
23	LT FEEDER PILLAR BOX 630A, 1PH-24,3PH-8 (Supply of LT Feeder pillar box 1.1 kV class, made out of 3mm thick electronically galvanized sheet with provision of LILO of loop cables and 2No's of 630A MCCB for Incomer supply . Provision for total 32 consumer installations (1phase -24, 3phase -8). Bus bar for 3 Phase & Neutral , fiber board insulation for the inside surface (As per design))	EA	150				
24	GI PIPE 40MM DIA 3M LENGTH (Supply of Material for pipe earthing : 3 Mtr length , 40 mm dia heavy gauge GI pipe for earthing of LT Feeder Pillar Box)	EA	290				
25	G.I. FLATS 50 X 6 MM (Supply of GI Flat 50X6 for earthing of LT Feeder Pillar Box)	KG	14,500				
26	G.I. FENCING 2MTR HEIGHT For LT Feeder Pillar (Supply Material for fencing : Galvanized Fencing around each FDP with height 2mtr for external protection .The Dimension will be 4Mtr length x 2Mtr Width. Total Running meter will be 12Mtr.Refer the drawing attached in Specification)	EA	150				



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27	CABLE 2X 4SQMM CU SERVICE CABLE PVC (Supply of 1.1KV Class 2 Cx 4 sq.mm PVC insulated, CU, Armoured, UG cable for service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations)	M	50,000				
28	2CX6SQMM 1.1KV PVC INSU.UG ARM.CU CABLE (Supply of 1.1KV Class 2 Cx 6sq.mm PVC insulated, CU, Armoured, UG cable for service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations)	M	25,000				
29	4CX10SQMM 1.1KV PVC INSU.UG ARM.AL.CABLE (Supply of 4 Core 10 sq.mm PVC insulated, ,AL, Armoured, UG cable for service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations)	M	20,000				
30	4CX16SQMM 1.1KV PVC INSU.UG ARM.AL.CABLE (Supply of 4 Core 16 sq.mm PVC insulated , AL, Armoured UG cable for service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations)	M	20,000				
31	PVC PIPE 2 INCH (Supply of 2 inch PVC pipe heavy duty (schedule -80) for service cable laying)	M	34,500				
32	CLAMP FOR 2" PVC PIPE (Supply of clamps for fixing 2" PVC pipe)	EA	4,000				



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33	SINGLE PHASE TERMINAL CONNECTOR (Supply terminal connectors for connecting service cable)	EA	20,000				
34	GI BOLTS & NUTS ASSORTED DIMENSION (Supply of GI clamps ,Nuts & bolts for clamping of LT panel ,Meter box and holding of cable at 11KV and LT side of DT and for other requirements)	KG	5000				
35	12CORE 12F OPTICAL FIBRE ARMOURED CABLE (Supply of 12 core fiber optic cables single mode, duct type, fiber armoured laid along 11kv UG cable)	M	15,000				
36	HDPE PLB DUCT SIZE 32/26 MM FOR OF CABLE (Supply of HDPE PLB duct of size 32/26mm for laying of OFC Cables)	M	15,000				
37	ST.THRH.CONNECTR(PLASTIC COUPLER)FOR OFC (Supply of straight through Connectors (Plastic Coupler) and accessories for OFC connection)	SET	37				
38	END CONNECTOR FOR OPTICAL FIBRE CONCTION (Supply of end Connectors and accessories for OFC connection at IRMUs. CSS Transformer)	SET	48				
39	FRTU 4WAY WITH LIU FOR 3WAY & 4WAY RMU (Supply of Standard FRTU 4Way with FRTU networking Equipments consisting of Fiber Optic switch (Mono mode along with associate LIU units for connections of FO Cables) for 3 Way & 4 way RMUs, CSS)	EA	40				



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40	INSU. DISC POLYMER 11KV B&S 70KN (Supply of 11KV polymer Disc Insulator-70KN for DP structure)	EA	18				
41	LIGHTNING ARRESTER 12KV 10KA STION CLS (Supply of 12KV,10KA Lighting Arrester for DP structure)	EA	6				
42	PIN INSU. POLYMER 11KV 24MM FRP DIA (Supply of 11KV Polymer Pin Insulator for DP structure)	EA	18				
43	AB S/W 11KV 400-AMP 3-POLE (Supply of 11KV 400A , 3pole AB Switch for DP structure)	SET	6				
44	H.T. STAY SET COMPLETE (Supply of HT Complete stay Set for DP structure)	SET	12				
45	GI PIPE 40MM DIA 3M LENGTH (Supply of Material for pipe earthing : 3 Mtr length , 40 mm dia heavy gauge GI pipe for eathing of DP structure)	EA	12				
46	G.I. FLATS 50 X 6 MM (Supply of GI Flat 50X6 for earthing of DP structure)	KG	600				
47	HARDWARE FITTINGS B.S.TYPE ( DOG ) (Supply of 11KV hardware fitting 3 bolted , 70KN for DP structure)	EA	18				
48	3BOLT M16 PGCLAMP 100MM2 AAA COND11KV (Supply of PG Clamp 100sqmm for DP structure)	EA	18				



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	SERVICE/ ERECTION						
1	Earth work excavation of soil (Earth work Excavation of soil for laying HT & LT Cable & other associated work)	M3	9,395.23				
2	Earth Excavation for Hard Rock Earth work (Earth work Excavation of Hard rock for laying HT & LT Cable & other associated work)	M3	14,092.85				
3	Shifting of excavated soil to a lead (Shifting of excavated soil to a lead distance of 10 Km)	M3	15,267.25				
4	Filling with fine river sand (Filling with fine river sand after laying of cable inside the trench)	M3	9,395.23				
5	Back filling with excavated soil outside (Back filling with excavated soil outside and above the trench)	M3	8,220.83				
6	Damage of asphalt/tar road and other (Damage of asphalt/tar road and other utilities and reconstructing to bring its original shape after laying of cable in open trench (1mtr Width).BA has follow all the guidelines mentioned by PWD while reconstructing to bring it to original shape)	M	31,000				
7	Bedding with fine river sand (Bedding with fine river sand in cable trench as per cable laying guidelines)	M3	4,955.20				



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8	PCC (1:3:6) with 100mm Thickness (PCC Grade (1:3:6) with Thickness 100mm for site requirement)	M3	495.568				
9	Laying of 11KV,3CX400sqmm XLPE Insulated (Laying commissioning and testing of 11kv, 3C, 400sq.mm XLPE insulated armored UG cable , Laying the cable by open trench ,Tray , Pole or through HDPE pipe)	M	15,000				
10	Laying of 160mm dia PE 80 PN8 open trench, Fixing to DP, Pole (Laying of HDPE Pipe in Trench , Fixing to Pole or DP as per site requirement. All costing for laying & fixing shall be included in costing)	M	15,000				
11	Erection of straight through joint kits(Erection of straight through joint kits , heat shrinkable type suitable for 11kv, 3Core, 400sq.mm, aluminium UG cable Kits for 3core set by providing skilled Jointer. Jointer should have valid certificate)	SET	60				
12	Erection of Indoor terminating kits (Erection of Indoor terminating kits , heat shrinkable type suitable for 11kv Class, 3Core, 400sq.mm, aluminium UG cable Kits for 3core set)	SET	130				
13	Erection of Outdoor terminating kits (Erection of Outdoor terminating kits , heat shrinkable type suitable for 11kv Class, 3Core, 400sq.mm, aluminium UG cable Kits for 3core set by providing skilled Jointer. Jointer should have valid certificate)	SET	30				



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Procurement Department  
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Tender No.: TPCODL/P&S/1000000106/2021-22

14	ECT OF 4W 11KV RMU (Erection, commissioning & Testing of 4 Way RMU two load break switches 630A & 2 SF6 VCB 630 A in the RMU Foundation. The scope involved all loading , unloading, grouting, minor modification at site, Earthing connection to RMU)	EA	25				
15	Prefabricated RCC foundation for RMU (BA has to construct Prefabricated RCC foundation for RMU including supply of all materials as per attached TPCODL Drawing)	EA	25				
16	Erection of Galvanized fencing around RMU (Erection of Galvanized fencing around RMU for external protection)	EA	25				
17	Civil work for fencing around RMU (Detail civil work to be done as per attached TPCODL Drawing)	EA	25				
18	Laying of earthing material 3 mtr for RMU (Supply & installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering & painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earthing in complete shape)	EA	50				
19	Laying of UG cable 1.1 kV , 240 sq.mm, Al (Laying of UG cable 1.1 kV , 240 sq.mm, Aluminium PVC insulation armored cable in Trench, HDPE Pipe, Tray)	M	34,700				



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20	Laying of 110mm dia PE80 PN8 HDPE pipe (Laying of 110mm dia PE80 PN8 HDPE pipe Inside open trench)	M	12,500				
21	Erection of straight through jointing kit (Erection of straight through jointing kits heat shrinkable with accessories for 240 sq.mm 4 core LT UG cable)	SET	50				
22	Erection of outdoor jointing kits heat (Erection of outdoor jointing kits heat shrinkable with accessories for 240 sq.mm 4core LT UG cable)	SET	230				
23	Erection of indoor jointing kits heat (Erection of indoor jointing kits heat shrinkable with accessories for 240 sq.mm 4 core LT UG cable)	SET	636				
24	ECT of Compact type S/S (Erection commissioning and testing compact type package substation 11/0.433 KV consisting of 3 way including loading, unloading, shifting, earthing connection, minor modification at site, Fixing on the foundation)	EA	15				
25	ECT of earthing pit for CSS (Supply & installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering & painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earthing in complete shape)	EA	105				





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26	Erection of galvanized fencing around CSS (Erection of galvanized fencing around each CSS of 2mtr height for external protection as per attached TPCODL drawing)	EA	15				
27	Prefabricated RCC foundation for CSS (BA has to construct RCC foundation for CSS including supply of all materials as per attached TPCODL Drawing)	EA	15				
28	Civil work Fencing around CSS (BA has to the necessary civil work for fixing fencing as per attached CSS fencing drawing)	EA	15				
29	Prefabricated RCC foundation for LT feeder (Prefabricated RCC foundation for LT feeder pillar box including supply of all materials as per attached Drawing)	EA	150				
30	Civil work Fencing around each feeder (BA has to the necessary civil work for fixing fencing as per attached Feeder pillar fencing drawing)	EA	150				
31	ECT of LT feeder pillar box(Erection , commissioning & Testing of LT Feeder pillar Box in the existing Feeder pillar. Scope includes loading, unloading, shifting , Minor modification, grouting at site, Fixing on Foundation)	EA	150				



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32	ECT of earthing pit for feeder pillar <i>(Supply &amp; installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering &amp; painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earthing in complete shape)</i>	EA	290				
33	Erection of galvanized fencing around FDP <i>(Erection of galvanized fencing around each FDP for external protection as per attached TPCODL drawing)</i>	EA	150				
34	Laying of 2 Core 4 sq.mm PVC UG <i>(Laying of 2 Core 4 sq.mm PVC insulated UG cable to be laid by Open trench method )</i>	M	50,000				
35	Laying of 2 Core 6 sq.mm PVC UG <i>(Laying of 4 Core 6 sq.mm PVC insulated UG cable to be laid by Open trench method )</i>	M	25,000				
36	Laying of 4 Core 10 sq.mm PVC UG <i>(Laying of 4 Core 10 sq.mm PVC insulated UG cable to be laid in Open trench method )</i>	M	20,000				
37	Laying of 4 Core 16 sq.mm PVC UG <i>(Laying of 4 Core 16 sq.mm PVC insulated UG cable to be laid in Open trench method )</i>	M	20,000				



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38	Laying of 2 inch PVC Pipe (Laying of 2 inch PVC Pipe for service cable laying)	M	34,500				
39	Erection of clamps for fixing PVC pipe or service cable (Erection of clamps to fix service mains cable)	EA	4,000				
40	Erection terminal connectors at meter end (Erection terminal connectors at meter end & service main)	EA	20,000				
41	Laying of 12 core fiber optic cables (Laying of 12 core fiber optic cables single mode, duct type, fiber armoured laid along 11kV UG cable through HDPE PLB duct size 32/26mm for laying OFC Cable) (The scope includes both laying of OFC with duct pipe))	M	15,000				
42	Installation of straight through Connector (Installation of straight through Connectors (Plastic Coupler) and accessories for OFC connection)	SET	37				
43	Installation of end Connectors (Installation of end Connectors and accessories for OFC connection at IRMU CSS Transformer)	SET	48				
44	Erection commissioning & Testing of FRTU (BA has to necessary wiring for erection, commissioning & Testing for FRTU)	EA	40				
45	Excavation with Back filling (Excavation of soil with Back filling with same earth (L 1m X W 1m X D 2.2m for DP structure erection)	M3	5.4				

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46	PCC (1:3:6) for pole concreting (PCC (1:3:6) for pole concreting of DP structure)	M3	1.2				
47	RCC(1:1,5:3) 0.45X0.45X2.1 for pole concreting (RCC(1:1,5:3) 0.45X0.45X2.1 for pole concreting DP structure )	M3	5.103				
48	Installation of 11KV polymer Disc Insulator (Installation of 11KV polymer Disc Insulator in DP structure)	EA	18				
49	Installation of 11KV hardware fitting (Installation of 11KV hardware fitting in in DP structure)	EA	18				
50	Installation of 12KV,10KA Lighting Arrestor (Installation of 12KV,10KA Lighting Arrestor in DP structure)	EA	6				
51	Installation of 11KV Polymer Pin Insulator (Installation of 11KV Polymer Pin Insulator in DP structure)	EA	18				
52	Installation 11KV 3Pole 400AAB Switch (Installation 11KV 400AAB Switch in DP structure)	SET	6				
53	Erection of Earthing material for DP structure (Supply & installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering & painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earhing in complete shape)	EA	12				

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54	Fixing of HT Stay Set with all accessories (Fixing of HT Stay Set with all accessories in DP structure including all Concreting as per attached TPCODL Drawing)	SET	12				
55	Erection of 3bolted PG Clamp (Erection of 3bolted PG Clamp in DP structure)	EA	18				
56	Dismantling of 11KV line(Dismantling of 11KV line along with all X Cross arm. conductor, pole, pin insulator, Ms channel etc & return to TPCODL Store)	M	13,620				
57	Dismantling of 1.1KV line (Dismantling of 1.1KV line along with all X Cross arm. conductor, pole, pin insulator, Ms channel etc & return to TPCODL Store)	M	17,350				
58	Dismantling of different size DT (Dismantling of different size DT & return back to TPCODL Store)	EA	28				
59	Supply and erection 11 kV DP structure (Supply and erection 11 kV DP structure with Supply 11 mtr long, 160x152x11.Mtr GI WPB pole, GI channel & angle in complete shape as per Engineer In Charge ). (This scope excludes supply and erection of concreting, insulator, H/W fitting, LA, AB switch, earthing, stay set, PG clamp as mentioned above)	SET	6				
60	Erection of Nut bolt (Erection of GI Nut bolt for clamping of LT panel ,Meter box, DP, Pole and holding of cable at 11KV and LT side of DT and for other requirements)	KG	5000				

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61	Supply and Erection of GI Channel (Supply and Erection of GI Channel along with cutting, fixing, welding)	KG	500				
	<b>TOTAL</b>						

**Signature & Seal of the Bidder**

**NOTE:**

- Bidder should quote as per the "Item description" column.
- The bids will be evaluated commercially on the overall all-inclusive price of tender BOQ of each packages.
- All materials shall be supplied and erected by the BA.
- The unit price should be inclusive of freight, insurance, cess and other levies (if any) and exclusive of GST. GST to be mentioned separately. Total price shall be inclusive of all.
- The bidders are advised to quote prices strictly in the above format. Failing to do so, bids are liable for rejection.
- The bidders advised to visit the site and understand scope of the work before price quotation.
- The bidder must fill each and every column of the above format. Mentioning "extra/inclusive" in any of the column may lead for rejection of the price bid.

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- No cutting/ overwriting in the prices is permissible.
- The BA has to arrange all necessary ROW permission for execution of project. No extra charges will be paid by TPCODL for arranging any permission from Govt. authorities or any other agency.
- Guarantee Period : 60 months from the date of handing over the completed installations.
- Completion Period : Six Months for whole project.
- Price shall be quoted considering item description and technical specification.
- Other T&C as per tender documents.



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**Tender No.: TPCODL/P&S/1000000106/2021-22**

## **ANNEXURE II**

**Technical Specification attached separately with the tender**



### **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:*

<b>S. No.</b>	<b>Clause No.</b>	<b>Tender Clause Details</b>	<b>Details of deviation with justifications</b>

*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  
SELF DECLARATION FORM**

Sir,

I/We the undersigned do hereby declare that, I/We have never been blacklist and/or there were no debaring actions against us for any default in supply of material/ equipments or in the performance of the contract entrusted to us in any of the electricity utilities of *India*.

*Seal of the Bidder:*

*Signature:*

*Name:*

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## ANNEXURE V

### 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 VI

### Checklist of all the documents to be submitted with the Bid

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

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

## **Annexure VII**

### **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 VIII**  
**SCOPE OF WORK**

1. The detail route survey to be conducted including route map
2. Complete manufacture, including shops testing & supply of materials from the approved vendor (materials which are to be supplied by the bidder)
3. Providing Engineering drawings related to scope of work for the Owner's approval;
4. Loading, transportation and Unloading from store/ factory to work site or vice versa.
5. Resolve of ROW issue (if any ) by the BA. TPCODL extend support to BA in ROW arrangement.
6. Liaising with autonomous body (Govt. Department- Development Authority /Municipality/NHAI/R&B/ Forest etc.) is under scope of bidder. Any Fees towards the scope paid by BA.
7. The BA has to arrange all necessary ROW permission for execution of project. No extra charges will be paid by TPCODL for arranging any permission from Govt. authorities or any other agency.
8. Necessary statutory clearance from Electrical Inspector of Odisha (if any) other authority (if any) for energizing the Circuit shall be in the scope of this tender. Any statutory fees shall be borne by the BA.
9. Bidders are requested to visit the site to understand the scope of work, site conditions and requirement prior to bidding. Hence, no price/time escalation shall be admissible on these accounts.
10. Prior erecting any extra items for these scheme- rates should be approved from competent authority.
11. The Bidder should have own Safety equipment like Neon Tester, Portable Earth, Earthing discharge rod etc. along with Calibration certificates of all equipment.
12. BA has to ensure safety and Quality of job at site for whole duration and they have to submit the safety report and quality report to TPCODL if required.
13. Taking Over: After commissioning of the complete system and final approval of Electrical Inspector & compliance to punch points observed to the satisfaction of Projects as per statutory requirements, system shall be handed over to TPCODL. In case taking over by TPCODL is delayed because of reasons not attributable to BA, taking over certificate will be issued by TPCODL & Retention money will be released. It would be considered to be deemed taking over by TPCODL after fully compliance by bidder to all applicable successful testing & compliance to Inspections carried out to the satisfaction of TPCODL Projects & further taking over is pending due to reasons attributable to TPCODL beyond a period of one month. However, Retention amount shall be cleared after 03 months at the option of bidder after successful Pre commissioning & EI clearance subject to fulfilling of other terms of Tender (i.e. Submission of EPBG etc) & submission of undertaking from bidder to provide fullest support in future at the time of commissioning.
14. There will be no price escalation given to bidder after issue the PO even if there is delayed the project due to ROW permission.
15. Providing the steel barricading/ any other (as per site requirement) as per TPCODL specification will be in Bidder scope, TPCODL will not give any additional cost for this activity. This line item is not mentioned in Tender BOQ and no extra item will be paid to successful bidder in future for this activity.
16. Loading, Unloading & Transportation of all the scrap material to be stacked counted (where material supplied by BA) and loading unloading, transportation of this scrap to TPCODL site/Store as per direction of Engg In-Charge will be in bidder scope.
17. Crane/ New Generation Hydra shall be used for loading, unloading, handling & erection of equipments at site. Normal Hydra shall not be used at site. In case of site related issues where crane or New Gen Hydra cannot be used due to site constraint or other reasons, the Normal Hydra can be used only post receipt of permission from TPCODL E-I-C.

18. Sign writing of equipments/ poles where ETC of such equipments is also in bidder scope shall be in bidder scope. No additional price shall be given to BA.
19. Providing Infrastructure and Supporting to Jointer for making the joints in HT/LT in O/H Line and underground line shall be in bidder Scope. This item shall not be paid additional.
20. Watch & Ward, de-watering (normal) shall be in bidder scope.
21. Wherever TPCODL specifications are not available relevant IS/IEC to be followed. All Drawings mentioned in the Tender Specification and other required for the completeness of the tender shall be submitted. Drawing submission process shall not be deemed complete if all the requirements are not complied during the submission of the same.
22. The BA has to follow the Contract safety management (CSM) as per GCC. The penalty will be imposed on the bidder for any safety violation as per CSM matrix.
23. The scope of supply items- includes design, Engineering, Manufacturing; testing, loading, unloading, transportation to site storage, preservation, insurance, along with supply of all accessories, tools, spares, O&M catalogs for successful ITC is in the scope of Bidder.
24. Clearance of Site : The Contractor's shall from time to time during the progress of the Works clear away and remove all surplus materials and rubbish disposal in an approved manner. On completion of the work the Contractor shall remove all Contractors' equipment and leave the whole of the Site clean and in a workable condition, to the satisfaction of the TPCODL. The contractor should rectify any damage occur during execution like road, footpath restoration etc to its original position.

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**SCOPE OF THE MEJOR WORK**

SL.NO	NAME	QTY
1	11KV 400 SQ.MM SQ.MM XLPE UG CABLE	15 KM
2	RMU	25No's
3	Packaged substation 630KVA	2No's
4	Packaged substation 750KVA	12No's
5	Packaged substation 1000KVA	1No's
6	LT FEEDER PILLAR BOX	150
7	LT XLPE 240 SQ.MM	34.7 KM
8	LT SERVICE CABLE	115 KM

**GEOGRAPHICAL AREA TO BE COVERED**

SL.NO.	AREA
1	ROAD FROM CHAITANYA CHHAKA TO JAGANNATH TEMPLE
2	ROAD FROM LOKANATH TEMPLE TO JAGANNATH TEMPLE
3	ROAD FROM MOCHISAHU CHHAKA TO JAGANNATH TEMPLE
4	NARENDRA POKHARI ROAD
5	RED CROSS ROAD



SUPPLY			
Sl. No.	Description of item	UOM	Quantity
<b>A</b>	<b>Supply of materials for laying of 11kV trunk cable ring feeder through 11kV RMUs</b>		
1	CABLE UG 11KV AL 3C X 400 SQMM XLPE ARMoured (Supply of 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable for 11kV)	M	15,000
2	JT KIT 11KV XLPE ST TH 3 X 400 SQ MM (Supply of 3 core straight through jointing kits, Heat shrinkable type suitable for 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable)	EA	60
3	INDOOR TERMINATION KIT-11KV 3C x400 SQMM (Supply of indoor 3 Core termination Kit, Heat shrinkable type suitable for 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable)	SET	130
4	OUTDOOR TERMNATION KIT-11KV 3CX 400SQMM (Supply of Outdoor 3 Core termination Kit, Heat shrinkable type suitable for 11kV , 3 Core , 400 sq.mm, Al, XLPE armoured UG cable)	SET	30
5	PIPE HDPE 160MM DIA PN8 PE 80 (Supply of HDPE PE 80-PN8 pipe of 160 mm dia for 400 sq.mm HT cable laying)	M	15,000
<b>B</b>	<b>Supply of Ring Main Units (RMUs), compact type SF6 gas insulated, 12kV class, extendable , motorised load break switches(LBS) with fault passage indicators and VCB with protective relays , MFM compatible for distribution SCADA/automation</b>		
6	RMU 11KV 4WAY 2* 630A BKR O/D (Supply of 4-Way ,630A SF6,11KV RMU with 2 LBS 630A + 2VCB 630A Suitable to connecting 11KV 3C 400 sq.mm Cable)	EA	25
7	GI PIPE 40MM DIA 3M LENGTH (Supply of Material for pipe earthing : 3 Mtr length , 40 mm dia heavy gauge GI pipe for earthing of RMU)	EA	50
8	G.I. FLATS 50 X 6 MM (Supply of GI Flat 50X6 for earthing of RMU)	KG	2,500
9	G.I. FENCING 2MTR HEIGHT (Supply Material for fencing : Galvanized Fencing around each RMU with height 2mtr for external protection .The Dimension will be 4Mtr length x 2Mtr Width. Total Running meter will be 12Mtr.Refer the drawing attached in Specification)	EA	25
<b>C</b>	<b>Supply of 11 kV/433V CSS (Compact Secondary Substation)</b>		

10	COMPACT SUBSTATION 630KVA, 11/0.433KV (Supply of 11kV/433V , 630 KVA CSS with 630 KVA Cast Resin Transformer as per attached specification. Primary side with 3 Way RMU (2 LBS and 1 SF6 CB), Secondary side with one 2000A ACB and 6nos 630A MCCB. All equipments housed in single encloser made of electronically Galvanized sheet as per attached Specification)	EA	1
11	COMPACT SUBSTATION 750KVA, 11/0.433KV (Supply of 11kV/433V , 750 KVA CSS with 750 KVA Cast Resin Transformer as per attached specification. Primary side with 3 Way RMU (2 LBS and 1 SF6 CB), Secondary side with one 2000A ACB and 6nos 630A MCCB. All equipments housed in single encloser made of electronically Galvanized sheet as per attached Specification)	EA	12
12	COMPACT SUBSTATION 1000KVA,11/0.433KV (Supply of 11kV/433V , 1000 KVA CSS with 1000 KVA Cast Resin Transformer as per attached specification. Primary side with 3 Way RMU (2 LBS and 1 SF6 CB), Secondary side with one 2000A ACB and 6nos 630A MCCB. All equipments housed in single encloser made of electronically Galvanized sheet as per attached Specification)	EA	2
13	GI PIPE 40MM DIA 3M LENGTH (Supply of Material for pipe earthing : 3 Mtr length , 40 mm dia heavy gauge GI pipe for earthing of CSS)	EA	105
14	G.I. FENCING 2MTR HEIGHT (Supply Material for fencing : Galvanized Fencing around each CSS with height 2mtr for external protection. The Dimension will be 6Mtr length x 5Mtr Width. Total Running meter will be 22Mtr.Refer the drawing attached in Specification)	EA	15
15	G.I. FLATS 50 X 6 MM (Supply of GI Flat 50X6 for earthing of CSS)	KG	5,250
<b>D</b>	<b>Supply materials for laying of LT UG cable Ring feeder between CSS through LT feeder pillar box</b>		
16	CABLE 1.1KV AL 4CX240 SQMM XLPE ARMORED (Supply of 1.1kV , 4core , 240 sq.mm, Al, XLPE, armoured UG cable for LT UG cable Ring feeder between CSS through LT feeder pillar box)	M	25,000
17	JT. KIT ST.TH.1.1KV XLPE 4X240 HS (Supply of straight through jointing kits Heat shrinkable type suitable for 240 sq.mm, 4 core ,1.1 kV, LT, XLPE UG cable)	EA	50
18	HS I/D TERM.KIT 1.1KV XLPE UG 4CX240SQMM (Supply of Heat shrinkable Indoor termination kit heavy duty , long Aluminium terminals suitable for 240 sq.mm ,4core , 1.1 kV LT XLPE UG cable)	SET	390
19	PIPE HDPE 110MM DIA PN10 PE 80 (Supply of HDPE PE 80-PN10 pipe of 110 mm dia for 240 sq.mm LT cable laying)	M	12,500
<b>E</b>	<b>Supply materials for laying of LT UG cable from existing DT</b>		

	<b>to LT panel (for 250 KVA one ckt and 500 KVA two ckt )</b>		
20	CABLE 1.1KV AL 4CX240 SQMM XLPE ARMORED (Supply of 1.1kV, 4core, 240 sq.mm, Al, XLPE, armoured UG cable for LT UG cabling from existing DT to LT panel)	M	9,700
21	HS I/D TERM.KIT 1.1KV XLPE UG 4CX240SQMM (Supply of Heat shrinkable Indoor termination kit heavy duty, long Aluminium terminals suitable for 240 sq.mm, 4core, 1.1 kV LT XLPE UG cable)	SET	246
22	HS.O/D TERM.KIT 1.1KV XLPE UG 4Cx240SQMM (Supply of heat shrinkable Outdoor termination kit heavy duty, long Aluminium terminals suitable for 240 sq.mm, 4core 1.1 kV LT XLPE UG cable)	EA	230
<b>F</b>	<b>Supply of LT Feeder Pillar Box (FPB)</b>		
23	LT FEEDER PILLAR BOX 630A, 1PH-24,3PH-8 (Supply of LT Feeder pillar box 1.1 kV class, made out of 3mm thick electronically galvanized sheet with provision of LILO of loop cables and 2No's of 630A MCCB for Incomer supply. Provision for total 32 consumer installations (1phase -24, 3phase -8). Bus bar for 3 Phase & Neutral, fiber board insulation for the inside surface (As per design))	EA	150
24	GI PIPE 40MM DIA 3M LENGTH (Supply of Material for pipe earthing : 3 Mtr length, 40 mm dia heavy gauge GI pipe for earthing of LT Feeder Pillar Box)	EA	290
25	G.I. FLATS 50 X 6 MM (Supply of GI Flat 50X6 for earthing of LT Feeder Pillar Box)	KG	14,500
26	G.I. FENCING 2MTR HEIGHT For LT Feeder Pillar (Supply Material for fencing : Galvanized Fencing around each FDP with height 2mtr for external protection. The Dimension will be 4Mtr length x 2Mtr Width. Total Running meter will be 12Mtr. Refer the drawing attached in Specification)	EA	150
<b>G</b>	<b>Supply of UG cable service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations</b>		
27	CABLE 2X 4SQMM CU SERVICE CABLE PVC (Supply of 1.1KV Class 2 Cx 4 sq.mm PVC insulated, CU, Armoured, UG cable for service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations)	M	50,000
28	2CX6SQMM 1.1KV PVC INSU.UG ARM.CU CABLE (Supply of 1.1KV Class 2 Cx 6sq.mm PVC insulated, CU, Armoured, UG cable for service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations)	M	25,000
29	4CX10SQMM 1.1KV PVC INSU.UG ARM.AL.CABLE (Supply of 4 Core 10 sq.mm PVC insulated, AL, Armoured, UG cable for service mains inside PVC pipes from the LT feeder pillar boxes to individual consumer installations)	M	20,000
30	4CX16SQMM 1.1KV PVC INSU.UG ARM.AL.CABLE (Supply of 4 Core 16 sq.mm PVC insulated, AL, Armour UG cable for service mains inside PVC pipes from the LT feeder	M	20,000

	<i>pillar boxes to individual consumer installations)</i>		
<b>H</b>	<b>Supply of 2 inch PVC pipe heavy duty (schedule -80) for above size service cable laying.</b>		
31	PVC PIPE 2 INCH <i>(Supply of 2 inch PVC pipe heavy duty (schedule -80) for service cable laying)</i>	M	34,500
<b>I</b>	<b>Supply of Service main cable Accessories</b>		
32	CLAMP FOR 2" PVC PIPE <i>(Supply of clamps for fixing 2" PVC pipe)</i>	EA	4,000
33	SINGLE PHASE TERMINAL CONNECTOR <i>(Supply terminal connectors for connecting service cable)</i>	EA	20,000
<b>J</b>	<b>Supply of GI clamps ,Nuts &amp; bolts</b>		
34	GI BOLTS & NUTS ASSORTED DIMENSION <i>(Supply of GI clamps ,Nuts &amp; bolts for clamping of LT panel ,Meter box and holding of cable at 11KV and LT side of DT and for other requirements)</i>	KG	5000
<b>K</b>	<b>Supply of 12 core fiber optic cables single mode, duct type, fibre armoured with duct pipe, laid along 11kV UG cable.</b>		
35	12CORE 12F OPTICAL FIBRE ARMOURED CABLE <i>(Supply of 12 core fiber optic cables single mode, duct type, fiber armoured laid along 11kV UG cable)</i>	M	15,000
36	HDPE PLB DUCT SIZE 32/26 MM FOR OF CABLE <i>(Supply of HDPE PLB duct of size 32/26mm for laying of OFC Cables)</i>	M	15,000
37	ST.THRH.CONNECTR(PLASTIC COUPLER)FOR OFC <i>(Supply of straight through Connectors (Plastic Coupler) and accessories for OFC connection)</i>	SET	37
38	END CONNECTOR FOR OPTICAL FIBRE CONCTION <i>(Supply of end Connectors and accessories for OFC connection at IRMUs. CSS Transformer)</i>	SET	48
<b>L</b>	<b>Supply of FRTU installed with RMU,CSS for SCADA automation</b>		
39	FRTU 4WAY WITH LIU FOR 3WAY & 4WAY RMU <i>(Supply of Standard FRTU 4Way with FRTU networking Equipments consisting of Fibre Optic switch (Mono mode along with associate LIU units for connections of FO Cables) for 3 Way &amp; 4 way RMUs, CSS)</i>	EA	40
	<b>DP Structure</b>		
40	INSU. DISC POLYMER 11KV B&S 70KN <i>(Supply of 11KV polymer Disc Insulator-70KN for DP structure)</i>	EA	18
41	LIGHTNING ARRESTER 12KV 10KA STION CLS <i>(Supply of 12KV,10KA Lighting Arrester for DP structure)</i>	EA	6
42	PIN INSU. POLYMER 11KV 24MM FRP DIA <i>(Supply of 11KV Polymer Pin Insulator for DP structure)</i>	EA	18
43	AB S/W 11KV 400-AMP 3-POLE	SET	6

	<i>(Supply of 11KV 400A , 3pole AB Switch for DP structure)</i>		
44	H.T. STAY SET COMPLETE <i>(Supply of HT Complete stay Set for DP structure)</i>	SET	12
45	GI PIPE 40MM DIA 3M LENGTH <i>(Supply of Material for pipe earthing : 3 Mtr length , 40 mm dia heavy gauge GI pipe for earthing of DP structure)</i>	EA	12
46	G.I. FLATS 50 X 6 MM <i>(Supply of GI Flat 50X6 for earthing of DP structure)</i>	KG	600
47	HARDWARE FITTINGS B.S.TYPE ( DOG ) <i>(Supply of 11KV hardware fitting 3 bolted ,70KN for DP structure)</i>	EA	18
48	3BOLT M16 PGCLAMP 100MM2 AAA COND11KV <i>(Supply of PG Clamp 100sqmm for DP structure)</i>	EA	18

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SERVICE / ERECTION			
Sl. No.	Description of item	UOM	Quantity
1	Earth work excavation of soil (Earth work Excavation of soil for laying HT & LT Cable & other associated work)	M3	9,395.23
2	Earth Excavation for Hard Rock Earth work (Earth work Excavation of Hard rock for laying HT & LT Cable & other associated work)	M3	14,092.85
3	Shifting of excavated soil to a lead (Shifting of excavated soil to a lead distance of 10 Km)	M3	15,267.25
4	Filling with fine river sand (Filling with fine river sand after laying of cable inside the trench)	M3	9,395.23
5	Back filling with excavated soil outside (Back filling with excavated soil outside and above the trench)	M3	8,220.83
6	Damage of asphalt/tar road and other (Damage of asphalt/tar road and other utilities and reconstructing to bring its original shape after laying of cable in open trench (1mtr Width).BA has follow all the guidelines mentioned by PWD while reconstructing to bring it to original shape)	M	31,000
7	Bedding with fine river sand (Bedding with fine river sand in cable trench as per cable laying guidelines)	M3	4,955.20
8	PCC (1:3:6) with 100mm Thickness (PCC Grade (1:3:6) with Thickness 100mm for site requirement)	M3	495.568
9	Laying of 11KV,3CX400sqmm XLPE Insulated (Laying commissioning and testing of 11kv, 3C, 400sq.mm XLPE insulated armored UG cable , Laying the cable by open trench ,Tray , Pole or through HDPE pipe)	M	15,000
10	Laying of 160mm dia PE 80 PN8 open trench, Fixing to DP, Pole (Laying of HDPE Pipe in Trench , Fixing to Pole or DP as per site requirement. All costing for laying & fixing shall be included in costing)	M	15,000
11	Erection of straight through joint kits (Erection of straight through joint kits , heat shrinkable type suitable for 11kv, 3Core, 400sq.mm, aluminium UG cable Kits for 3core set by providing skilled Jointer.Jointer should have valid certificate)	SET	60
12	Erection of Indoor terminating kits (Erection of Indoor terminating kits , heat shrinkable type suitable for 11kv Class, 3Core, 400sq.mm, aluminium UG cable Kits for 3core set)	SET	130
13	Erection of Outdoor terminating kits (Erection of Outdoor terminating kits , heat shrinkable type suitable for 11kv Class, 3Core, 400sq.mm, aluminium UG cable Kits for 3core set by providing skilled Jointer. Jointer should have valid certificate)	SET	30

14	ECT OF 4W 11KV RMU (Erection, commissioning & Testing of 4 Way RMU two load break switches 630A & 2 SF6 VCB 630 A in the RMU Foundation. The scope involved all loading , unloading, grouting, minor modification at site, Earthing connection to RMU)	EA	25
15	Prefabricated RCC foundation for RMU (BA has to construct Prefabricated RCC foundation for RMU including supply of all materials as per attached TPCODL Drawing)	EA	25
16	Erection of Galvanized fencing around RMU (Erection of Galvanized fencing around RMU for external protection)	EA	25
17	Civil work for fencing around RMU (Detail civil work to be done as per attached TPCODL Drawing)	EA	25
18	Laying of earthing material 3 mtr for RMU (Supply & installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering & painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earthing in complete shape)	EA	50
19	Laying of UG cable 1.1 kV , 240 sq.mm, Al (Laying of UG cable 1.1 kV , 240 sq.mm, Aluminium PVC insulation armored cable in Trench, HDPE Pipe, Tray)	M	34,700
20	Laying of 110mm dia PE80 PN8 HDPE pipe (Laying of 110mm dia PE80 PN8 HDPE pipe Inside open trench)	M	12,500
21	Erection of straight through jointing kit (Erection of straight through jointing kits heat shrinkable with accessories for 240 sq.mm 4 core LT UG cable)	SET	50
22	Erection of outdoor jointing kits heat (Erection of outdoor jointing kits heat shrinkable with accessories for 240 sq.mm 4core LT UG cable)	SET	230
23	Erection of indoor jointing kits heat (Erection of indoor jointing kits heat shrinkable with accessories for 240 sq.mm 4 core LT UG cable)	SET	636
24	ECT of Compact type S/S (Erection commissioning and testing compact type package substation 11/0.433 KV consisting of 3 way including loading, unloading, shifting, earthing connection, minor modification at site, Fixing on the foundation)	EA	15
25	ECT of earthing pit for CSS (Supply & installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering & painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earthing in complete shape)	EA	105

26	Erection of galvanized fencing around CSS (Erection of galvanized fencing around each CSS of 2mtr height for external protection as per attached TPCODL drawing)	EA	15
27	Prefabricated RCC foundation for CSS (BA has to construct RCC foundation for CSS including supply of all materials as per attached TPCODL Drawing)	EA	15
28	Civil work Fencing around CSS (BA has to the necessary civil work for fixing fencing as per attached CSS fencing drawing)	EA	15
29	Prefabricated RCC foundation for LT feeder (Prefabricated RCC foundation for LT feeder pillar box including supply of all materials as per attached Drawing)	EA	150
30	Civil work Fencing around each feeder (BA has to the necessary civil work for fixing fencing as per attached Feeder pillar fencing drawing)	EA	150
31	ECT of LT feeder pillar box (Erection , commissioning & Testing of LT Feeder pillar Box in the existing Feeder pillar. Scope includes loading, unloading, shifting , Minor modification, grouting at site, Fixing on Foundation)	EA	150
32	ECT of earthing pit for feeder pillar (Supply & installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering & painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earthing in complete shape)	EA	290
33	Erection of galvanized fencing around FDP (Erection of galvanized fencing around each FDP for external protection as per attached TPCODL drawing)	EA	150
34	Laying of 2 Core 4 sq.mm PVC UG (Laying of 2 Core 4 sq.mm PVC insulated UG cable to be laid by Open trench method )	M	50,000
35	Laying of 2 Core 6 sq.mm PVC UG (Laying of 4 Core 6 sq.mm PVC insulated UG cable to be laid by Open trench method )	M	25,000
36	Laying of 4 Core 10 sq.mm PVC UG (Laying of 4 Core 10 sq.mm PVC insulated UG cable to be laid in Open trench method )	M	20,000
37	Laying of 4 Core 16 sq.mm PVC UG (Laying of 4 Core 16 sq.mm PVC insulated UG cable to be laid in Open trench method )	M	20,000
38	Laying of 2 inch PVC Pipe (Laying of 2 inch PVC Pipe for service cable laying)	M	34,500
39	Erection of clamps for fixing PVC pipe or service cable (Erection of clamps to fix service mains cable )	EA	4,000
40	Erection terminal connectors at meter end (Erection terminal connectors at meter end & service main)	EA	20,000



41	Laying of 12 core fibre optic cables (Laying of 12 core fibre optic cables single mode, duct type, fibre armoured laid along 11KV UG cable through HDPE PLB duct size 32/26mm for laying OFC Cable) (The scope includes both laying of OFC with duct pipe))	M	15,000
42	Installation of straight through Connector (Installation of straight through Connectors (Plastic Coupler) and accessories for OFC connection)	SET	37
43	Installation of end Connectors (Installation of end Connectors and accessories for OFC connection at IRMU CSS Transformer)	SET	48
44	Erection commissioning & Testing of FRTU (BA has to necessary wiring for erection, commissioning & Testing for FRTU)	EA	40
45	Excavation with Back filling (Excavation of soil with Back filling with same earth (L 1mX W 1m X D 2.2m for DP structure erection )	M3	5.4
46	PCC (1:3:6) for pole concreting (PCC (1:3:6) for pole concreting of DP structure)	M3	1.2
47	RCC(1:1,5:3) 0.45X0.45X2.1 for pole concreting (RCC(1:1,5:3) 0.45X0.45X2.1 for pole concreting DP structure )	M3	5.103
48	Installation of 11KV polymer Disc Insulator (Installation of 11KV polymer Disc Insulator in DP structure)	EA	18
49	Installation of 11KV hardware fitting (Installation of 11KV hardware fitting in in DP structure)	EA	18
50	Installation of 12KV,10KA Lighting Arrestor (Installation of 12KV,10KA Lighting Arrestor in DP structure)	EA	6
51	Installation of 11KV Polymer Pin Insulator (Installation of 11KV Polymer Pin Insulator in DP structure)	EA	18
52	Installation 11KV 3Pole 400AAB Switch (Installation 11KV 400AAB Switch in DP structure)	SET	6
53	Erection of Earthing material for DP structure (Supply & installation of Materials for masonry work for earth pit, charcoal, salt etc including construction of earthing chamber (2ftx2ft) and RCC/CI (cast iron) slab cover including plastering & painting and testing of IR value is to be carried out by the vendor in presence of TPCODL representative. The scope also includes erection of earthing pipe, GI flat etc for earthing in complete shape)	EA	12
54	Fixing of HT Stay Set with all accessories (Fixing of HT Stay Set with all accessories in DP structure including all Concreting as per attached TPCODL Drawing)	SET	12
55	Erection of 3bolted PG Clamp (Erection of 3bolted PG Clamp in DP structure)	EA	18
56	Dismantling of 11KV line (Dismantling of 11KV line along with all X Cross arm. conductor, pole, pin insulator, Ms channel etc & return to TPCODL Store)	M	13,620
57	Dismantling of 1.1KV line (Dismantling of 1.1KV line along with all X Cross arm. conductor, pole, pin insulator, Ms channel etc & return to TPCODL Store)	M	17,350
58	Dismantling of different size DT (Dismantling of different size DT & return back to TPCODL Store)	EA	28

59	Supply and erection 11 kV DP structure (Supply and erection 11 kV DP structure with Supply 11 mtr long, 160x152x11.Mtr GI WPB pole, GI channel & angle in complete shape as per Engineer In Charge ). (This scope excludes supply and erection of concreting, insulator, H/W fitting, LA, AB switch, earthing, stay set, PG clamp as mentioned above)	SET	6
60	Erection of Nut bolt (Erection of GI Nut bolt for clamping of LT panel ,Meter box, DP, Pole and holding of cable at 11KV and LT side of DT and for other requirements)	KG	5000
61	Supply and Erection of GI Channel (Supply and Erection of GI Channel along with cutting, fixing, welding)	KG	500

**Annexure IX**

**General Conditions of Contract – Attached separately**

**Annexure X**

**Safety Policy and Safety terms and conditions (Attached separately)**

## **Annexure-XI**

### **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: [pkjain@tatapower.com](mailto:pkjain@tatapower.com).

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## Annexure XII



### **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: 15<sup>th</sup> 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: 15<sup>th</sup> June, 2018

**TATA POWER**  
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**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**

<b>Reason for Change</b>	<b>Prepared By</b>	<b>Checked By</b>	<b>Approved by</b>
Revision to accommodate Existing changes in org structure and to simplify the procedure	Rajesh Sharma <i>(Head-Safety Generation)</i>	Suresh Khetwani <i>(Chief - Safety &amp; Environment)</i>  Monish Kumar <i>(Chief -Corporate Contract)</i>	V. V. Namjoshi <i>(Chief Generations)</i>

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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.)

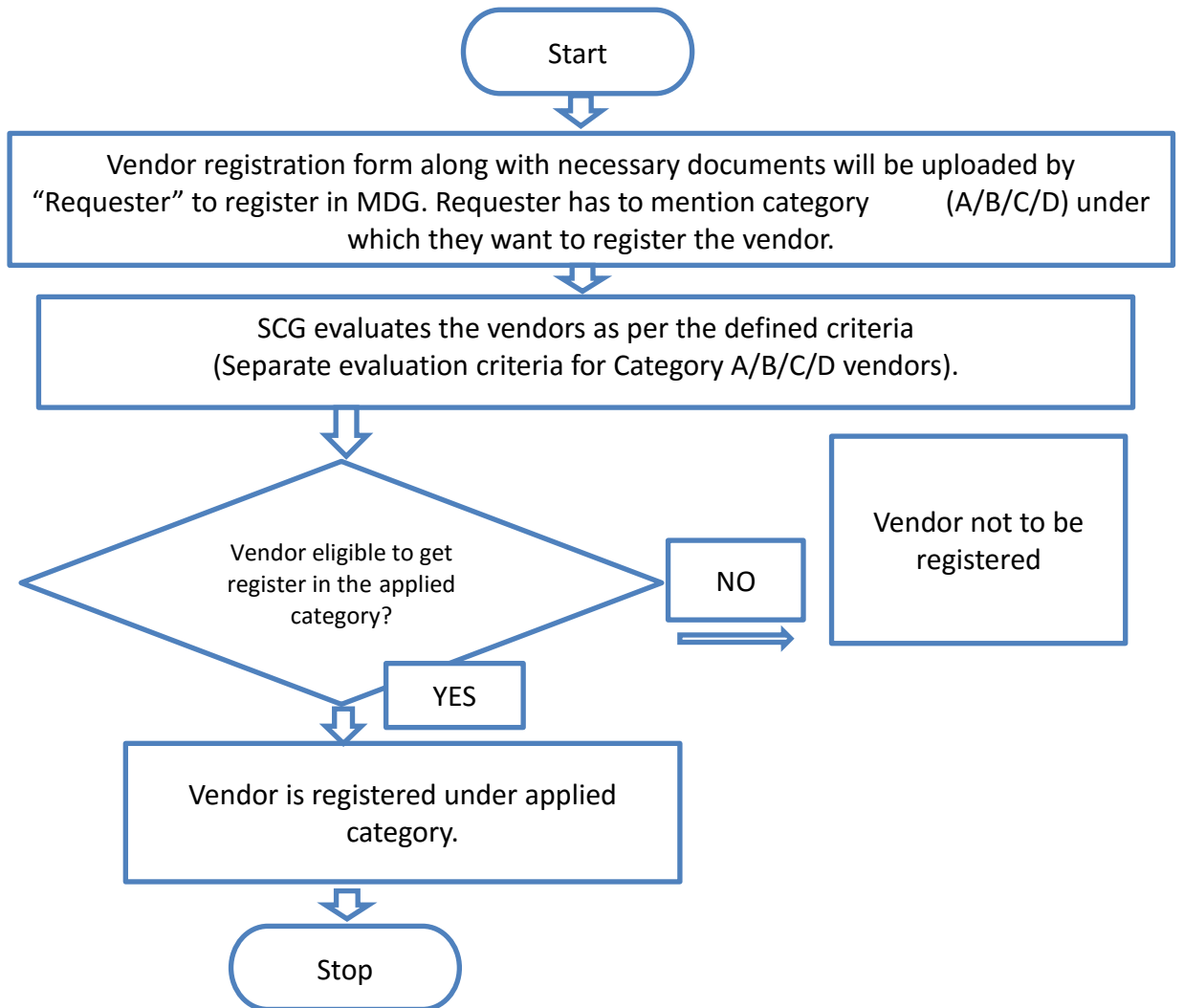
Otherwise the RFQ will be attached only with Safety Terms and Conditions. Long term and low value jobs (see definition) are exempted from the CSCC process.

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**



<b>The Tata Power Company Ltd</b>		<i>Contractor's Safety Code of Conduct</i>
<i>Document No. TPSMS/GSP/CSM/015 REV 05</i>		<i>Date of Issue: 30/07/2020</i>

## 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 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		<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th>Year 1 (Last FY)</th> <th>Year 2</th> <th>Year 3</th> </tr> </thead> <tbody> <tr> <td>LTIFR</td> <td></td> <td></td> <td></td> </tr> <tr> <td>LTISR</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Year 1 (Last FY)	Year 2	Year 3	LTIFR				LTISR			
	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:

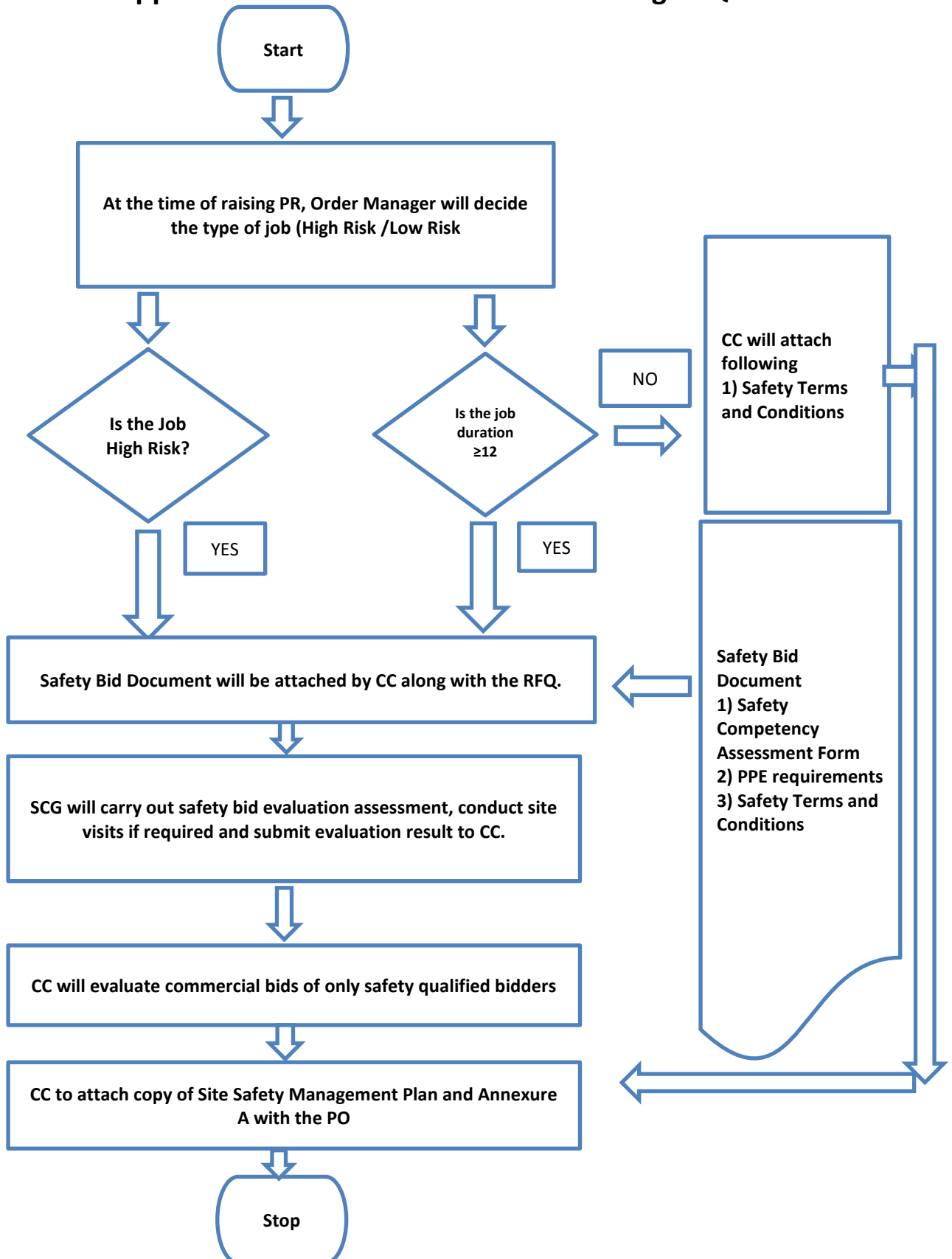
Sr No	Description of violation	Severity	Penalty
1.	Working without Permit	5	5000/-
2.	Untrained (TPSDI) worker on high-risk jobs.	5	5000/-
3.	Unhygienic/Bad condition of PPE	2	250/-
4.	Not following Tata Power Procedure & Standard	4	2000/-
5.	Unsafe Act/Condition of Severity 4	4	2000/-
6.	Unsafe Act/Condition 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	500/
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 arrester 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"> <li>• First Time</li> </ul>	3	Warning
101.	<ul style="list-style-type: none"> <li>• Second Time</li> </ul>	4	1000/-
102.	<ul style="list-style-type: none"> <li>• Third Time</li> </ul>	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					
<b>Total Manpower</b>					

#### 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.



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## 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			
<b>Scope of work: -</b>			
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><b>Fall Protection Measures:</b> (Where Work at height cannot be avoided)</p>							
<p><b>Control Measures for Electrical Hazards</b></p>							
<p><b>Others Hazard if any</b> (please provide details)</p>							
<p><b>Hazardous Substances to be used in job :</b> (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.
--	---	--	--	---	---	---	---

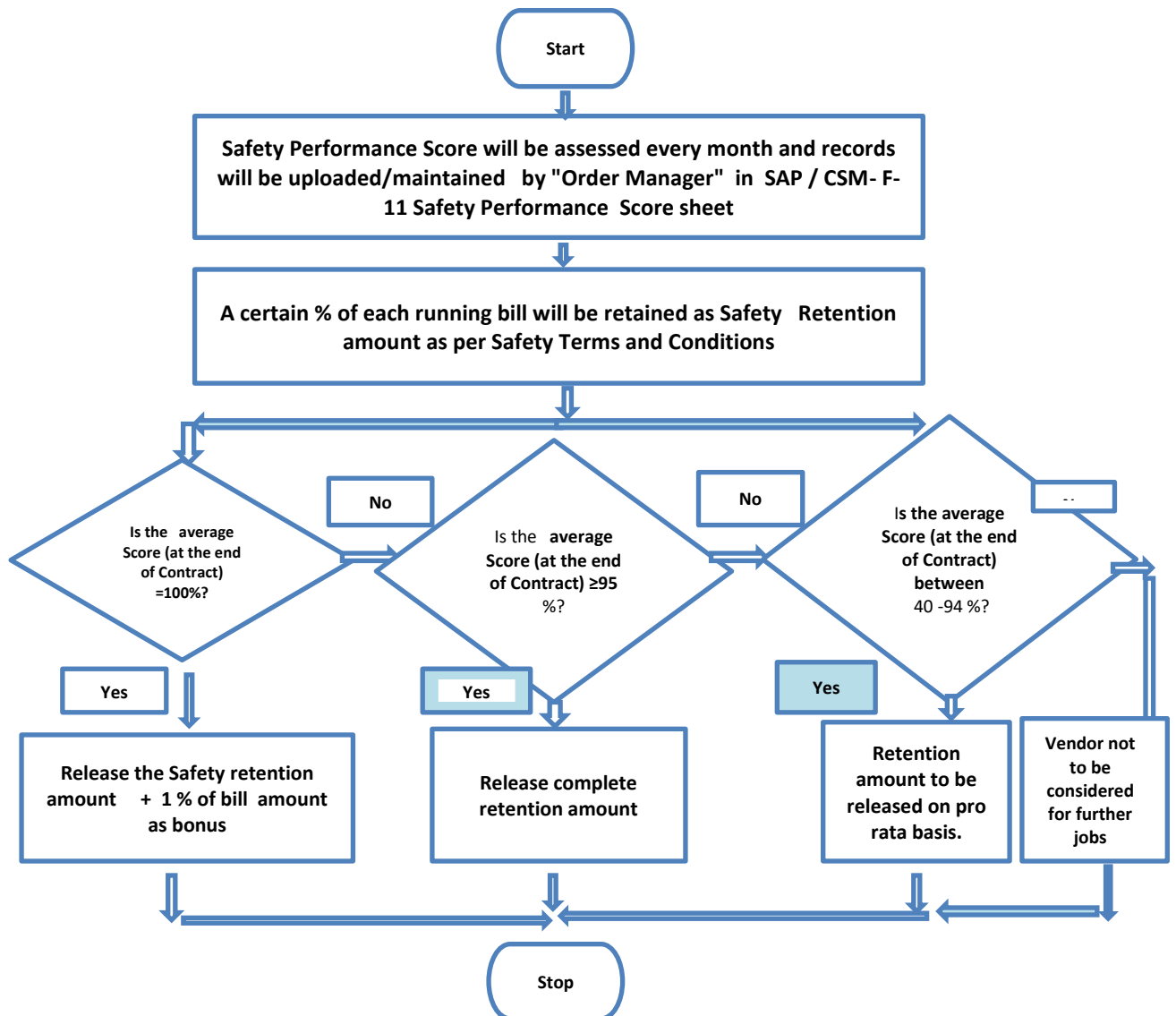
**10.0 First Aid facilities and Nearby Hospitals Details**

	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
<b>Lead Indicator</b>						
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		
<b>Lag Indicator</b>						
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		
					<b>Final Score</b>	
					<b>Invoice Value</b>	
					<b>Amount to be released</b>	

**Safety Performance Evaluation Criteria**

**Lead Indicators**

	<b>Target</b>			
% of Employee certified in TPSDI/Authorized agency	50%	100%	Less than 100%	
Score		10	5	
	<b>Target</b>			
CFSA score	<=1.49	1.5 to 2.5	2.51 to 3.5	>=3.51
Score	20	15	10	0
	<b>Target</b>			
Monthly inspection completed for Critical Equipment, lifting Tools & Tackles and hand tools used at site	>=80%	79 to 50%	<50%	
Score	10	7	0	
	<b>Target</b>			
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

<b>The Tata Power Company Ltd</b>		<i>Contractor's Safety Code of Conduct</i>
<i>Document No. TPSMS/GSP/CSM/015 REV 05</i>		<i>Date of Issue: 30/07/2020</i>

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		
	<b>Total</b>	<b>100</b>		

**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
	<b>Total</b>	<b>100</b>		

**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
Sl. 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		
<b>Total</b>			<b>25</b>	

**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	<b>Safety Officer</b>	Marks	
		≥80% of employees	5	
		50 to 79 % of employee	2.5	
		<50%	0	
		<b>Safety Supervisor</b>	Marks	
		≥80% of employees	10	
		50 to 79 % of employee	6	
		<50%	0	
		<b>Workmen</b>	Marks	
		≥80% of employees	10	
		50 to 79 % of employee	6	
		<50%	0	
<b>Total</b>			<b>25</b>	

**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	
<b>Total</b>			<b>15</b>	

### 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	<b>Safety Officer (1 per 500 workers)</b>	<p><b>Qualification-</b> Officer shall possess Advance Diploma In Industrial Safety by state technical board.</p> <p><b>Experience-</b> Minimum 1-year experience in relevant field as mentioned in the job in PR.</p>	5	
	<b>Safety Supervisor (1 per work site up to max. 50 workers)</b>	<p><b>Qualification-</b> Supervisor shall possess ITI/ Diploma in relevant field.</p> <p><b>Experience-</b> Minimum 2-year experience in relevant field as mentioned in the job in PR.</p> <p><b>Training –</b> Trained and certified by TPSDI or equivalent institute in relevant safety procedures.</p> <p><b>Note:</b> On request of the contractor/Users -TPDSI should vet &amp; certify the skilled &amp; experienced</p>	5	

		Technician if Technical Qualification is not adequate.		
	<b>Technician (Skilled workers as electrician, rigger, fitter, welder, cable jointer, line men etc)</b>	<b>Experience-</b> Minimum 2 year experience in relevant field as mentioned in the job in PR.  <b>Training</b> – Trained and certified by TPSDI or equivalent institute in relevant safety procedures.	5	
<b>Tools &amp; Tackles</b>	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	
<b>Safety Records</b>	Safety Records	Safety Records for last 3 years (as per vendor or as per our knowledge) – Recommendation?	15	
<b>Safety Plan</b>	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	
<b>Accredited Bodies certificate</b>	ISO-9001	ISO-9001	2	
	ISO-14001	ISO-14001	3	
	OHSAS 18001 ISO 45000	OHSAS 18001/ISO 45000	15	
<b>Total Score</b>				

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:**

<b>Checklist to be used: During site visit to check the adequacy Safety systems.</b>			
		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		
	<b>Total Score</b>		
	<b>Site Visit Score</b>		

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	Unsafe Condition	
1														
	<b>Sub Totals</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	<b>% of Observed People Working Safely</b>													
	<b>Number of Violations</b>													
	<b>Average Severity of Violations</b>													
	<b>Number of Severity 4 &amp; 5 Violations</b>													
	<b>% of 4 &amp; 5 Violations</b>													
	<b>Approximate Number of Workers Observed</b>													
	<b>Number of People on Site</b>													
	<b>% of Workers Observed</b>													

## 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.					



**TECHNICAL BOOKLET**


**OF**

**GENERAL TECHNICAL PARTICULARS AND DRAWINGS**

ENGINEERING AND QUALITY DEPARTMENT


DOCUMENT No: - TPCODL -ENGG. - 001 Rev:00

Date Of Issue: - 05<sup>th</sup> July 2021


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30.0	55mm <sup>2</sup> , 80mm <sup>2</sup> , 100mm <sup>2</sup> AND 148 mm <sup>2</sup> AAA CONDUCTOR .....	59
31.0	3x95+1x70+1x16 mm <sup>2</sup> , 3x70+1x50+1x16 mm <sup>2</sup> , 3x50+1x35+1x16 mm <sup>2</sup> , 3x35+1x25+1x16 mm <sup>2</sup> , 3x50+1x35 mm <sup>2</sup> , 1x35+1x25 mm <sup>2</sup> , 3x35+1x25 mm <sup>2</sup> LT XLPE AB CABLE .....	61
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33.0	11kV 3x95 mm <sup>2</sup> , 3x120 mm <sup>2</sup> , 3x300 mm <sup>2</sup> AND 3x400 mm <sup>2</sup> XLPE ALUMINIUM ARMOURED CABLE .....	99
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## 1.0 GALVANIZATION (Spec: TPCO-OTH-010)

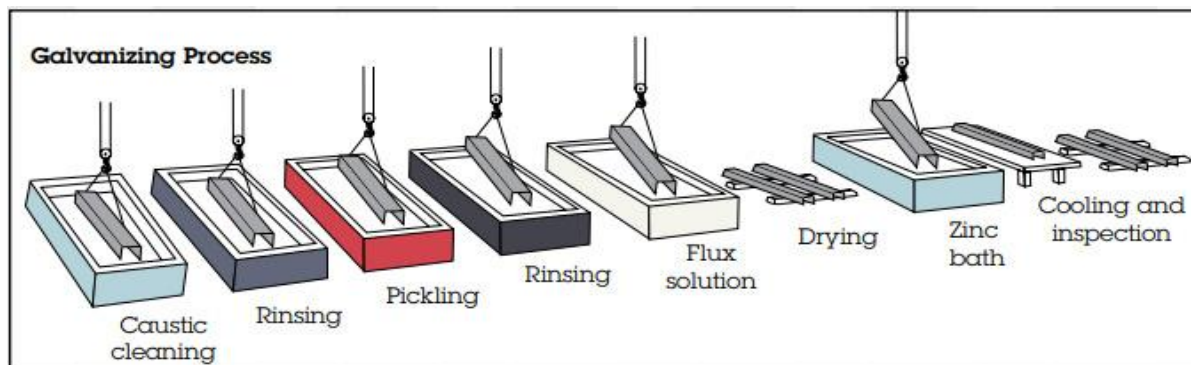
Zinc Coating thickness/ Mass of Zinc Coating to be as per mentioned in Tender /TPCODL requirements. Minimum Zinc Coating to be as detailed below:


Sl. No.	Product	Minimum Value for Average Mass of Coating (g/m <sup>2</sup> )	Coating thickness in microns (No of Dip)
1	Fabricated steel articles: a) 5 mm thick and over b) Under 5 mm, but not less 2 mm c) Under 2 mm, but not less than 1.2 mm d) All type Steel Pole	705 610 340 850	100 (6Dip) 86 (5 Dip) 48 (3 Dip) 120 (7 Dip)
2	Threaded items (Not bolts etc.) other than tubes and tube fittings: a) 10 mm dia and over b) Under 10 mm dia	460 320	65 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:




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## 2.0 9 Mtrs. 300 kg PSC POLE

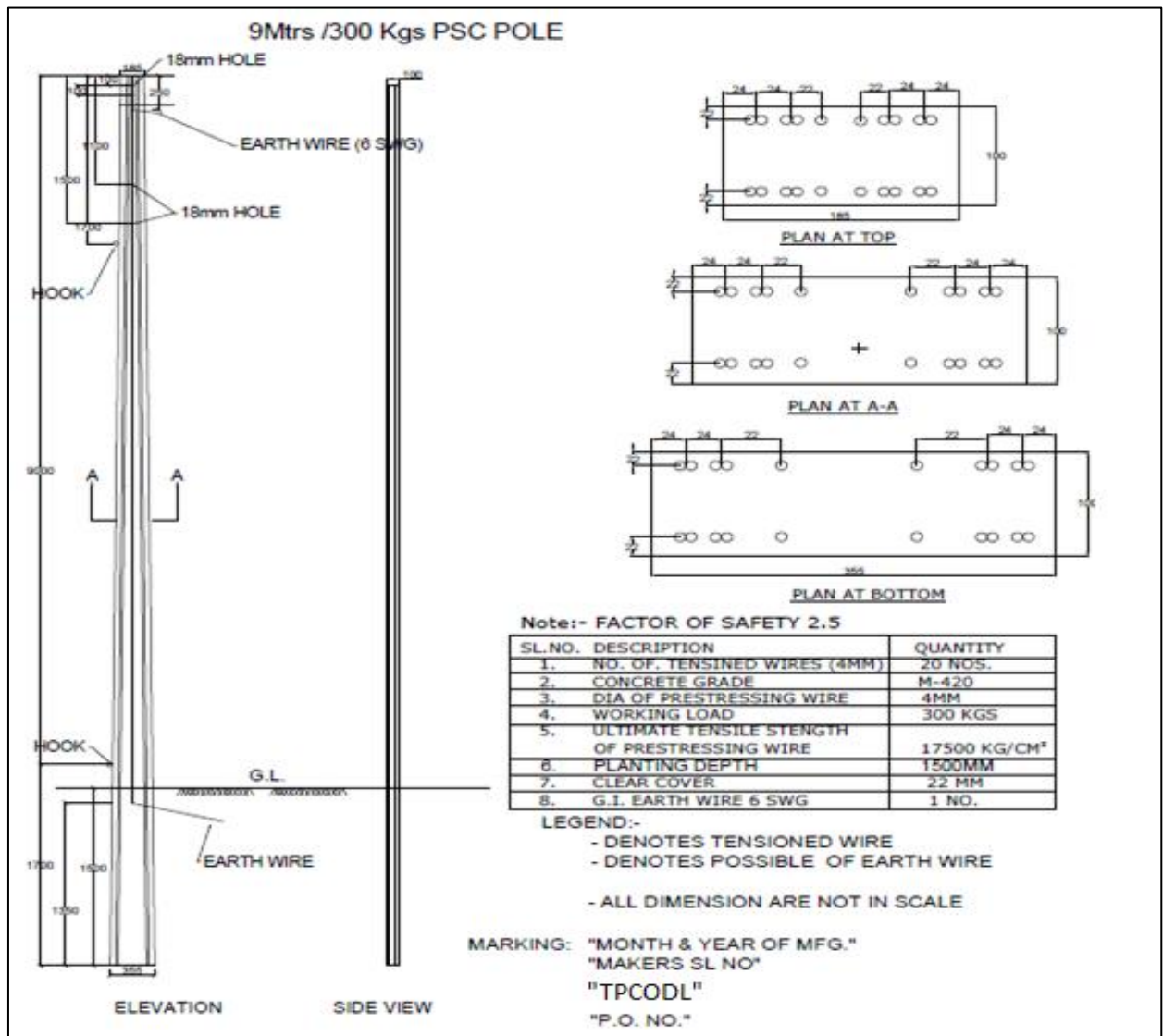
### GENERAL TECHNICAL PARTICULARS

SI. No.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Type of Pole	PSC
2	Factor of Safety	2.5
3	Overall Length of Pole (Meter)	9Mtr
4	Working Load (Kg.)	300
5	Point of application of Load (below top) (mm)	600
6	Depth of Plantation(mm)	1500
7	<b>Overall Dimensions</b>	
a)	Bottom Depth(mm)	355
b)	Top Depth(mm)	185
c)	Breath(mm)	100
8	<b>Reinforcement Details:</b>	
a)	Diameter of Pre-stressing wire	4 mm
b)	No of Tensioned wire	20
c)	Length of each Pre-stressing wire	9 Mtr
d)	Ultimate Tensile Strength (Kg. /cm <sup>2</sup> )	17500
e)	Length of Earth Wire	7.8Mtr (200mm each at Top & Bottom)
9	<b>Concrete Details:</b>	
a)	Cement Type	OPC
b)	Grade	43 Grade
c)	Type	M-420
d)	Concrete mix strength	210 kg/cm <sup>2</sup> at the time of transfer of pre-stress (min)
		420 kg/cm <sup>2</sup> at the age of 28 days (min)
e)	Concrete Qty	0.243 cub mtr
f)	Concrete covering to wires	20 mm
10	Weight (Kg)	607
11	GI Earth Wire with top & bottom 200mm(min) projection outside.	250mm (from Top)
		1350(from bottom)
a	Size of GI Earth Wire	6 SWG
12	<b>IS</b>	
a)	Pole	IS: 1678/2000
b)	Cement	IS: 8041
c)	Aggregates	IS: 383/1970
d)	Pre-Stressing Steel	IS: 6003/1983
e)	Concrete Mix	IS: 456/2000
13	18mm Holes at a distance from Top	100, 200,1000 mm


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SI. No.	TECHNICAL PARTICULARS	DESIRED VALUE
14	Engraved Marking (Punching before galvanisation)	TPCODL
		Makers Serial No.
		Manufacturer's name, Month/Year of manufacture & PO No.
15	Tolerances Dimensions	a) $\pm 15$ mm on overall length of pole
		b) $\pm 5$ mm on sectional dimension
		c) 0.5% on the uprightness of pole

### DRAWINGS



**Note: -All Dimensions are in mm unless noted otherwise specified.**


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### 3.0 WPB GI JOIST POLE (11Mtr/13Mtr)

#### GENERAL TECHNICAL PARTICULARS

SI.NO	TECHNICAL PARTICULARS	DESIRED VALUE
1	Length of Joist in Mtr with +100mm/-0% Tolerance	11mtr / 13mtr
2	Make	TATA/ JINDAL/SAIL <b>(Billet with re rolling not allowed)</b>
3	Weight in kg/m with $\pm 2.5\%$ Tolerance	30.44 Kg. /Mtr. + 2.5%
4	Sectional Area (cm <sup>2</sup> )	38.8
5	Flange slope	90 deg
6	Cutting length tolerance as per IS 12779:89	13000+100 mm (no negative tolerance)
7	Depth(D) of Section (mm) with +3.0mm/3.0mm	152mm+/- 3mm
8	Width(B) of Flange(mm) $\pm 0.7$ mm Tolerance	160mm +/- 3mm
9	Thickness of Flange (Tf) (mm) with $\pm 1.5$ mm Tolerance	9 +/- 1.5mm
10	Thickness of Web (Tw) (mm) with $\pm 1.0$ mm Tolerance	6 +/- 1.0mm
11	Corner Radius of fillet or root (R1) (mm)	15mm
12	Corner Radius of Toe (R2) (mm)	10
13	Moment of Inertia	
a	Ixx (cm <sup>4</sup> ) 1673	1673
b	Iyy (cm <sup>4</sup> ) 615.6	615.6
14	Radius of Gyration (cm)	-
a	Rxx	6.57
b	Ryy	3.98
15	Modulus of Section Zxx(cm <sup>3</sup> )	
a	Zyy(cm <sup>3</sup> )	220.1
b	Zxx(cm <sup>3</sup> )	76.9
16	GI Base Plate in mm	300 x 300 x 12
17	GI Stiffener Flange	150 x 60 x 6
18	GI Stiffener Web	150 x 100 x 6
19	<b>Mechanical Properties</b>	
a)	Grade	E-350A
b)	Yield stress	350 Min Mpa
c)	Tensile stress	490 min Mpa
d)	Elongation	22 min % Max
e)	Bend test	Shall not crack
20	<b>Chemical properties</b>	
a)	Grade	E-350A
b)	Carbon	0.2 % Max
c)	Manganese	1.55 % max

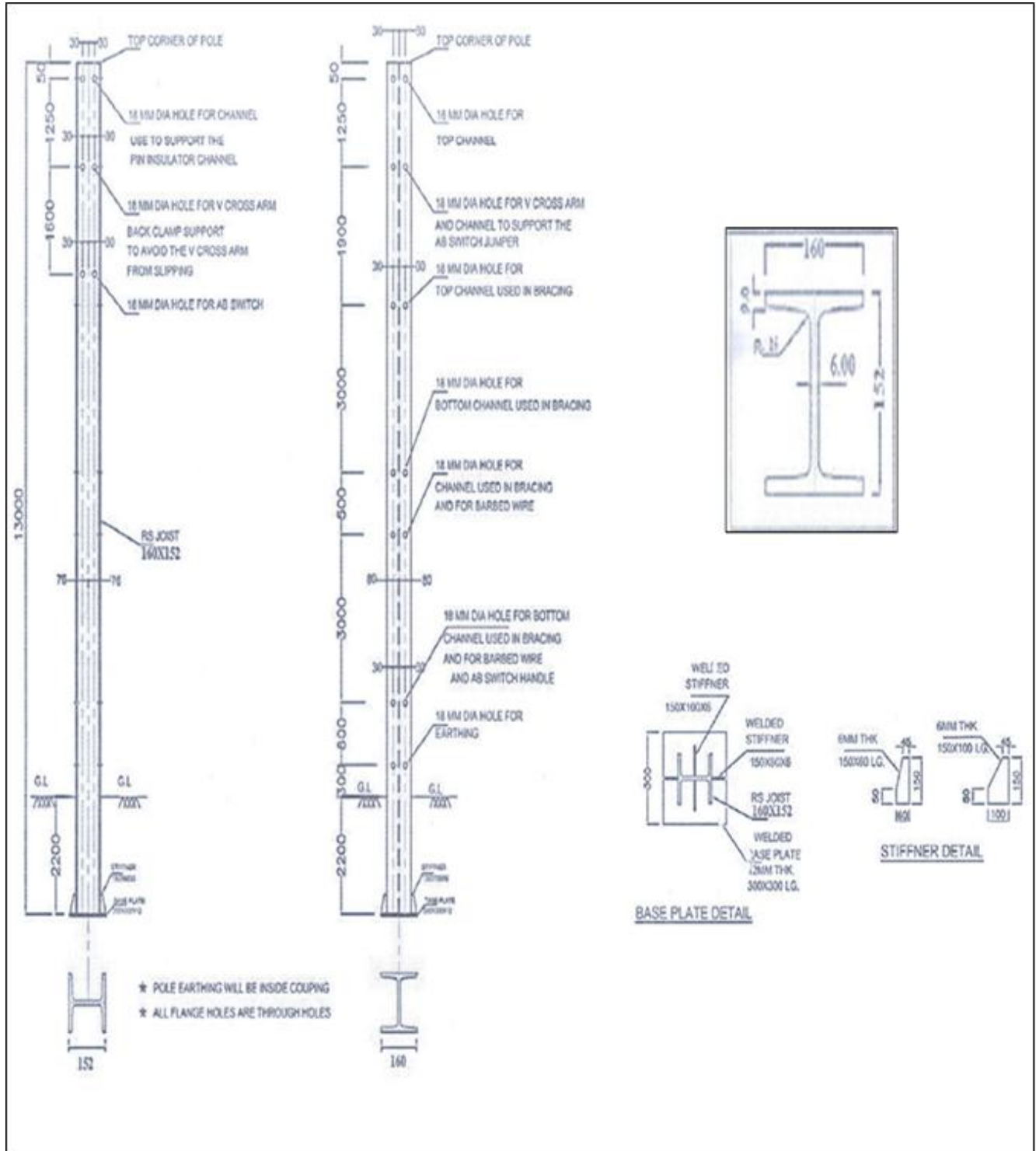


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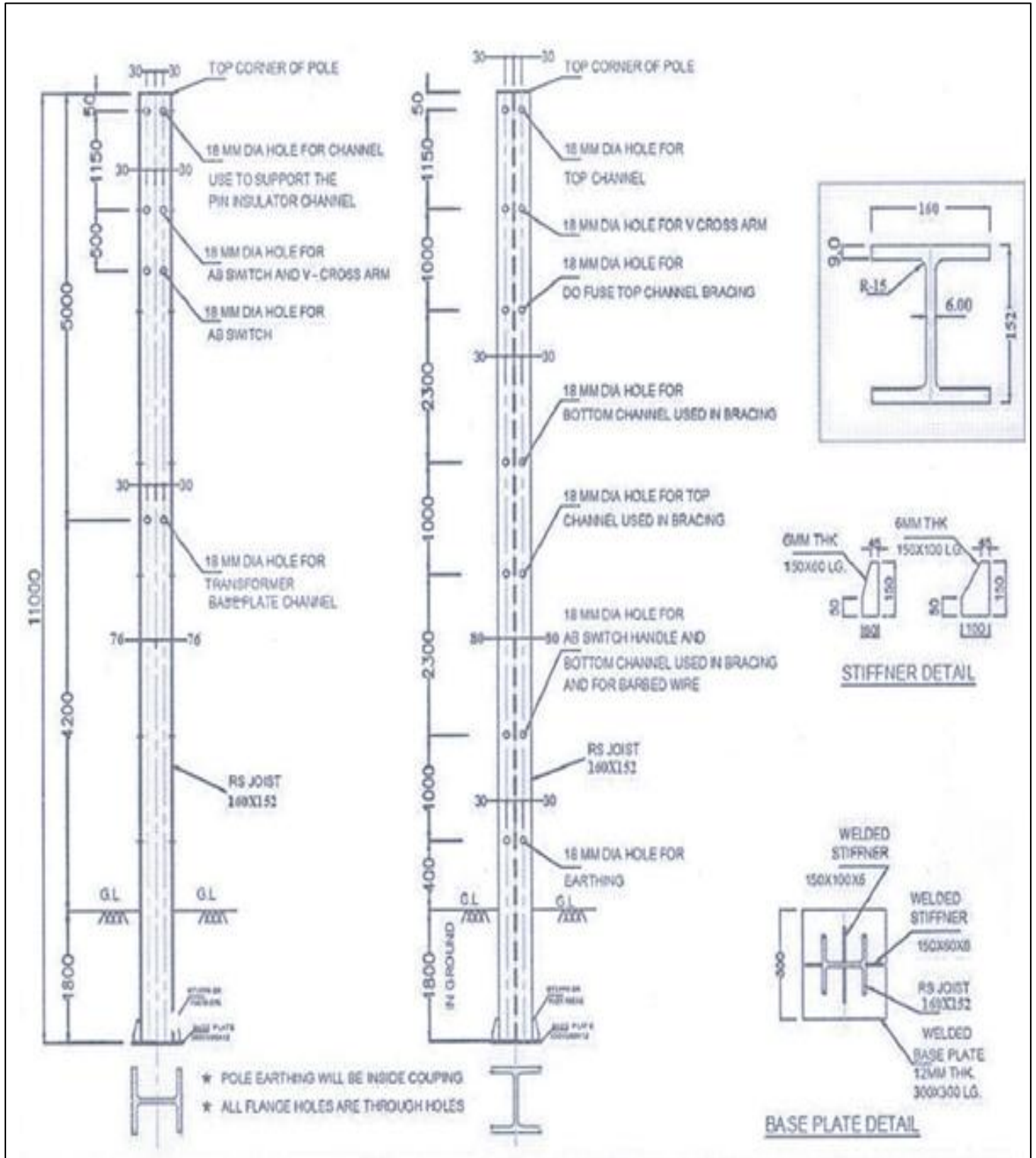
SI.NO	TECHNICAL PARTICULARS	DESIRED VALUE
d)	sulphur	0.045 % max
e)	Phosphorous	0.045 % max
f)	Silicon	0.45 % max
g)	Carbon equivalent	0.47 % max
h)	De oxidation method	Semi killed or killed
21	Supply condition	As rolled
22	Galvanising standard	IS 2633, IS 2629, TPCO-OTH-010
23	Tensile Test:	Requirement as per IS:2062/ 2011 Grade-A
a)	Yield Stress (Mpa)	Min 350
b)	Tensile Strength (Mpa)	Min 490
c)	Lo= (5.65 So) Elongation%	Min 22
d)	Bend Test	Shall not Crack
24	The zinc coating (705 gms per sq.mt / 100Micron) 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.	705 gms per sq.mt / 100 Micron with 6 Dips(min)
25	Zinc Coating Uniformity shall withstand for 6 dips(min) in Dip Test process for WPB Pole	YES
26	Fabrication	1. Hole as per GA drawing provided by TPCODL 2. Arc welding to be used for fabrication / jointing of Base plate & stiffener to the pole
27	Embossing	ISI Mark, WPB 160, Manufacturer Name/ Trade Mark.
28	Engraved Marking (Punching before galvanisation)	TPCODL, P.O No and Date

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## DRAWINGS



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#### 4.0 100x50x6mm, 75x40x4.8 mm GI CHANNEL & 65x65x6mm, 50x50x6 GI ANGLE

##### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE			
		100X50X6 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, TPCO-OTH-010.	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
4	Grade of Steel	E 250 A	E 250 A	E 250 A	E 250 A
5	Minimum Tensile Strength	410 N/mm <sup>2</sup>	410 N/mm <sup>2</sup>	410 N/mm <sup>2</sup>	410 N/mm <sup>2</sup>
6	Yield Stress	250 N/mm <sup>2</sup>	250 N/mm <sup>2</sup>	250 N/mm <sup>2</sup>	250 N/mm <sup>2</sup>
7	Percentage Elongation (Min.) at Gauge Length	23%	23%	23%	23%
8	Bend Test (Internal Dia)	Min-2t	Min-2t	Min-2t	Min-2t
9	Mass of Zinc Coating	705 gm/m <sup>2</sup>	610 gm/m <sup>2</sup>	705 gm/m <sup>2</sup>	705 gm/m <sup>2</sup>
10	Zinc Coating Thickness	86 Micron (5 Dip)	100 Micron (6 Dip)	100 Micron (6 Dip)	100 Micron (6 Dip)
11	Chemical composition	Grade: E 250 (As per IS: 2062)	Grade: E 250 (As per IS: 2062)	Grade: E 250 (As per IS: 2062)	Grade: E 250 (As per IS: 2062)
12	Engraved Marking (Punching before galvanisation)	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.			

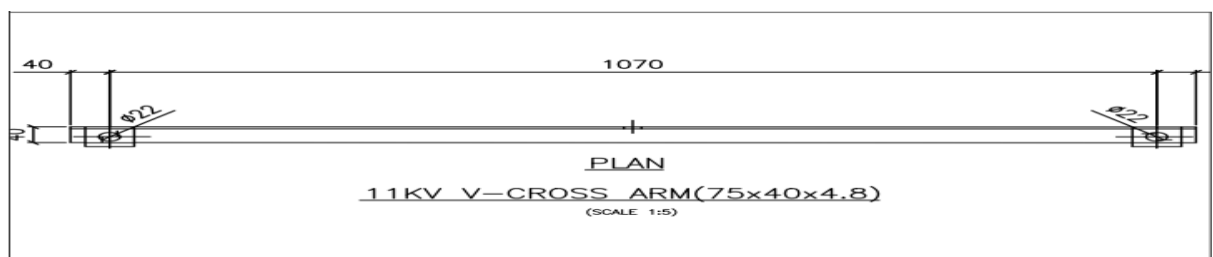
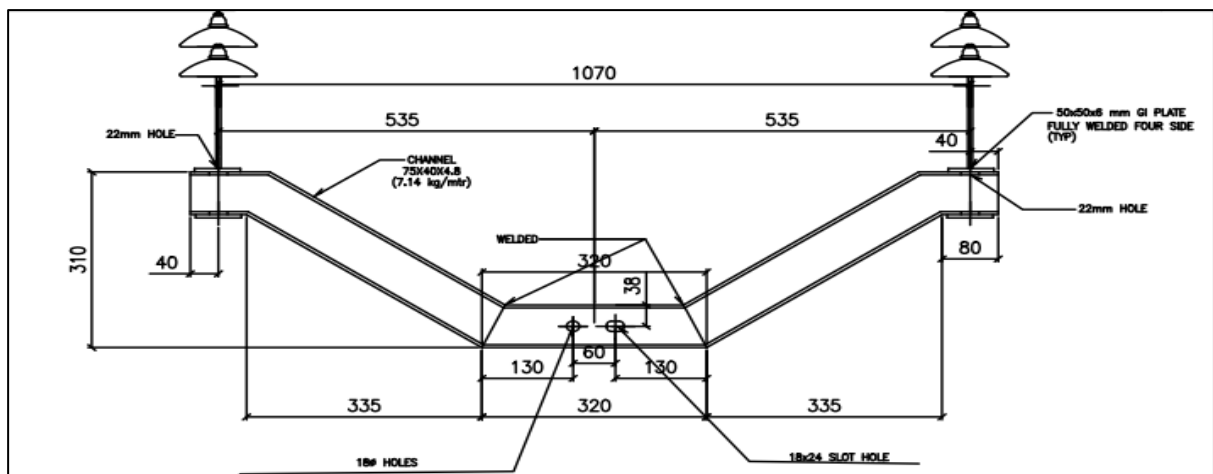
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## 5.0 11 KV GI V CROSS ARM

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Materials	75X40X4.8 mm, 50X50X6 mm
2	Galvanisation process	Hot-Dip Galvanized
2	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
3	Weight of Cross Arm	10.5 KG (Min)
4	Grade of Steel	E 250 A
5	Minimum Tensile Strength	410 N/mm <sup>2</sup>
6	Yield Stress	250 N/mm <sup>2</sup>
7	Percentage Elongation (Min.) at Gauge Length	23%
8	Bend Test (Internal Dia)	Min-2t
9	Mass of Zinc Coating	610 gm/m <sup>2</sup>
10	Zinc Coating Thickness	86 micron (5 Dip)
11	Chemical composition	Grade: E 250 (As per IS: 2062)
12	Engraved Marking (Punching before galvanisation)	TPCODL, Manufacturer's name or trademark, Month & Year of Manufacturing.

### DRAWINGS



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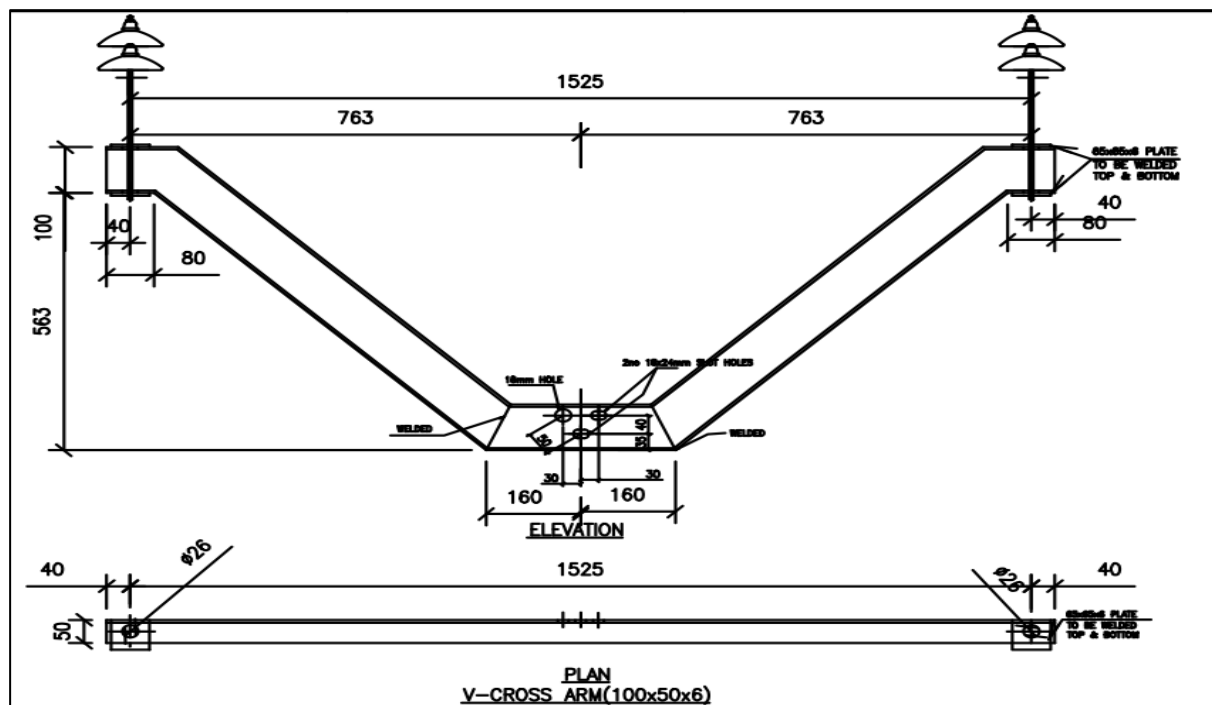
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## 6.0 33 kV GI V CROSS ARM


### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Materials	100X50X6 mm, 65X65X6 mm
2	Galvanisation process	Hot-Dip Galvanized Channel
3	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
4	Weight of Cross Arm	20 KG (Min)
5	Grade of Steel	E 250 A
6	Minimum Tensile Strength	410 N/mm <sup>2</sup>
7	Yield Stress	250 N/mm <sup>2</sup>
8	Percentage Elongation (Min.) at Gauge Length	23%
9	Bend Test (Internal Dia)	Min-2t
10	Mass of Zinc Coating	6 Dip, 705 gm/m <sup>2</sup>
11	Zinc Coating Thickness	100 microns
12	Chemical composition	Grade: E 250 (As per IS: 2062)
13	Engraved Marking (Punching before galvanisation)	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.

### DRAWINGS



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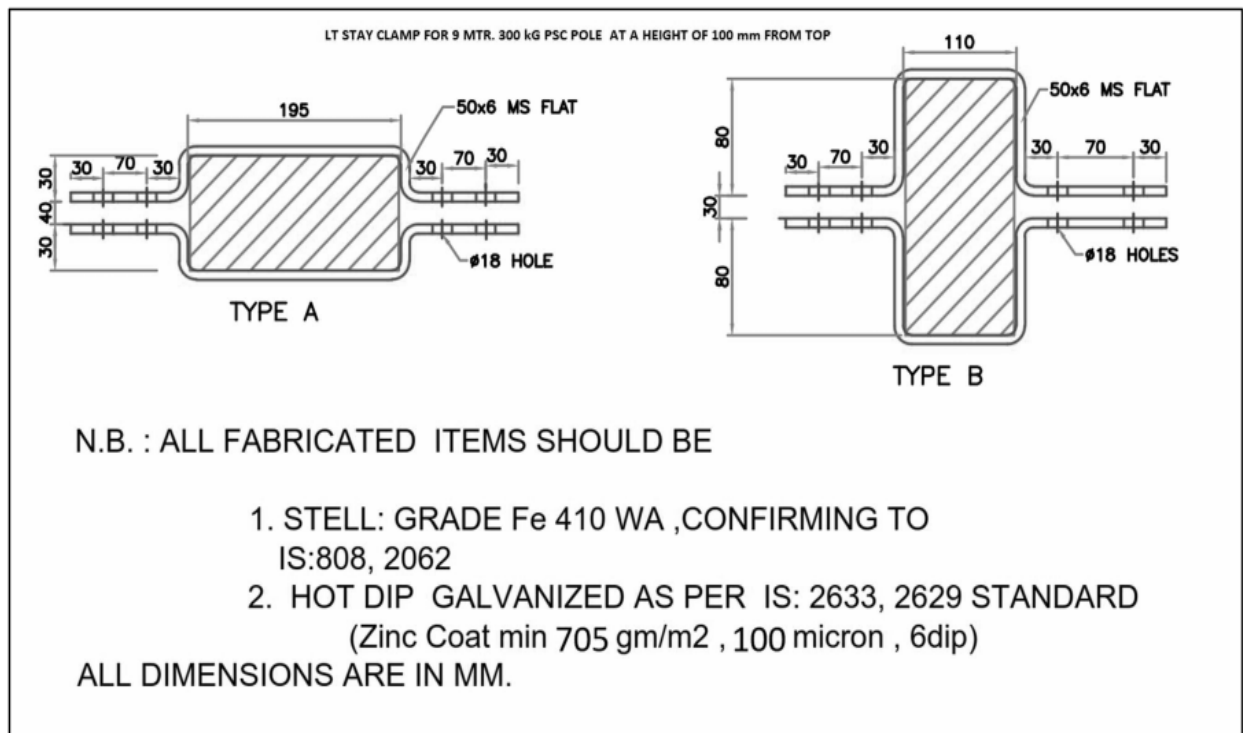
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## 7.0 GI STAY CLAMP (FOR LT AND HT)

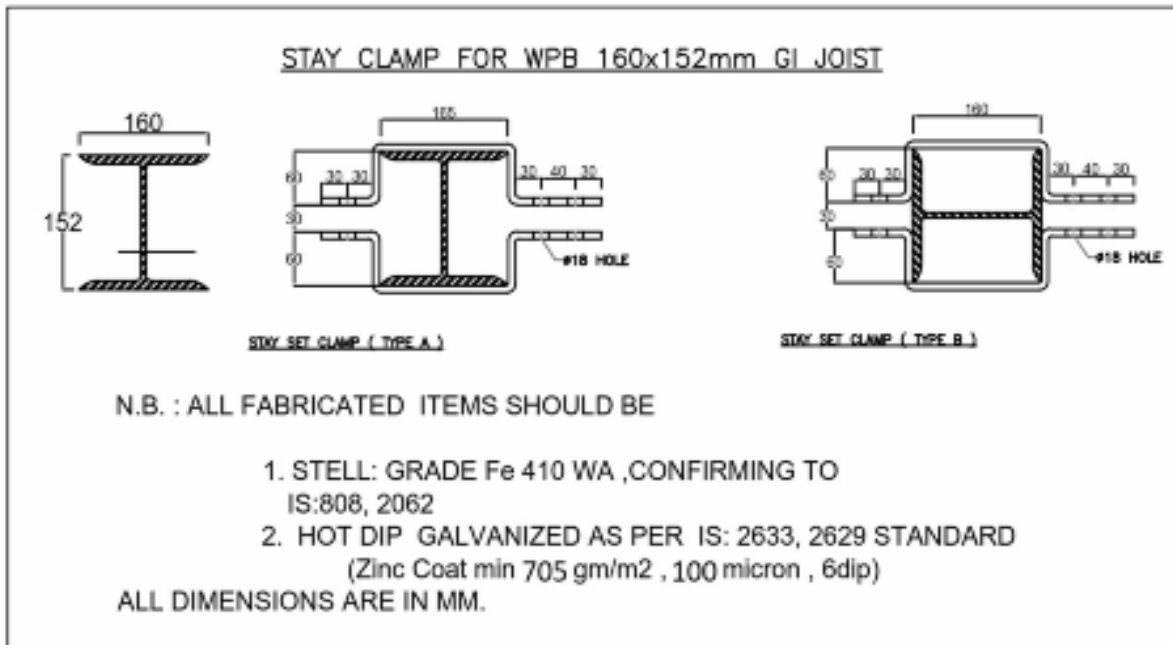
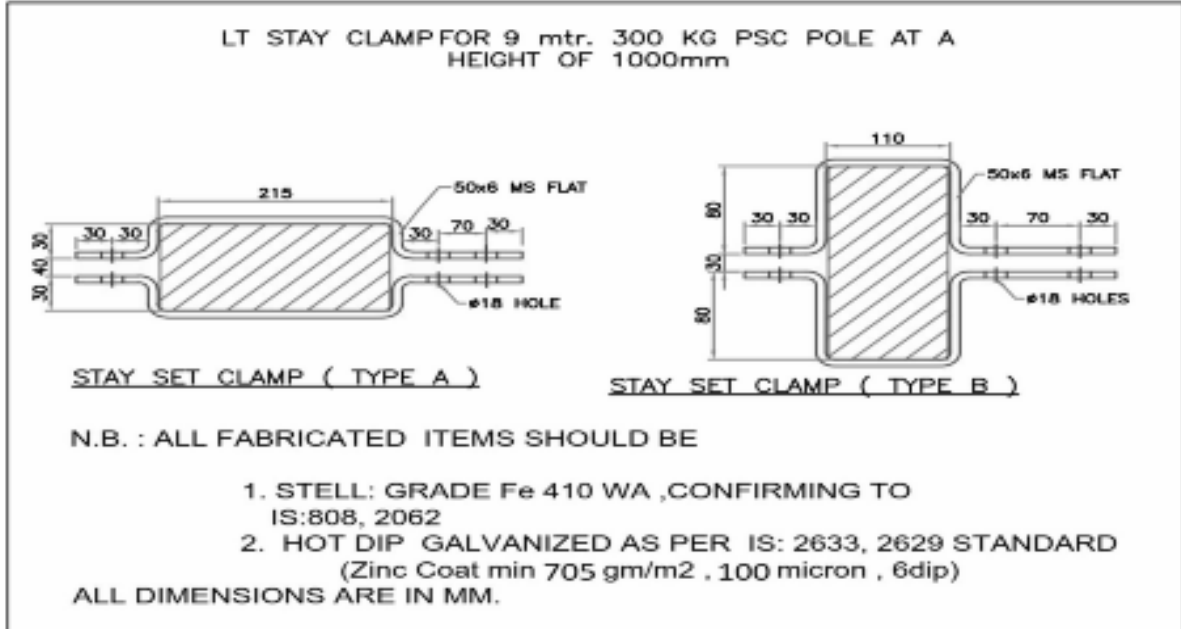
### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Material	Hot-Dip Galvanized, Flat(50X6) GI Flat
2	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
3	Grade of Steel	E 250 A
4	Minimum Tensile Strength	410 N/mm <sup>2</sup>
5	Yield Stress	250 N/mm <sup>2</sup>
6	Percentage Elongation (Min.) at Gauge Length	23%
7	Bend Test (Internal Dia)	Min-2t
8	Mass of Zinc Coating	705 gm/m <sup>2</sup>
9	Zinc Coating Thickness	100-micron, 6 Dip(min)
10	Chemical composition	Grade: E 250 (As per IS: 2062)
11	Markings/Embossing	TPCODL, Manufacture's trademark.


### DRAWINGS



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## 8.0 GI HT STAY SET

### GENERAL TECHNICAL PARTICULARS

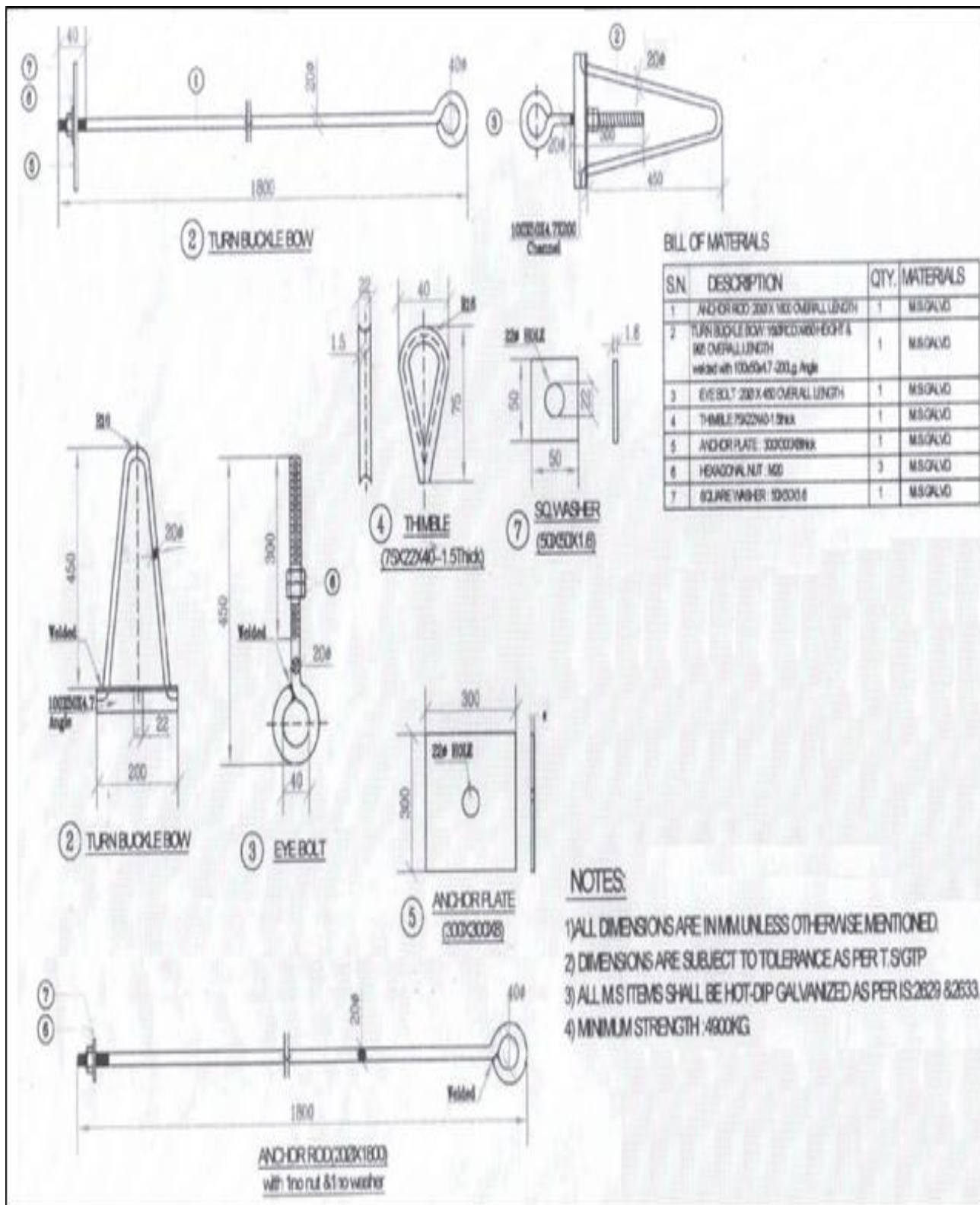
SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Manufacturer Name & Address	To be specified by Bidder
2	Referred IS	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
3	Dimensions	
<b>4</b>	<b>Anchor Rod (20mm Dia): 1 No.</b>	
a)	Dia of Rod	20mm (+ 5%, - 3%)
b)	Overall length of Anchor rod	1800mm (+ 0.5%)
c)	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 50X 1.6mm
<b>5</b>	<b>Anchor Plate: 1 No.</b>	
a)	Size of the MS Anchor plate	300x300x8 mm
b)	Dia of the hole made at the centre of the plate	22mm
<b>6.</b>	<b>Turn Buckle</b>	
(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>(B)</b>	<b>Bow with welded angle</b>	
(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 Angle welded at the order end of the bow	200mm & 100x50x4.8 mm Angle
(v)	Number of holes made in the GI Channel/ angle	3
(vi)	Dia of the holes	22mm (3Nos.)
<b>7</b>	<b>Thimble: 1 No.</b>	

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<b>SL. NO.</b>	<b>TECHNICAL PARTICULARS</b>	<b>DESIRED VALUE</b>
a)	Thickness of the MS Sheet used for thimble	1.5mm
b)	Size of thimble	75x22x40mm
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 Galvanised
11	All Tolerance of the dimensions/weight	± 5%
12	Markings/Embossing	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.

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## DRAWINGS




### BILL OF MATERIALS

S.N	DESCRIPTION	QTY.	MATERIALS
1	ANCHOR ROD: 200 X 1800 OVERALL LENGTH	1	M/S GALVO
2	TURNBUCKLE BOW: 1000 X 450 X 170 OVERALL LENGTH welded with 100x50x17 200g Angle	1	M/S GALVO
3	EYE BOLT: 300 X 40 OVERALL LENGTH	1	M/S GALVO
4	THIMBLE: 75x22x40-1.5 Thick	1	M/S GALVO
5	ANCHOR PLATE: 300x300x8	1	M/S GALVO
6	HEXAGONAL NUT: M20	3	M/S GALVO
7	SQUARE WASHER: 100x200x6	1	M/S GALVO

### NOTES:


- 1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE MENTIONED.
- 2) DIMENSIONS ARE SUBJECT TO TOLERANCE AS PER T.S/GTP
- 3) ALL M/S ITEMS SHALL BE HOT-DIP GALVANIZED AS PER IS:2629 & 2633
- 4) MINIMUM STRENGTH : 4800KG

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## 9.0 GI LT STAY SET

### GENERAL TECHNICAL PARTICULARS

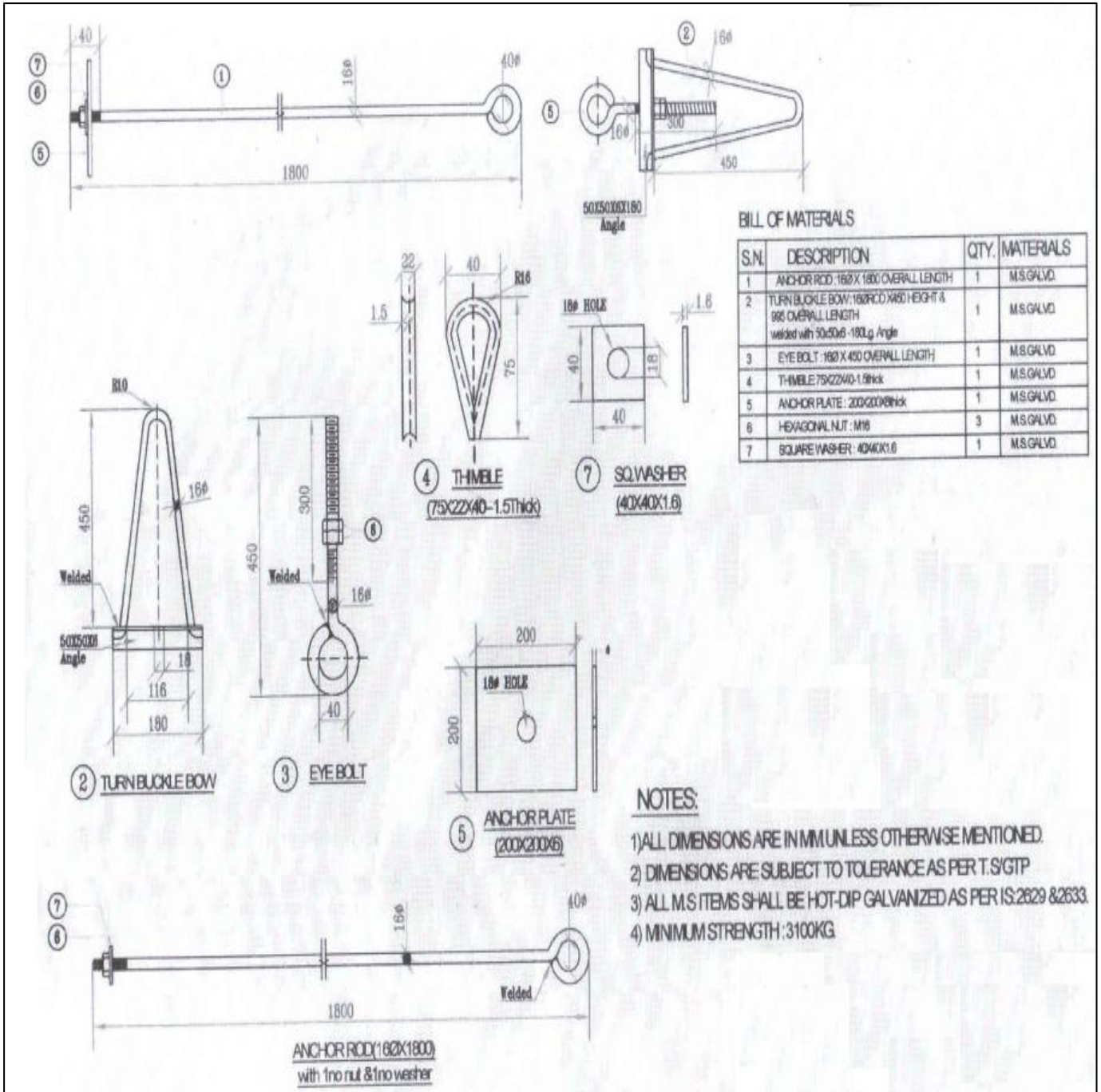
SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Manufacturer Name & Address	To be specified by Bidder
2	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
3	Dimensions	
4	<b>Anchor Rod (16mm Dia.): 1 No.</b>	
a)	Dia. of Rod	16mm (+ 5%, - 3%)
b)	Overall length of Anchor rod	1800mm (+ 0.5%)
c)	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)	16mm Sq. Washer 40X 40X 1.6mm
5	<b>Anchor Plate: 1 No.</b>	
a)	Size of the MS Anchor plate	300x300x6 mm
b)	Dia of the hole made at the centre of the plate	18mm
6.	<b>Turn Buckle</b>	
(A)		
(i)	Dia of the eye bolt	16mm (+ 5%, - 3%)
(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)	<b>Bow with welded angle</b>	
(i)	Dia of the MS Rod used for bow	16mm 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 Angle welded at the order end of the bow	180mm & 50x50x6.0mm Angle
(v)	Number of holes made in the GI Channel/ angle	3
(vi)	Dia of the holes	18mm (3Nos.)
7	<b>Thimble: 1 No.</b>	

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<b>SL. NO.</b>	<b>TECHNICAL PARTICULARS</b>	<b>DESIRED VALUE</b>
a)	Thickness of the MS Sheet used for thimble	1.5mm
b)	Size of thimble	75x22x40mm
8	Minimum strength of the welding provide on various components of Guy/Stay Sets (IS:823/1964)	3100Kg.
9	Average weight of finished stay set	7.702 kg (min) / 8.445 kg (Max)
10	Surface Finish of stay set	Hot Dip Galvanised
11	All Tolerance of the dimensions/weight	± 5%
12	Engraved Marking (Punching before galvanisation)	TPCODL, Manufacture's name or trademark, Month &Year of Manufacturing.

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## DRAWINGS



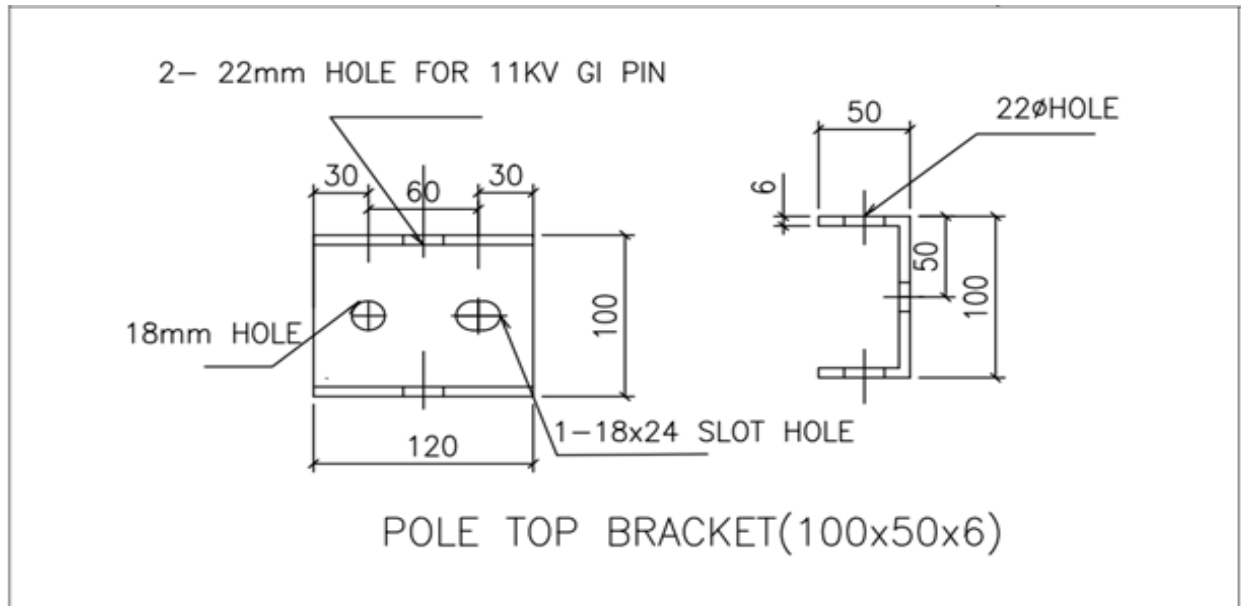
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## 10.0 GI TOP CLAMP 100X50X6MM


### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
2	Grade of Steel	E 250 A
3	Minimum Tensile Strength	410 N/mm <sup>2</sup>
4	Yield Stress	250 N/mm <sup>2</sup>
5	Percentage Elongation (Min.) at Gauge Length	23%
6	Bend Test (Internal Dia)	Min-2t
7	Mass of Zinc Coating	705 gm/m <sup>2</sup>
8	Zinc Coating Thickness	100 microns
9	Chemical composition	Grade: E 250 (As per IS: 2062)
10	Engraved Marking (Punching before galvanisation)	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.

### DRAWINGS



**Note: -All Dimensions are in mm unless noted otherwise specified.**

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## 11.0 7/8 GI STAY WIRE (33kV), 7/10 GI STAY WIRE (11kV) AND 7/12 GI STAY WIRE (LT)

### GENERAL TECHNICAL PARTICULARS

Sl. No	TECHNICAL PARTICULARS	DESIRED VALUE		
		7/8 SWG	7/10 SWG	7/12SWG
1	Nominal Diameter	4.00 mm	3.15 mm	2.5mm
2	Sectional Area in sq. mm	87.92(for stranded wire)	54.52(for stranded wire)	34.35(for stranded wire)
3	Tolerance in diameter	+0.06 mm to -0.03 mm	+0.06 mm to -0.03 mm	+0.06 mm to -0.03 mm
4	Tensile strength	700-1100(N/mm <sup>2</sup> )	700-1100(N/mm <sup>2</sup> )	700-1100(N/mm <sup>2</sup> )
5	Minimum breaking Load (KN)	8.80(for single wire) 54.90(for stranded wire)	5.46(for single wire) 34.52(for stranded wire)	3.44(for single wire) 21.40(for stranded wire)
6	Type of coating Heavy/Medium/Light	Heavy	Heavy	Heavy
7	Variety Hard/Soft	Hard	Hard	Hard
8	Weight of Zn Coating(gm/mtr.2)(After stranding)	260	240	240
9	No of dips the coating is able to withstand at 18±2°C	2x1 Min, 1x1/2 Min	2x1 Min, 1x1/2 Min	2x1 Min, 1x1/2 Min
10	Adhesion Test (wrap test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)			
a)	Min. Complete turn of wrap	10	10	10
b)	Diameter of mandrel on which wrapped	4xNominal Diameter	4xNominal Diameter	4xNominal Diameter
11	Freedom from defects	The wire shall be free from all kinds of surface defects.	The wire shall be free from all kinds of surface defects.	The wire shall be free from all kinds of surface defects.
12	<b>Chemical composition of the MS Wire used shall not exceed</b>			
a)	Sulphur	0.055%	0.055%	0.055%
b)	Phosphorous	0.055%	0.055%	0.055%
c)	Carbon	0.23%	0.23%	0.23%
13	Standard	IS: 2141,4826,6594	IS: 2141,4826,6594	IS: 2141,4826,6594
14	Wt. of Each Coil(Kg)	70-100	70-100	70-100
15	Marking	Coil attached with a metallic tag containing:		
		Manufacturer make or Trade mark, ISI Mark		
		Coil no, Size, TPCODL-marking		
		Mass of coil, Length, Manufacturing month & year		



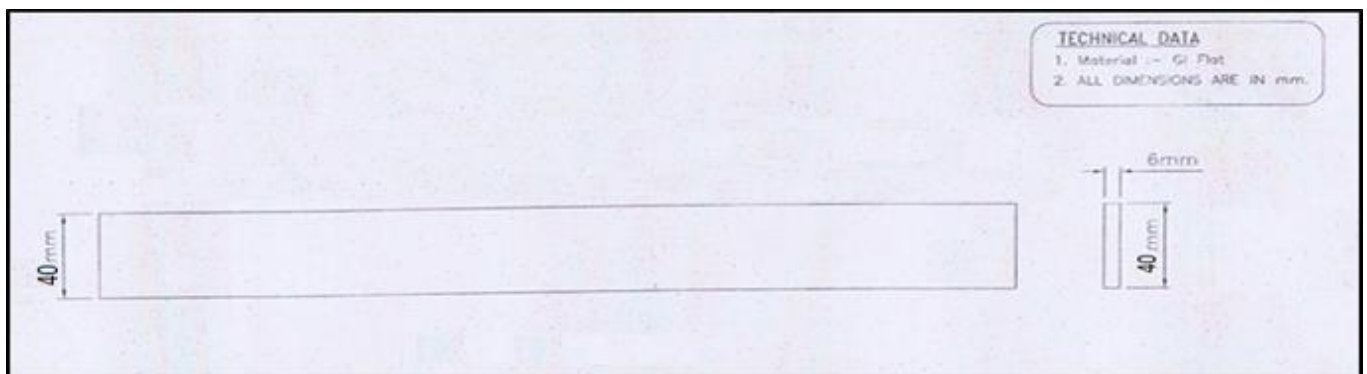
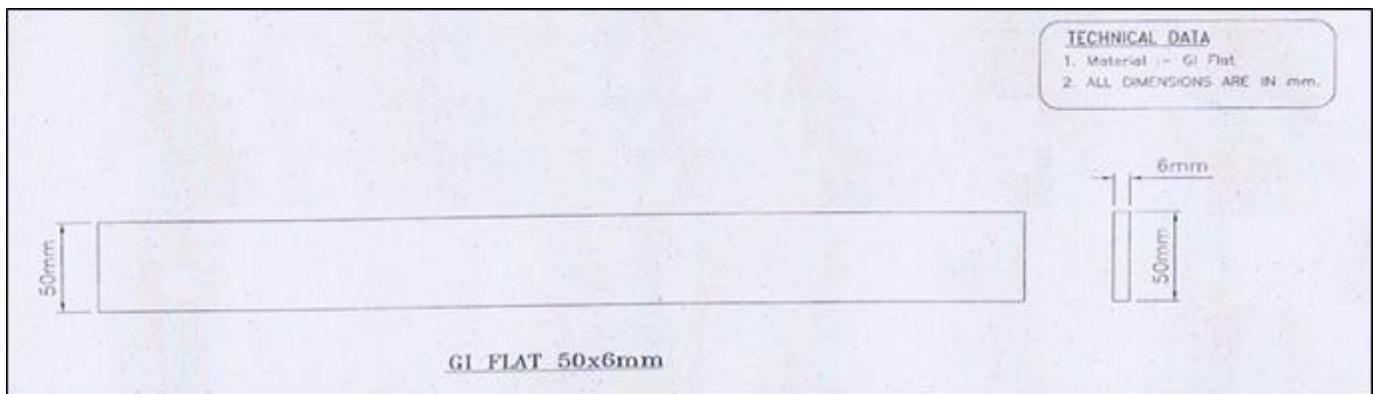
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## 12.0 GI FLAT 50x6 MM (2.36 Kg/mtr.) AND 40x6 MM (1.9 Kg/mtr)

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Relevant Standard	IS: 2062, IS: 2633, IS: 2629, TPCO-OTH-010.
2	Grade of Steel	E 250 A (As per IS: 2062)
3	Minimum Tensile Strength	410 N/mm <sup>2</sup>
4	Yield Stress	250 N/mm <sup>2</sup>
5	Percentage Elongation (Min.) at Gauge Length	23%
6	Bend Test (Internal Dia)	Min-2t
7	Mass of Zinc Coating	705 gm/m <sup>2</sup>
8	Zinc Coating Thickness	100 microns
9	Engraved Marking (Punching before galvanisation)	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.

### DRAWINGS




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## 13.0 GI BARBED WIRE

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Nominal Diameter OF Wire	2.5mm (Line) x 2.5mm (Point)
2	Min Breaking Load of complete Barbed wire	3.7KN
3	Tolerance in diameter	+0.06 mm to -0.03 mm
4	Tensile strength Of line Wire	390-590 N/mm <sup>2</sup>
5	Type of coating Heavy/Medium/Light	Heavy
6	Variety Hard/Soft	Hard
7	Weight of Zn Coating (gm/mtr <sup>2</sup> ) (After stranding)	150
a	No of Dips	1x 1 min ,1x ½ min
8	Distance from Between Two Barbs	75 mm +/- 12mm
9	Barbs Points	35 To the Axis of Wire Forming Barbs
10	No of Lays in Between Two Consecutive Barbs.	2 to 7
11	Wrapping Test	8 ON x 8 OFF x OWN Dia
12	Adhesion Test	4D x 10 Turn
13	Freedom from defects	The wire shall be free from all kinds of surface defects.
14	<b>Chemical composition of the MS Wire used shall not exceed (IS:7887/1975)</b>	
a)	Sulphur & Phosphorous	0.055%
b)	Carbon	0.25%
15	Standard	IS: 278/1978
16	Weight of Each Coil (In Kg)	28-32
17	Marking/ Packing	Coil attached with a metallic tag containing:
		Manufacturer make & Trade mark,
		Coil no,
		Size,
		Length, Mass of coil
		TPCODL
Month & Year of Manufacturing		

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## 14.0 No.6 GI WIRE AND No.8 GI WIRE

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULAR	DESIRED VALUE	
		GI NO 6 (SWG)	GI NO 8(SWG)
1	Nominal Diameter OF Wire	4.9 mm	4 mm
2	Sectional Area in in sq. mm	19.642	12.6
3	Tolerance in diameter	+0.06 mm to -0.03 mm	+0.06 mm to -0.03 mm
4	Tensile strength	550-950(N/mm <sup>2</sup> )	550-950(N/mm <sup>2</sup> )
5	Type of coating Heavy/Medium/Light	Heavy	Heavy
6	Variety Hard/Soft	Hard	Hard
7	Weight of Zn Coating(gm/mtr.2)(After stranding)	290	280
8	No of dips the coating is able to withstand at 18±2°C	3x1/2 Min	3x1/2 Min
9	<b>Adhesion Test (wrap test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)</b>		
a)	Min. Complete turn of wrap	10	10
b)	Diameter of mandrel on which wrapped	6xNominal Diameter	6xNominal Diameter
10	Freedom from defects	The wire shall be free from all kinds of surface defects.	The wire shall be free from all kinds of surface defects.
11	<b>Chemical composition of the MS Wire used shall not exceed (IS:7887/1975)</b>		
a)	Sulphur & Phosphorous	0.055%	0.055%
b)	Carbon	0.23%	0.23%
12	<b>BEND TEST</b>		-
(a)	Angle	90	90
(b)	Dia Round a formed to be bent	10	10
13	Standard	IS: 280/1978, 7887/1992,4826/1979	IS: 280/1978, 7887/1992,4826/1979
14	Weight of Each Coil (In Kg)	40-55	40-55
15	Marking/ Packing	Coil attached with a metallic tag containing:	
		Manufacturer make & Trade mark, Coil no,	
		Size, Mass of coil ,	
		Length, Manufacturing Date	

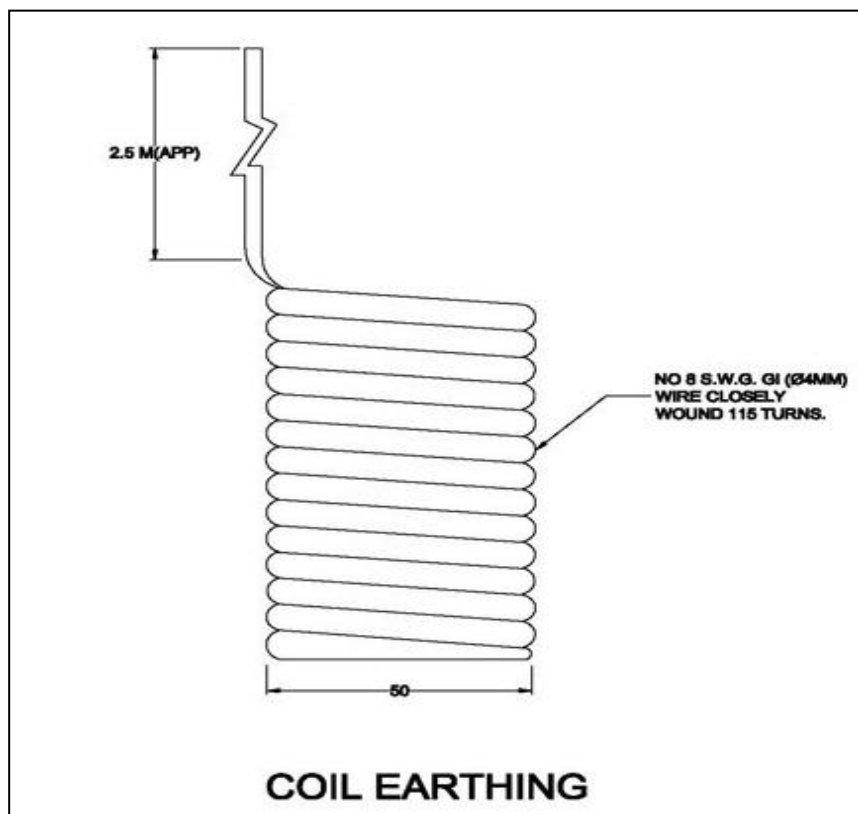
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## 15.0 GI EARTHING COIL


### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULAR	DESIRED VALUE
1	Manufacturer	To be Specified by Bidder
2	Materials of Earthing coil	G.I Wire
3	<b>DIMENSIONS</b>	
a	Wire Diameter	8 SWG (4 mm)
b	Outside Dia of Coil	50 mm
c	Length of Coil	450 mm
d	Free Length of G.I wire of earthing coil	2500 mm
4	<b>No of Turns of coil</b>	115 turns
5	Surface Finish	Galvanised
6	Complete weight of Earthing Set (in Kgs)	1.7 Kg. (Approx.)
7	General Tolerance in Dimensions & Weight	+/- 5 %
8	Reference Standard	IS: 2633, IS: 2629, TPCO-OTH-010.

### DRAWINGS



**Note:** -All Dimensions are in mm unless noted otherwise specified.

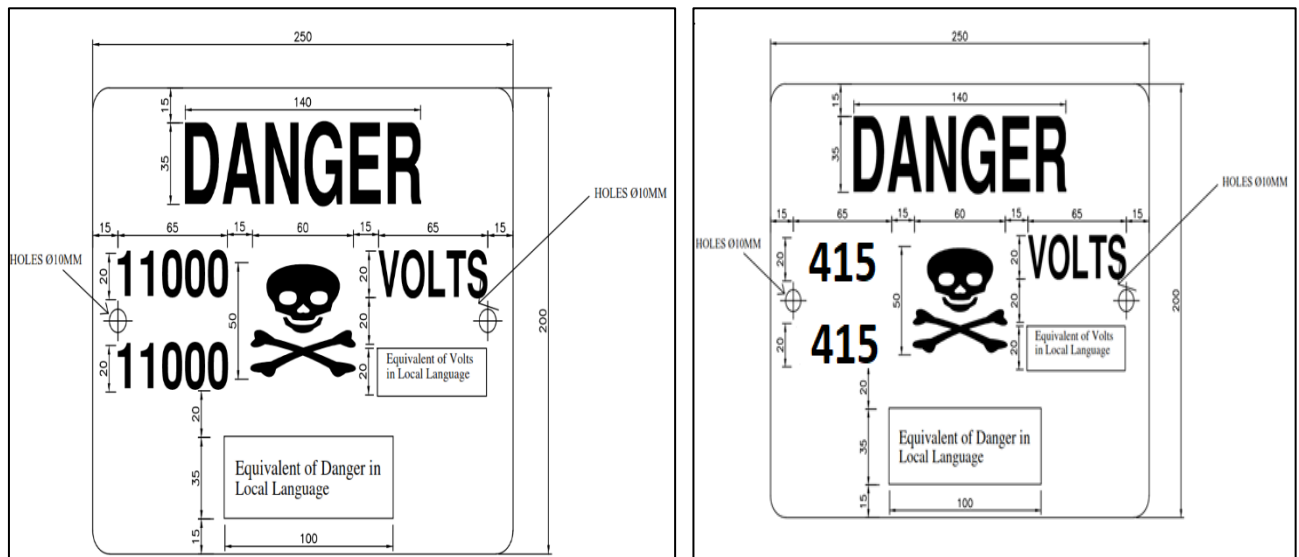
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## 16.0 DANGER BOARD


### 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, Manufacture's name or trademark, Month & Year of Manufacturing.

### DRAWINGS



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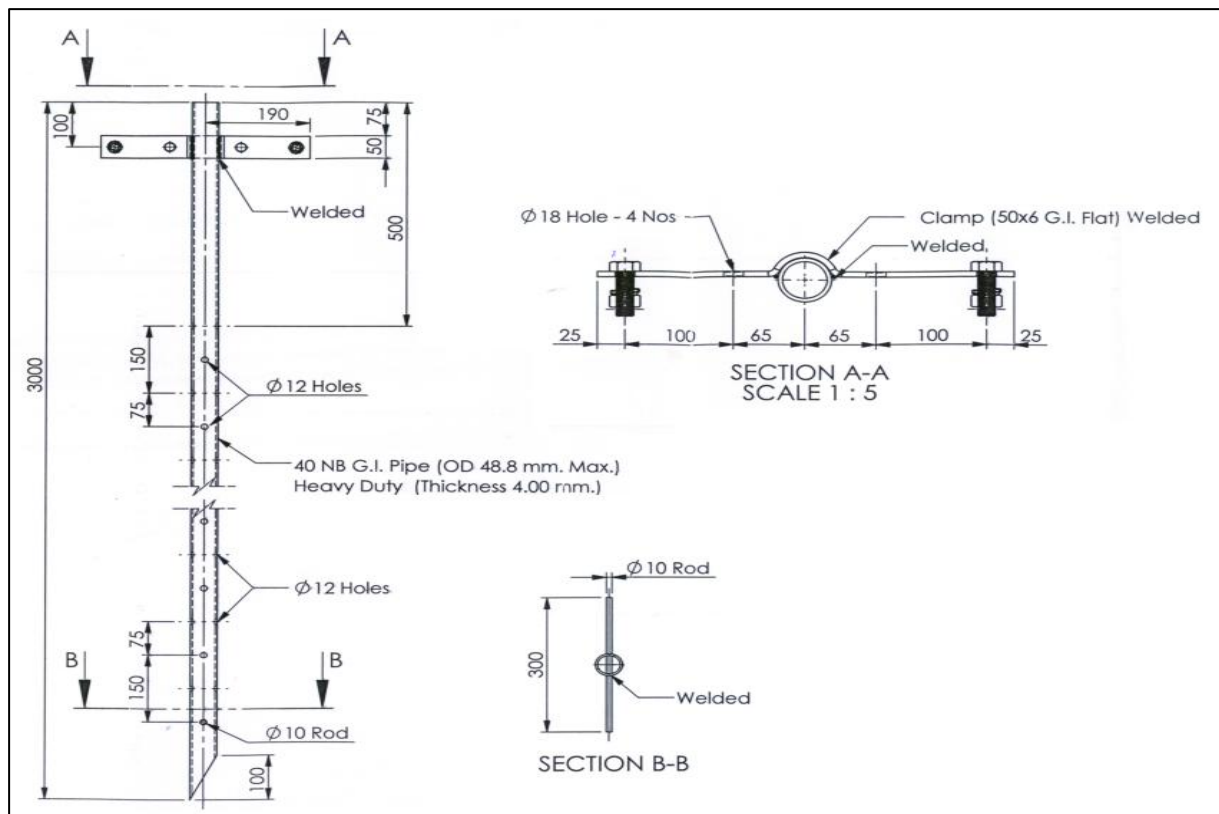
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## 17.0 40MM Dia. GI EARTHING PIPE


### GENERAL TECHNICAL PARTICULARS

SL. No	TECHNICAL PARTICULAR	DESIRED VALUE
1	Diameter of earthing Pipe	40 mm dia
2	Standard	IS 1239
3	Material	GI Pipe
4	Make	JINDAL /TATA
5	Length of pipe earthing	3000 mm
6	Dimensions of holes	12 mm
7	Centre of hole	150 mm
8	Tolerance on dimensions/weight	+/-5 %
9	Galvanizing shall confirm	IS: 2633, IS: 2629, TPCO-OTH-010.
10	Dimension of clamp	50 x 6 GI flat
11	Engraved Marking (Punching before galvanisation)	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.

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## 18.0 GI NUT & BOLT

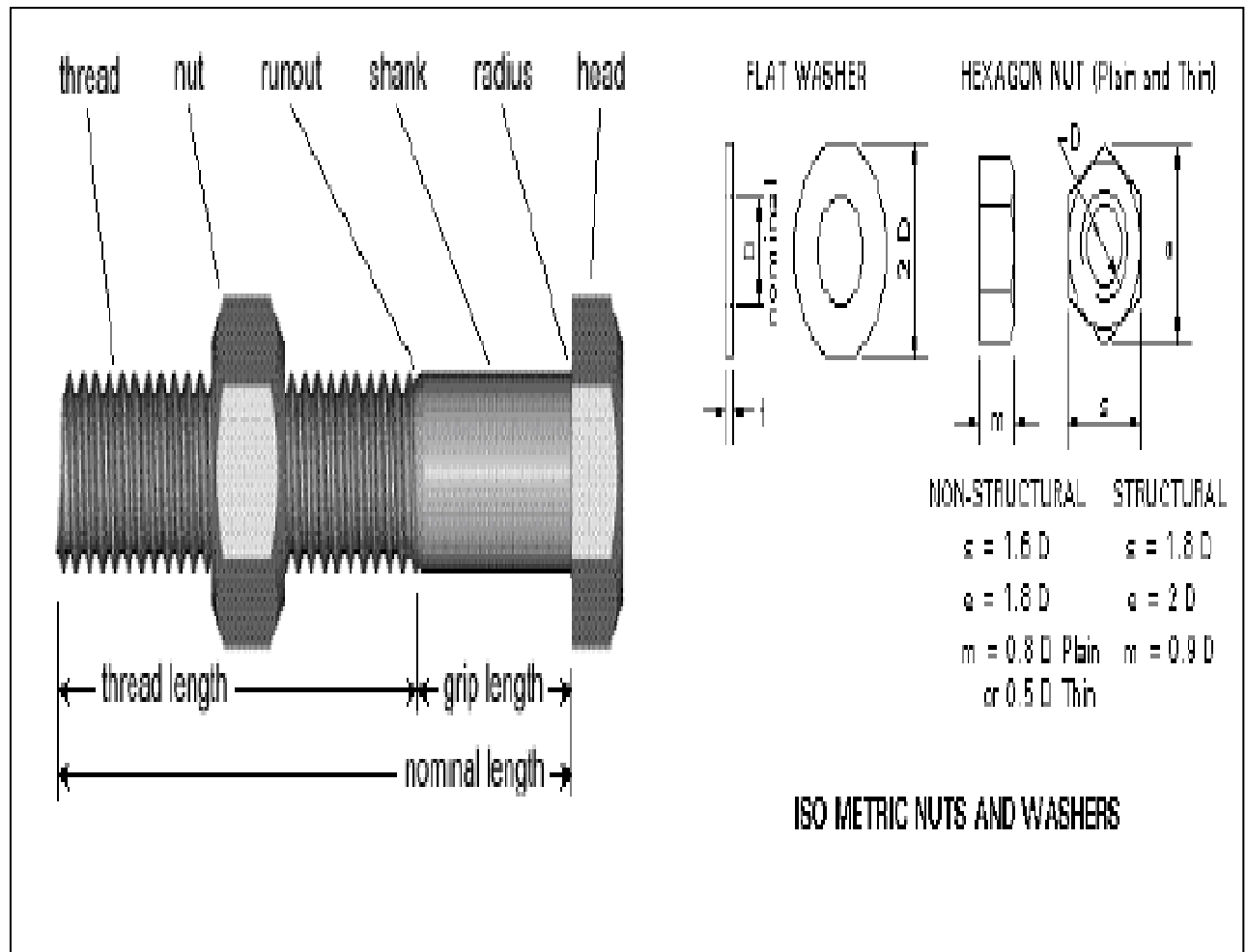
### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Material	Hot-Dip Galvanized Nut, Bolt & Washer
2	Relevant Standard	IS: 2633, IS: 2629, TPCO-OTH-010.
3	Grade of Steel	E 250 A
4	Minimum Tensile Strength	410 N/mm <sup>2</sup>
5	Yield Stress	250 N/mm <sup>2</sup>
6	Percentage Elongation (Min.) at Gauge Length	23%
7	Mass of Zinc Coating	460 gm/m <sup>2</sup>
8	Zinc Coating Thickness	65 microns
9	Chemical composition	Grade: E 250 (As per IS: 2062)

MM THREADS AS PER IS 1363/67																
APPROX WEIGHT IN KGS FOR 100 NOS.																
LENGTH	D I A M E T E R												M20	M22	M24	
	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 10	M 12	M 14	M 16	M 18				
3 mm	0.031															
4 mm	0.032	0.081														
5 mm	0.034	0.086	0.194													
6 mm	0.036	0.09	0.201	0.329	0.572	0.837										
8 mm	0.04	0.099	0.217	0.349	0.606	0.887	1.338									
10 mm	0.044	0.108	0.232	0.374	0.64	0.937	1.392									
12 mm	0.047	0.117	0.248	0.398	0.674	0.986	1.462	2.943	4.337							
16 mm	0.053	0.133	0.278	0.448	0.743	1.08	1.593	3.143	4.617							
20 mm		0.151	0.309	0.498	0.812	1.185	1.712	3.342	4.897							
25 mm		0.173	0.348	0.56	0.897	1.304	1.873	3.595	5.258	7.716	10.121	14.124				
30 mm			0.387	0.622	0.983	1.435	2.033	3.843	5.618	8.21	10.799	15.015				
35 mm			0.425	0.684	1.069	1.555	2.194	4.095	5.981	8.711	11.468	15.823				
40 mm			0.464	0.746	1.155	1.685	2.354	4.344	6.345	9.208	12.136	16.611				
45 mm			0.502	0.81	1.243	1.805	2.514	4.596	6.702	9.728	12.853	17.422				
50 mm			0.541	0.87	1.333	1.935	2.664	4.85	7.052	10.225	13.441	18.248	23.8335	29.2588	37.7863	
55 mm			0.58	0.932	1.422	2.056	2.825	5.097	7.418	10.707	14.124	19.157	24.8677	30.5263	39.2839	
60 mm			0.618	0.994	1.502	2.176	2.983	5.359	7.776	11.211	14.837	19.92	25.9019	31.7939	40.7826	
65 mm			0.657	1.056	1.593	2.305	3.145	5.612	8.143	11.71	15.432	20.747	26.9361	33.0614	42.2792	
70 mm			0.696	1.121	1.673	2.426	3.305	5.855	8.503	12.225	16.129	21.552	27.9703	34.3289	43.7769	
75 mm				1.181	1.763	2.556	3.465	6.112	8.865	12.626	16.892	22.422	29.0045	35.5964	45.2745	
80 mm				1.242	1.853	2.677	3.626	6.361	9.225	13.158	17.544	23.256	30.0386	36.8639	46.7722	
85 mm					1.933	2.806	3.785	6.614	9.579	13.661	18.182	24.038	31.0728	38.1315	48.2698	
90 mm					2.023	2.926	3.946	6.868	9.94	14.164	18.868	24.876	32.1070	39.3990	49.7674	
100 mm					2.194	3.177	4.255	7.364	10.661	15.152	20.161	26.455	34.1754	41.934	52.7627	
110 mm					2.361		4.579	7.886	11.39	16.181	21.645	28.249	36.2437	44.4691	55.758	
120 mm					2.734		4.95	8.375	12.136	17.182	22.936	29.94	38.3121	47.0041	58.7533	
130 mm					2.865		5.297	8.881	12.821	18.182	24.155	31.646	40.3805	49.5392	61.7486	
140 mm					3.012		5.593	9.381	13.514	19.231	25.641	33.333	42.4488	52.0742	64.7438	
150 mm					3.175		5.869	9.881	14.245	20.243	27.027	34.722	44.5172	54.6092	67.7391	
160 mm								10.04	14.62		28.571	36.496	46.5856	57.1443	70.7344	
170 mm								10.395	15.528		29.94	38.168	48.6539	59.6793	73.7297	
180 mm								11.261	16.34		30.864	39.683	50.7223	62.2144	76.7250	
190 mm									17.007		32.258	41.667	52.7907	64.7494	79.7202	
200 mm								12.165	17.794		33.113	43.103	54.8591	67.2844	82.7155	
225 mm									19.305		36.765	46.9383	60.03	73.6221	90.2037	
250 mm								14.749	21.645		40	51.0415	65.2009	79.597	99.6919	
260 mm												52.6828	67.2693	82.4947	100.6872	
280 mm																
300 mm									24.631			47.17				


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### DRAWINGS



**Note:** -All Dimensions are in mm unless noted otherwise specified.




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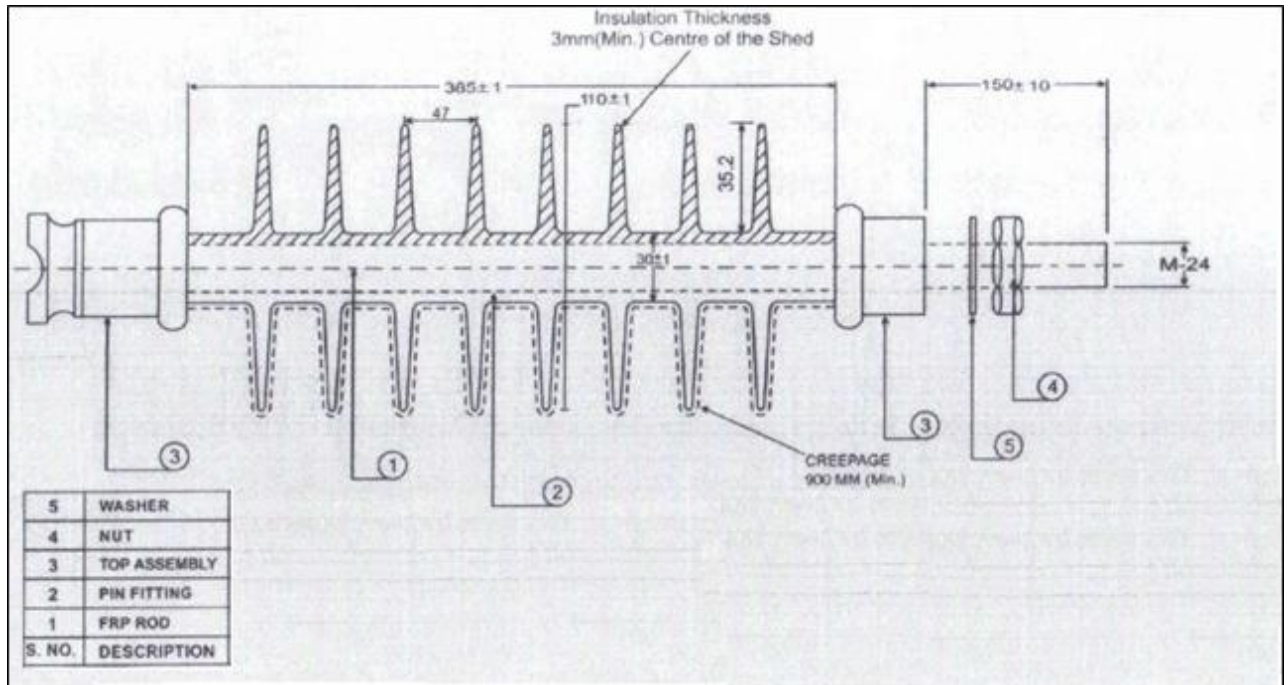
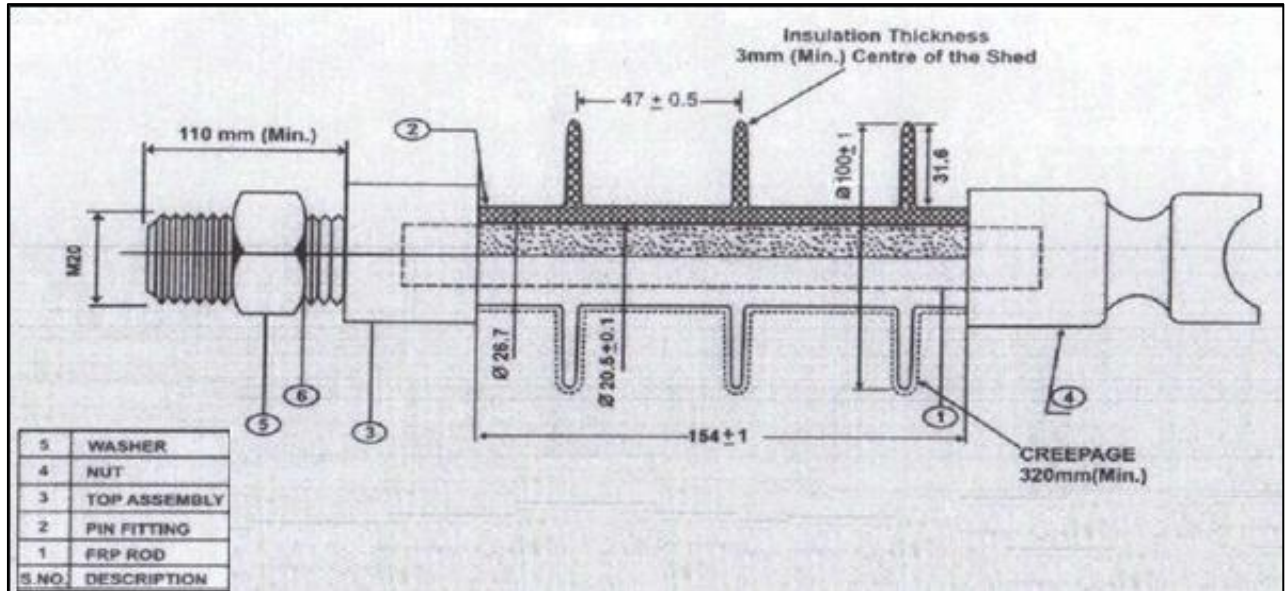
## 19.0 33kV GI PIN 10KN INSULATOR POLYMER AND 11kV GI PIN 5KN INSULATOR POLYMER

### GENERAL TECHNICAL PARTICULARS


SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
1	Type of insulator	11 KV Polymeric composite Pin Insulator	33 KV Polymeric composite Pin Insulator
2	Reference Standard	IEC 61109	IEC 61109
3	Material of FRP Rod	Borrion free ECR	Borrion free ECR
4	Material of sheds	Silicon Rubber	Silicon Rubber
5	Material of Top End Fittings	SGCI /MCI/FORGED STEEL	SGCI /MCI/ FORGED STEEL
6	Material of Bottom End Fittings	FORGED STEEL	FORGED STEEL
7	Material of sealing compound	RTV Silicon	RTV Silicon
8	Colour of sheds	Grey	Grey
9	Rated system voltage	11 KV	33 KV
10	Highest system voltage	12 KV	36 KV
11	Dry Power Frequency Withstand voltage	60 KV	95 KV
12	Wet Power Frequency Withstand voltage	35 KV	75 KV
13	Dry Power Frequency Flashover Voltage	75 KV	130 KV
14	Wet Power Frequency Flashover Voltage	45 KV	90 KV
15	Dry Lightning Impulse withstand voltage	Positive: 75 KV Negative: 80 KV	Positive: 170 KV Negative: 180 KV
16	Dry Lightning Impulse Flashover voltage	Positive: 95 KV Negative: 100 KV	Positive: 210 KV Negative : 230 KV
17	RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition	< 50 microvolt	< 70 microvolt
18	Creepage distance (min)	320 mm	900 mm
19	Min Failing load	5 KN	10 KN
20	Dia of FRP Rod	20 mm	24 mm
21	Length of FRP Rod (min)	165 mm	300 mm
22	Dia of weather sheds	100 mm	110 mm
23	Thickness of housing	3 mm	3 mm
24	Dry arc distance(min)	150 mm	300 mm
25	Method of fixing sheds to housing	Injection moulding	Injection moulding
26	Visible Discharge Voltage (PF)	9 KV	27 KV
27	Type of sheds	Aerodynamic	Aerodynamic
28	Dia of bottom end fitting	20 mm	24 mm
29	Thread length of bottom end fitting	110 mm (Min)	130 mm (min)
30	Type of packing	Wooden / Corrugated box	Wooden / Corrugated box
31	No of insulator in each pack	Thirty	Twenty
32	Marking / Embossing	TPCODL, Manufacture's name or trademark, Month & Year of Manufacture	

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## 20.0 11 kV 70 KN DISC INSULATOR POLYMER (B&S) AND 33 kV 90 KN DISC INSULATOR POLYMER (B&S)

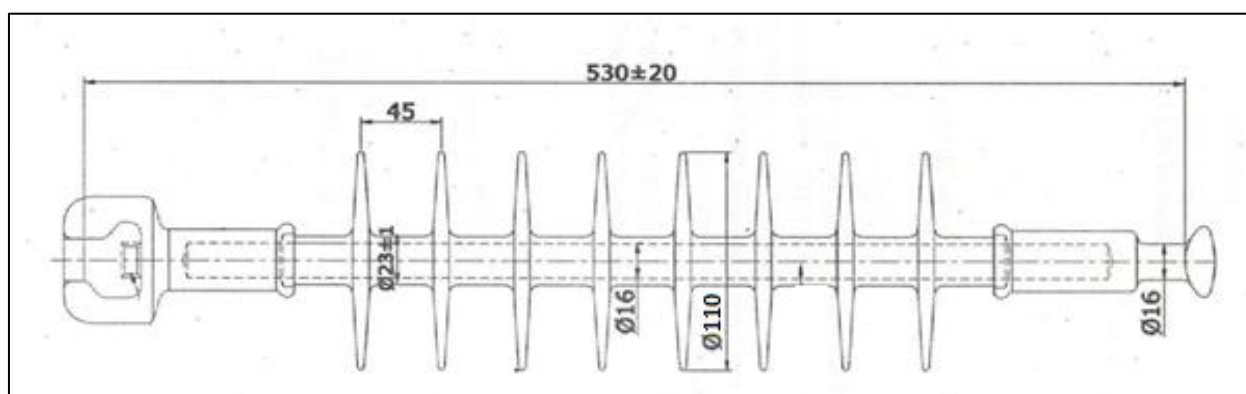
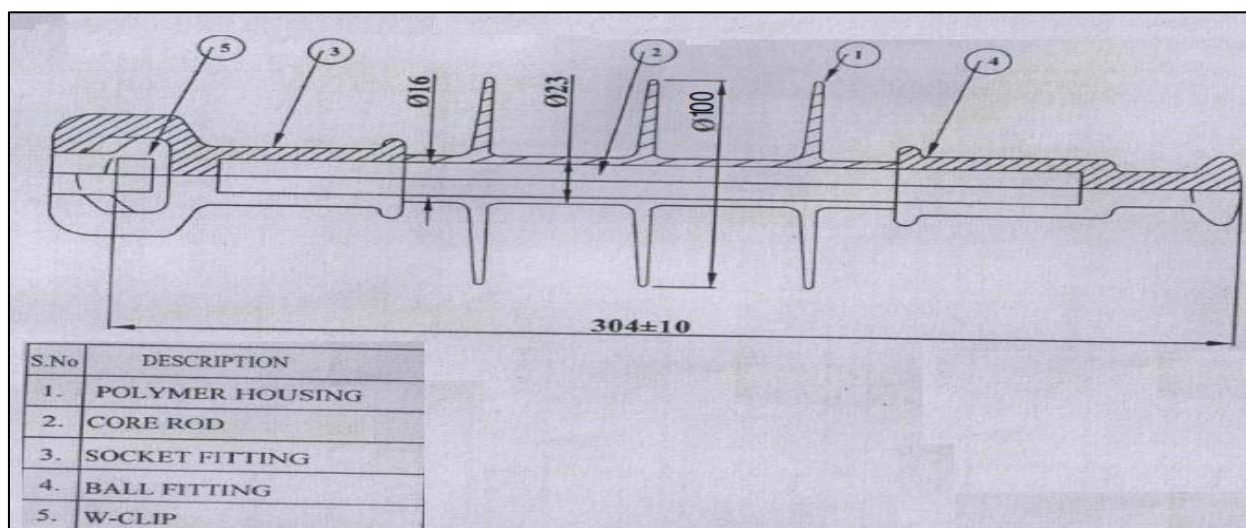
### GENERAL TECHNICAL PARTICULARS

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
		Min. requirement for 11 kV 70 KN	Min. requirement for 33 kV 90 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)	SILICON Wacker-Germany Dow Corning-USA	SILICON 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 Et weather sheds (silicon content by	High voltage grade SILICON RUBBER	High voltage grade SILICON RUBBER
(c)	Material of end fittings	SGI	SGI
(d)	Sealing compound for end fittings	RTV SILICON	RTV SILICON
4	Colour	GREY	GREY
5	Electrical characteristics		
(a)	Nominal system voltage	11 kV	33 kV
(b)	Highest system voltage	12 kV	36 kV
(c)	Dry Power frequency withstand voltage	70 kV	105 kV
(d)	Wet Power frequency withstand voltage	50 kV	75 kV
(e)	Dry flashover voltage	75 kV	125 kV
(f)	Wet flash over voltage	55 kV	85 kV
(g)	Dry lighting impulse withstand voltage		
	(a) Positive	120 kVp	170 kVp
	(b) Negative	120 kVp	170 kVp
(h)	Dry lighting impulse flashover voltage		
	a) Positive	120 KV	180 kV
	b) Negative.	120 KV	180 kV
(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	< 70 microvolt
(k)	Creepage distance (Min.)	320 MM	900 MM
6	Minimum failing load.	70 KN	90KN
7	<b>Dimensions of insulator</b>		
(i)	Weight	1.2 kg	1.6 kg
(ii)	Dia of FRP rod	16 mm	16 mm
(iii)	Length of FRP rod	210 mm	425 mm


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SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
		Min. requirement for 11 kV 70 KN	Min. requirement for 33 kV 90 KN
(iv)	Dia of weather sheds	100 mm	110 mm
(v)	Thickness of housing	3 mm	3 mm
(vi)	Dry arc distance Dimensioned drawings of insulator (including weight with tolerances in weight)	175 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	<b>Type of sheds</b>		
i)	Aerodynamic	Aerodynamic	Aerodynamic
ii)	With underbids		
10	Marking/Embossing	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.	

### DRAWINGS



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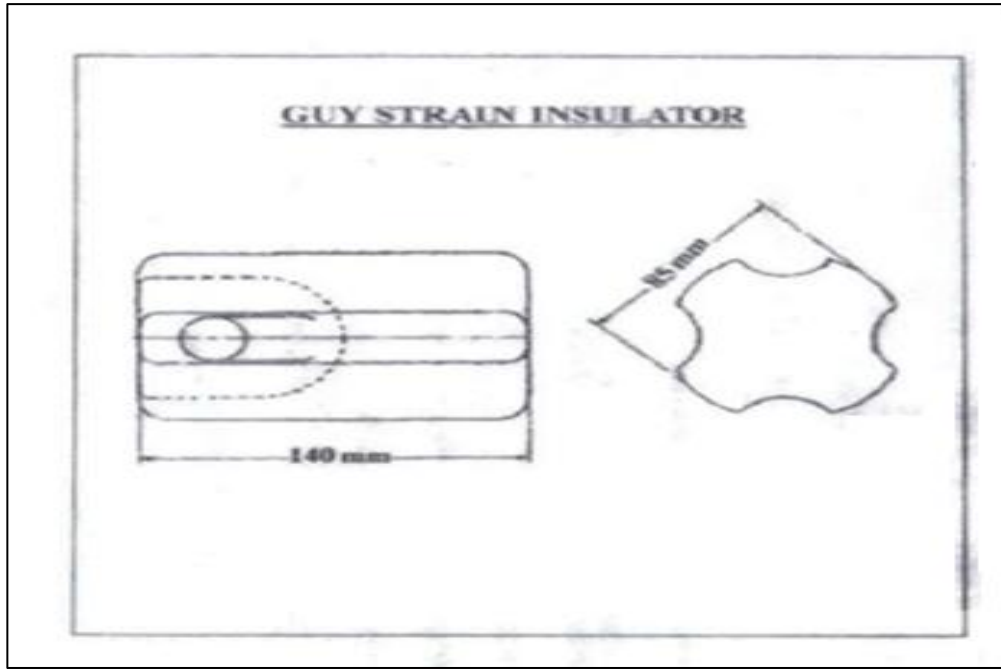
## 21.0 HT STAY INSULATOR

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Manufacturer's Name	To be specified by Bidder
2	Type of insulator	Type C
3	Standard Specification to which the material shall confirm	As per IS: 5300 - 1969
4	<b>ELECTRICAL CHARACTERISTICS</b>	
(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	Power Frequency Punctured withstand voltage	1.3 times of Actual Dry Flashover Voltage
7	<b>DIMENSIONS</b>	
(a)	Length	140 mm
(b)	Width	85 mm
(C)	Cable Hole Dia	25 mm
8	Creepage Distance	57 mm
9	Type of Glaze	Brown / Dark Brown
10	Weight per piece	1.1 Kg appx.
11	Markings/Embossing:	TPCODL.
		Failing Load in KN
		Manufacture's trademark, Month & Year of manufacturing
12	Packing details	All Insulators shall be in crates or boxes suitable for rough handling.
		Packing shall be marked with the strength and voltage ratings

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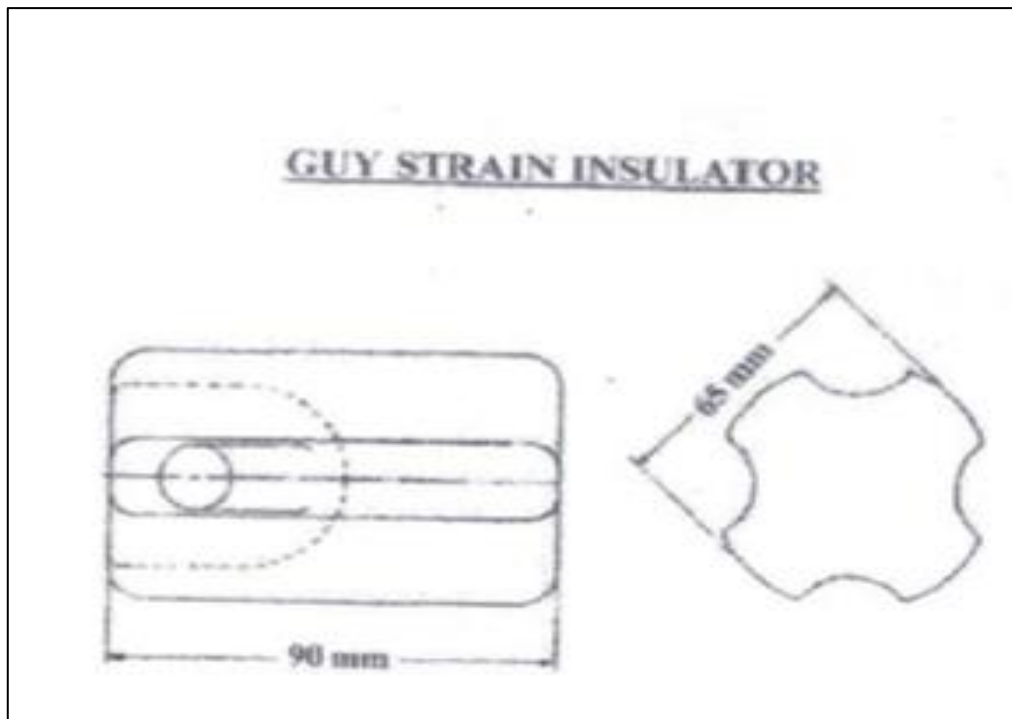
## 22.0 LT STAY INSULATOR

### GENERAL TECHNICAL PARTICULARS


SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Manufacturer's Name	To be specified by Bidder
2	Type of insulator	Type A
3	Standard Specification to which the material shall confirm	As per IS: 5300 - 1969
4	<b>ELECTRICAL CHARACTERISTICS</b>	
(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	Power Frequency Punctured withstand voltage	1.3 times of Actual Dry Flashover Voltage
7	<b>DIMENSIONS</b>	
(a)	Length	90 mm
(b)	Width	65 mm
(C)	Cable Hole Dia	16 mm
8	Creepage Distance	41 mm
9	Type of Glaze	Brown / Dark Brown
10	Weight per piece	0.45 Kg appx.
11	Markings/Embossing:	Property of TPCODL.
		Failing Load in KN
		Manufacture's name or trademark, Month/Year of manufacture
12	Packing details	All Insulators shall be in crates or boxes suitable for rough handling.
		Packing shall be marked with the strength and voltage ratings

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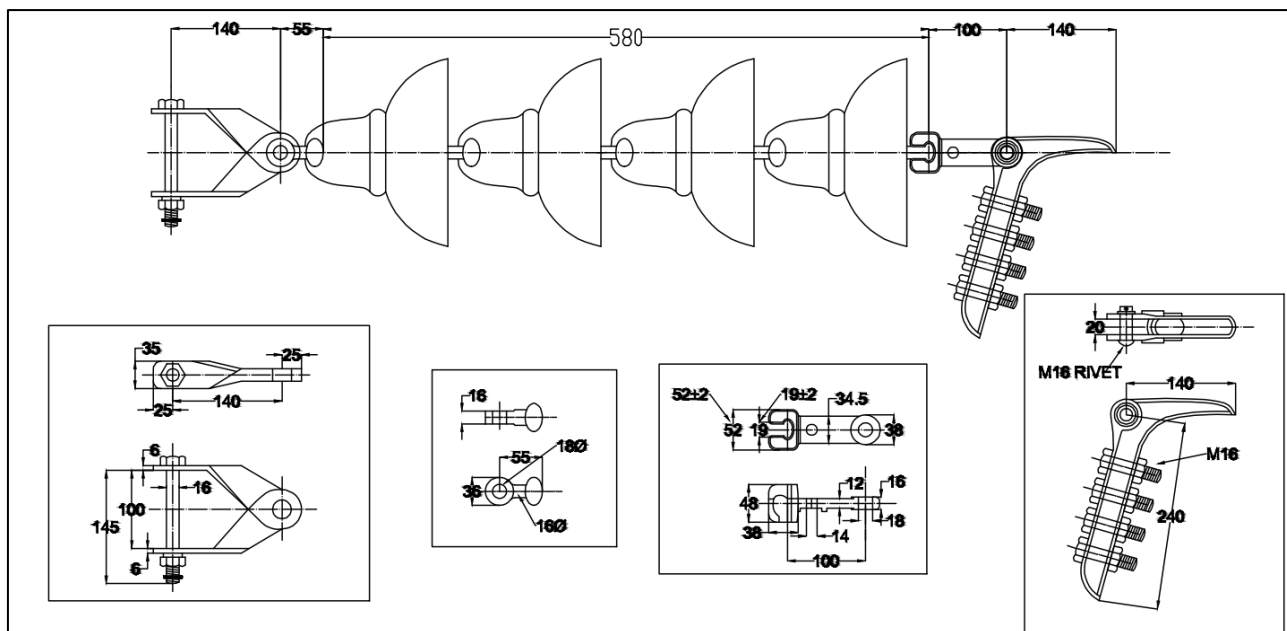
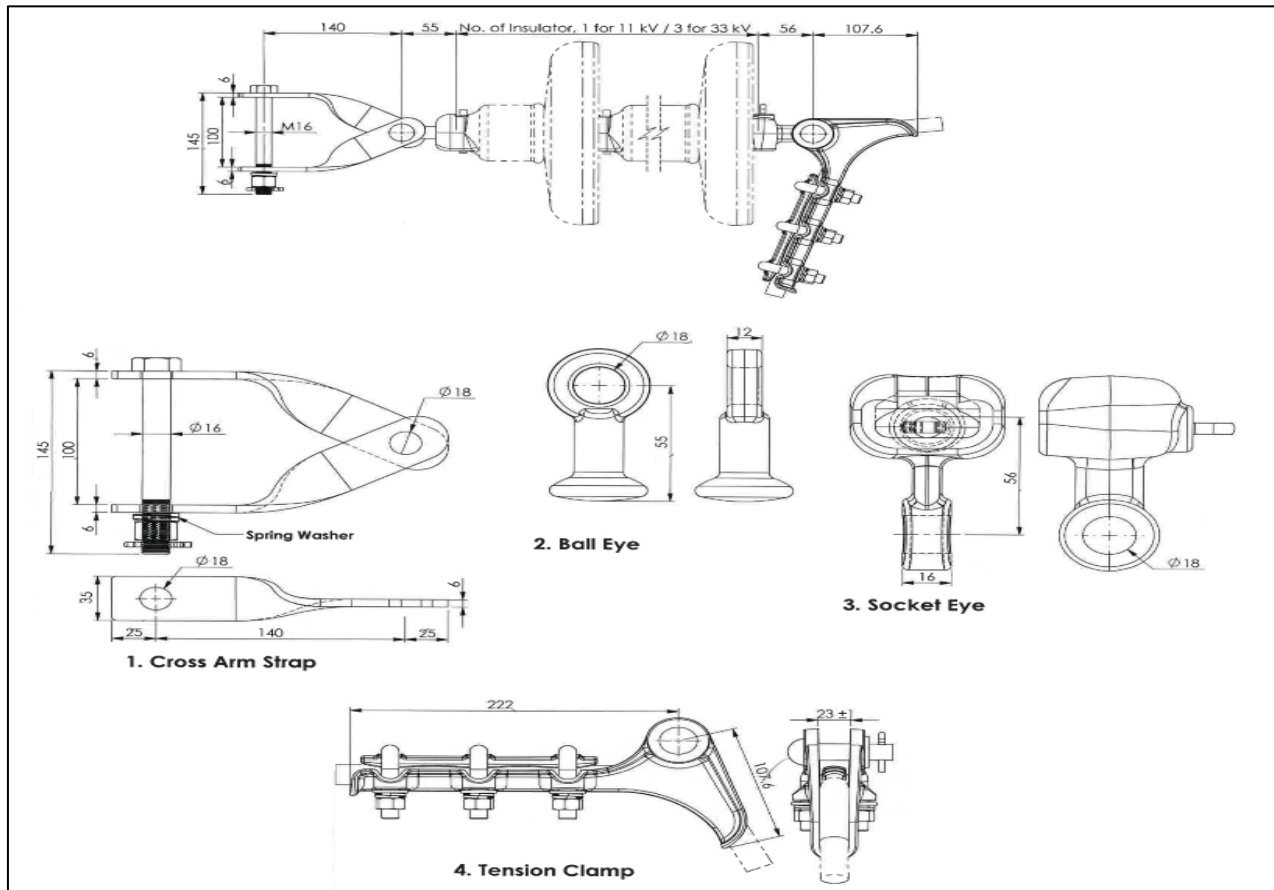
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## 23.0 H/W fitting (B&S) 70KN 3 BOLTED AND 90KN 4 BOLTED

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
1	Type	B&S type	
2	Ultimate Strength	70 KN (3 bolted)	90 KN (4 bolted)
3	Suitable for conductor Size	AAAC-80Sqmm, 100sqmm	
4	Slip strength of tension clamp	95% of UTS	95% of UTS
5	Referred IS Standard	IS 2486	IS 2486
6	Material Used		
a)	Cross Arm	Mild Steel (HDG)	Mild Steel (HDG)
b)	Ball Eye	Forged Steel	Forged Steel
c)	Socket Eye	Forged Steel	Forged Steel
d)	Bolted Type Tension Clamp and Keeper	Aluminium Alloy	Aluminium Alloy
e)	Security Clip	Stainless steel	Stainless steel
f)	Split Pin	Stainless steel	Stainless steel
g)	Cotter Pin and Bolt	Mild Steel (HDG)	Mild Steel (HDG)
h)	Nuts	Mild Steel (HDG)	Mild Steel (HDG)
i)	Spring Washer	Mild Steel (HDG)	Mild Steel (HDG)
j)	Plain Washer	Mild Steel (HDG)	Mild Steel (HDG)
k)	Zn confirming to grade	IS 209	IS 209
m)	Size of U Bolt	M16	M16
7	Galvanising	Is 2633, IS 2629	Is 2633, IS 2629
8	Packing details		
a)	Net Weight	N. A	N. A
b)	Gross Weight (Each Bag)	Under 50 Kg	Under 50 Kg
c)	Contents of each pack	N. A	N. A
d)	Type of Packing	In gunny bag	In gunny bag
9	Tolerance in weight / dimensions, if any	+5%	+5%
10	Marking	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.	

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## 24.0 12kV 10 KA LA CLASS 2

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Name of the Manufacturer	To be Specified by Bidder
2	Address of the Manufacturer	To be Specified by Bidder
3	Installation	Outdoor
4	Type	Metal oxide Gap less cage type
5	Housing material	Injection moulded silicon rubber
6	Service voltage or nominal voltage	11kV
7	Maximum system voltage	12kV
8	Rated frequency	50 Hz
9	Maximum continuous overrating voltage (MCOV), U <sub>c</sub>	9.6kV rms
10	Arrester Rating, U <sub>r</sub>	12kV rms
11	Nominal Discharge current, I <sub>n</sub>	10kA
12	Type of Arrester	Station class-SL
13	Repetitive charge transfer as >1.0C for Class-2, Station class (SL) as per IEC 60099-4 2014	>1.0C
14	Thermal energy withstand rating is given as 4kJ/kV. or Station Class-2	4kJ/kV
15	Power frequency voltage (dry and wet condition) for one minute	28kV rms
16	Lightning impulse voltage kV Peak	75 kVp
17	Rated short circuit current	25kA
18	High current impulse operating duty (4/10 microseconds impulse wave) kAp	100kAp
19	Partial Discharge at 1.05 times MCOV	<10pC
20	Material Insulating Bracket	UV resistant Fire retardant DMC
21	Material of end fittings	Machined or Pressure die casted aluminium
22	Pull strength	1000N
23	Cantilever strength	12KgM
24	Total Creepage length of an Arrester	380mm
25	Stack height	To be submitted by bidder
26	Rating of individual ZnO blocks used for assembly	3kV


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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
27	Temporary Over voltage rating kVp	
a	1 sec	Min 15kVp
b	10 sec	Min 14kVp
c	100 sec	Min 13kVp
28	Maximum Residual voltage during impulse discharge of 8/20 microseconds	Desired maximum values
	5kAp	35kVp
	10kAp	38kVp
29	Maximum steep lightning current impulse 1/20 microseconds residual voltage	33kVp
30	Material of insulating terminal cap	Polyolefin or silicone rubber
31	Material of Nut Bolt washers	Stainless steel
32	<b>Current at MCOV</b>	
a	Resistive current	<3000 microampere
b	Capacitive current	<4000 microampere
34	Bolt Grade	All hardware bolt shall be of 8.8 grade
35	Reference Standard	IEC 60099-4 :2014 ed. 03 IS-3070:1993 (Part-3)
36	Marking/Engraving	TPCODL, Rating, Serial No., Reference Standard, Manufacture's name or trademark, Month & Year of Manufacturing.


### **TYPE TEST REPORT**

Bidder shall furnish the type test report for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**

1. Power Frequency reference Voltage test (Both in Dry and Wet condition) As per IEC 60099-4 Ed.3 clause 10.8.2
2. Lightning impulse residual voltage on complete arrester as per IEC 60099-4 Ed.3 clause 10.8.2
3. Residual voltage tests as per IEC 60099-4 Ed.3 clause 10.8.3

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4. Test to verify long term stability under continuous operating voltage as per IEC 60099-4 Ed.3 clause 10.8.4
5. Test to verify the repetitive charge transfer rating, Qrs as per IEC 60099-4 Ed.3 clause 10.8.5
6. Heat dissipation behaviour as per IEC 60099-4 Ed.3 clause 10.8.6
7. Operating duty test as per IEC 60099-4 Ed.3 clause 10.8.7
8. Power-frequency voltage- versus-time test characteristic as per IEC 60099-4 Ed.3 clause 10.8.8
9. Tests of arrester disconnecter as per IEC 60099-4 Ed.3 clause 10. 8.9
10. Operating withstand Test for Disconnecter As per IEC 60099-4 Ed.3 clause 8.9.2
11. Disconnecter operation test Current vs time as per IEC 60099-4 Ed.3 clause 8.9.3
12. Mechanical tests on Disconnecter As per IEC 60099-4 Ed.3 clause 8.9.4
13. Temperature cycling and seal pumping test on Disconnecter As per IEC 60099-4 Ed.3 clause 8.9.5
14. Short-circuit tests a. High current SC b. Low current SC as per IEC 60099-4 Ed.3 clause 10.8.10
15. Bending moment test as per IEC 60099-4 Ed.3 clause 10.8.11
16. Seal leak rate test as per IEC 60099-4 Ed.3 clause 10.8.13
17. Radio interference voltage (RIV) test as per IEC 60099-4 Ed.3 clause 10.8.14
18. Test to verify the dielectric as per IEC 60099-4 Ed.3 clause
19. Test of internal grading components as per IEC 60099-4 Ed.3 clause 10.8.16
20. Thermal cyclic test as per IEC 60099-4 Ed.3 clause 8.16.2
21. Weather aging Test for 1000 hours of slat fog test and 1000 hours of UV test as per IEC 60099-4 Ed.3 clause 10.8.17

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## 25.0 33kV 10 KA LA CLASS 2

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Installation	Outdoor
2	Arrester Type and Housing	Metal Oxide Gapless Cage type and Polymeric housing
3	Normal System Voltage/Service Voltage	33 kV
4	Highest System Voltage	36 kV
5	Rated Frequency	50 Hz
6	Continuous operating voltage in rms	19.05Kv (rms)
7	Maximum Continuous Operating Voltage (M.C.O.V)	25 kV (rms)
8	Arrester Rating	30 kV (rms)
9	Nominal Discharge Current, In	10 kA
10	Arrester class and long duration Discharge	Station class-SL & Class-II
a	Short Circuit rating	40 kA
11	<b>Voltage Withstand on Arrester Housing</b>	
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	<b>Long Duration Current Requirement as per IS:3070: 1993</b>	
a	Peak Current	400A
b	Virtual duration of Peak T	2000 T (Micro Sec)
14	High Current impulse Operating Duty	100(kAP)
15	Creepage Distance of Arrester Housing	900 mm(minimum)
16	Partial Discharge at 1.05 times M.C.O. V	<10 pc
17	Energy Absorption capacity (KJ/KV)	>=4KJ/KV
18	<b>Temporary over voltage (TOV)</b>	
a	1 sec	51kVp
b	10 sec	49kVp
19	<b>Maximum Lightning Impulse Residual voltage with 8/20 microsecond wave</b>	
a	at 5kA	85kVp
b	at 10kA	90kVp
c	at 20kA	100kVp
20	<b>Maximum switching current impulse residual voltage in kVP</b>	
a	At 500 Amps	72KVp

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
b	AT 250 Amps	65kVp
21	Max. Cantilever Strength	24 KGM
22	IR at MCOV in mA	To be specified by bidder
23	IC at MCOV in mA	To be specified by bidder
24	Diameter of MO resister in mm	To be specified by bidder
25	Total height of the arrester	To be specified by bidder
26	Total weight of the arrester	To be specified by bidder
27	Warrantee/ Guarantee	To be specified by bidder
28	Dimensions of Metal Oxide Block (dia. & thickness)	To be specified by bidder
29	No. of Metal oxide blocks in arrester	To be specified by bidder
30	Rating of individual ZnO blocks used for assembly	To be specified by bidder
31	Power Losses of the Arrester in watt	To be specified by bidder
32	Power frequency current Vs Time for operation test 800 A/200 A	To be specified by bidder
33	Recommended clearances Phase to Phase in mm	To be specified by bidder
34	<b>Surge Counter</b>	
a	Continuous current scope (8/20 micro peak)	100 A to 10 KA
b	2000 micro sec rectangular current impulse withstand capability for 18 times	250 A
c	4/10 micro sec. high current impulse withstand capability for 2 times	100 KAp
d	Scope of leakage current measure for meter	0-7 mA range
35	Surge counter connecting lead from earth terminal of LA to surge counter	Insulated flexible tinned plated copper braid with lugs.
36	Size of Insulated tinned copper braid	25 sqmm
37	Length of Insulated tinned copper braid	13 meters
38	Bolt size and grade	Stainless Steel M12 bolt and 8.8
39	Reference Standard	IEC 60099-4 :2014 ed. 03 IS-3070:1993 (Part-3)
40	Type of Mounting	Pedestal
41	Material of Insulating base	UV resistant Fire retardant DMC
42	Marking/Engraving	TPCODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing

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## **TYPE TEST REPORT**

Bidder shall furnish the type test report for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**

1. Power Frequency reference Voltage test (Both in Dry and Wet condition) As per IEC 60099-4 Ed.3 clause 10.8.2
2. Lightning impulse residual voltage on complete arrester as per IEC 60099-4 Ed.3 clause 10.8.2
3. Residual voltage tests as per IEC 60099-4 Ed.3 clause 10.8.3
4. Test to verify long term stability under continuous operating voltage as per IEC 60099-4 Ed.3 clause 10.8.4
5. Test to verify the repetitive charge transfer rating, Qrs as per IEC 60099-4 Ed.3 clause 10.8.5
6. Heat dissipation behaviour as per IEC 60099-4 Ed.3 clause 10.8.6
7. Operating duty test as per IEC 60099-4 Ed.3 clause 10.8.7
8. Power-frequency voltage- versus-time test characteristic as per IEC 60099-4 Ed.3 clause 10.8.8
9. Tests of arrester disconnector as per IEC 60099-4 Ed.3 clause 10. 8.9
10. Operating withstand Test for Disconnector As per IEC 60099-4 Ed.3 clause 8.9.2
11. Disconnector operation test Current vs time as per IEC 60099-4 Ed.3 clause 8.9.3
12. Mechanical tests on Disconnector As per IEC 60099-4 Ed.3 clause 8.9.4
13. Temperature cycling and seal pumping test on Disconnector As per IEC 60099-4 Ed.3 clause 8.9.5
14. Short-circuit tests a. High current SC b. Low current SC as per IEC 60099-4 Ed.3 clause 10.8.10
15. Bending moment test as per IEC 60099-4 Ed.3 clause 10.8.11
16. Seal leak rate test as per IEC 60099-4 Ed.3 clause 10.8.13
17. Radio interference voltage (RIV) test as per IEC 60099-4 Ed.3 clause 10.8.14
18. Test to verify the dielectric as per IEC 60099-4 Ed.3 clause
19. Test of internal grading components as per IEC 60099-4 Ed.3 clause 10.8.16
20. Thermal cyclic test as per IEC 60099-4 Ed.3 clause 8.16.2
21. Weather aging Test for 1000 hours of slat fog test and 1000 hours of UV test as per IEC 60099-4 Ed.3 clause 10.8.17




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## 26.0 33 kV 3 POLE AB SWITCH (400AMP)

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Rating of AB Switch	400 Amps AB Switch
2	Installation	Outdoor
3	Suitable for Mounting	Horizontal Rotating Type
4	Type	3 Pole
5	Service Voltage	33 kV
6	Rated Voltage	36 kV
7	Rated Frequency	50 Hz
8	Current Carrying Capacity	400 Amps
9	Rated short time current	16 kA for 1sec
10	Rated peak withstand current	40 kA
11	Rated Short circuit making capacity	25 KA RMS
12	Rated Cable Charging breaking capacity	40 KA RMS
13	Rated line charging breaking capacity	5.3 A RMS
14	Rated Transformer off load breaking Capacity	16 A RMS
15	One-minute power frequency with stand voltage Dry	95 KV RMS
16	One-minute power frequency withstand voltage Wet	75 KV RMS
17	Power Frequency puncture withstand voltage	1.3 times of actual dry flashover voltage
A	Visible Discharge Voltage	27 KV RMS
B	Dry flashover Voltage	95 kV
18	Power Frequency withstand voltage between pole and earth	70 KV RMS
19	Power frequency withstand voltage across the isolation distance	80 KV RMS
20	Impulse with stand voltage for positive and negative polarity (1.2 / 50) micro second wave)	
A	Across Isolating distance	195 KV Peak
B	To earth and between poles	170 KV Peak
21	No. of Post Per Phase (Polymeric, IEC 61109)	To be provided by bidder
22	Total No. of post	To be provided by bidder
23	Minimum Creepage Distance	900 mm (one post)
24	Phase to Phase Clearance	1200 mm
25	Isolation Distance in switch open condition	640 mm
26	Vertical clearance from Top of Insulator cap to mounting channel	508 mm (Minimum)

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
27	Copper contacts Temp in Air should not exceed	65 Degree
28	Size of fixed contacts (Copper Type Electrolytic with silver plated)	80mmx50mmx8mm Jaw assemblies are to be bolted through stainless steel flat and spring washer (Min 6 nos. of spring to be used on each post).
29	Size of Moving contacts (Copper Type Electrolytic with silver plated)	250mmx50mmx8mm (a Min deposit of 10 micron of Silver on copper contact)
30	Moving Contact supporting Angle	50mmx50mmx6mm
31	Size of rods used for arcing horns	10 mm
32	Insulation for tinned Copper braid/rope	Polyolefin of woer make, (RSFR-H) type
33	Copper Flexible BRAIDED Tape - 320mm Long, Tined plated with Brass Nut, bolt & Washers both end shall be crimped with copper socket through brass bolts and nuts	450gm /Mtr
34	Minimum size*Length of Coupling Hot Dip GI Solid Rod for Phase coupling pipe, B Class	25mm Dia & 2500mm long
35	Operating Down Pipe, B Class (IS 1239-68)	32mm Dia & 7 Mtr Long (one piece)
36	Temperature Rise Limit (w.r.t ambient temp) - Tinned Copper contacts - Terminals - Metal Parts	50°C 40°C 40°C
37	Arching Horns	8 mm dia GI rod
38	Locking Arrangement	Provision for pad locking at both 'ON' & 'OFF' position
39	Earth Terminal	M12 Bolts with nuts and flat washer shall be provided at base channel as earthing Terminal.
40	'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 requirements & avoid entire change of arm.
41	'I' bolt	The I bolt shall be longer with 75 mm thread.
42	Supporting Channel	100x50x6 mm hot dip galvanized channel (C/C slotted 18x36 hole 250 mm) Min. 760 mm length
43	Connectors	Connectors shall be of hard drawn electrolytic copper or brass. The connector should be of 4 bolted type and suitable for 80- 100 sqmm AAC conductor. SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable


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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
		for 80-100 sqmm AAAC conductor.
44	Bearing	4 nos. self-lubricating bearing to be provided with grease nipple including 4 <sup>th</sup> bearing being a thrust bearing.
45	Marking/Engraving	TPCODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing.

### TYPE TEST REPORT

Bidder shall furnish the type test report of **AB Switch** for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**


- a) Test for Temperature rise as per IS 9920-part 4 cl.3.2.
- b) Test to verify the insulation level including withstand test at power frequency voltages on auxiliary equipment test as per IS 9920 part4 cl. 3.1.
- c) Test to prove satisfactory operation and mechanical endurance as per IS 9920 part4 cl.3.5.
- d) Making and braking test as per IS 9920 part4 cl.3.3.
- e) Test to prove the capability of the switch to carry the rated peak withstand current and rate short circuit current as per IS 9920 part4 cl.3.4.
- f) Test to prove satisfactory operation under ice conditions as per IS 9920 part4 Cl.3.6.
- g) Impulse voltage dry test
- h) Power frequency voltage dry test
- i) Power frequency voltage wet test
- j) Temperature of resistance.
- k) Measurement of resistance.
- l) Test to prove the capability of carrying the rated peak short circuit current and the rated short time current.
- m) Mainly active load breaking capacity test.
- n) Transformer off-load breaking test.
- o) Line charging breaking capacity test.
- p) Operation tests.
- q) Mechanical endurance test.
- r) Mechanical strength test for the post insulator as per IS-2544/1973.
- s) Test for galvanization of metal (ferrous) parts as perm IS-2633/1973.

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## 27.0 33 kV 3 POLE HG FUSE (200AMP)

### GENERAL TECHNICAL PARTICULARS

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 up to date, IEC 61109
5	Rated Voltage	36 Kv
6	Rated Frequency	50 Hz
7	Continuous current Rating	200 Amp
8	<b>Post Insulator</b>	
8.1	<b>Lightning Impulse Withstand Voltage Positive &amp; Negative Polarity (1.2/50 microsec wave)</b>	
a	Across the Isolating distance	195 kV (Peak)
b	To Earth & Between Poles	170 kV (Peak)
8.2	1 Minute Power Frequency Withstand Voltage (Dry)	95 kV RMS
8.3	1 Minute Power Frequency Withstand Voltage (Wet)	75 kV RMS
8.4	Visible Discharge Voltage	27kV RMS
8.5	Dry Flashover Voltage	95 kV
8.6	Power frequency puncture withstand voltage	1.3 times of actual dry flashover voltage
8.7	Impulse Withstand Voltage (Switching Position)	170 kV Peak
9	<b>1 Minute Power Frequency Withstand Voltage</b>	
a	Across the Isolating distance	100kV RMS
b	To Earth & Between Poles	75kV RMS
10	Temperature Rise	Within permissible limit as per IS 9385-1980 (Part-II) amended up to date
11	Outdoor/Indoor	Outdoor
12	Type of mounting	Horizontal
13	<b>Vertical clearance from top of insulator cap to mounting Channel</b>	508 mm
13B	Height of the riser for carrying the horns.	250mm from the cap (top) of insulator
13C	Details of Arcing Horns	Copper rod having 8.32 mm dia Silver-plated provided with screwing arrangement for fixing use wire made of copper casting. (Total length 995mm). All the bolts, nuts and washers should be made out of brass.

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
13D	Riser Unit	(a) The shape of connectors may be made of straight copper Flat of 250mm Height
		(b) 170mm height G.I. Riser made of 25mm nominal bore medium gauge G.I. Pipe welded with 2 nos. G.I. Flat of 35 x 5 mm at both ends fixed with 10mm dia stainless steel, bolts and nuts with flat stainless steel spring washers
14	Connectors	SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable for 80-100 sqmm AAC conductor.
15	Size of Base Channel (HDG)	100mmx50mmx6mm (C/C slotted hole 18x36- 250 mm) Min. 760 mm length
16	Aluminium Strip for HG Fuse	30mmx5mmx425mm
17	<b>33 kV Polymer Post Insulator</b>	
a.	Applicable Standard	IEC 61109-2008 amended up to date
b.	Make of Post Insulator	To be specified by Bidder
c.	Minimum failing load	10 kN
d.	CD of Post Insulator (min.)	900 mm
e.	Number of Insulators per Pole	1 Nos.
f.	Diameter of FRP Rod	24mm
18	Total weight of Horn Gap Fuse	To be specified by Bidder
19	Marking/Engraving	TPCODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing.

### TYPE TEST REPORT

Bidder shall furnish the type test report of **HG Fuse** for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**

#### 1. HORN GAP FUSE

- a) Lightning Impulse Voltage Withstand Test
- b) Dry Power Frequency Voltage Withstand Test
- c) Wet Power Frequency Voltage Withstand Test
- d) Temperature Rise Test shall be done at 100A current


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## 2. POST INSULATOR

Sr No.	Type Test	Test Procedure/Standard
1.	Dry Lightning Impulse Withstand Voltage test	IEC 61109 (Clause No.11.1)
2.	Wet power frequency test	IEC 61109 (Clause No.11.1)
3.	Damage Limit proof test and test of tightness of the interface between end fittings & Insulator housing	IEC 61109 (Clause No.11.2)
4.	Radio Interference test	IEC 60437
5.	Recovery of Hydrophobicity test	Annexure „A“

## 3. Tests on Insulator units


- a) RIV Test (Dry)
- b) Brittle Fracture Resistance Test
- c) Recovery of Hydrophobicity & Corona test
- d) Chemical Composition test for Silicon Content

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## 28.0 11 kV 3 POLE AB SWITCH (400AMP) FOR LINE AND 11 kV 3 POLE AB SWITCH (200AMP)


### GENERAL TECHNICAL PARTICULARS

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
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
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	28kV
20	1 Minute Power frequency withstand voltage across the isolation distance	32kV	32kV
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 61109)	2	2
23	Total No. of post	6	6
24	Minimum Creepage Distance	320 mm	320mm
25	Phase to Phase Clearance	760mm	760mm
26	Isolation Distance in switch open	380mm	380 mm

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
	condition		
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)	80mmx50mmx8mm	70mmx35mmx6mm
30	Size of Moving contacts (Copper Type Electrolytic with silver plated)	220mmx50mmx8mm	220mmx35mmx6mm
31	Moving Contact supporting Angle	50mmx50mmx5mm	45mmx45mmx5mm
32	Size of rods used for arcing horns	10 mm	10 mm
33	Insulation for tinned Copper braid/rope	Polyolefin of woer make, (RSFR-H) type	Polyolefin of woer make, (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 Rod for Phase coupling pipe, B Class	25mm Dia &1800 mm long	25mm Dia &1800mm long
36	Operating Down Pipe, B class (IS 1239-68)	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	50°C 40°C 40°C	50°C 40°C 40°C
38	Bearings	4 nos. self-lubricating bearing to be provided with grease nipple including 4 <sup>th</sup> 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 requirements & avoid entire change of arm.	
42	'I' bolt	The I bolt shall be longer with 75 mm thread.	
43	Mounting Channel HDG 86 microns	75x40x4.8 mm 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 80- 100 sqmm AAC conductor. Or SOCKET: Two no. of bimetallic copper sockets shall	




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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
		be used at both ends suitable for 80-100 sqmm AAAC conductor.
45	Marking/Engraving	TPCODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing.

### **TYPE TEST REPORT**

Bidder shall furnish the type test report of **AB Switch** for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**


- a. Test for Temperature rise as per IS 9920-part 4 cl.3.2.
- b. Test to verify the insulation level including withstand test at power frequency voltages on auxiliary equipment test as per IS 9920 part4 cl. 3.1.
- c. Test to prove satisfactory operation and mechanical endurance as per IS 9920 part4 cl.3.5.
- d. Making and braking test as per IS 9920 part4 cl.3.3.
- e. Test to prove the capability of the switch to carry the rated peak withstand current and rate short circuit current as per IS 9920 part4 cl.3.4.
- f. Test to prove satisfactory operation under ice conditions as per IS 9920 part4 Cl.3.6.
- g. Impulse voltage dry test
- h. Power frequency voltage dry test
- i. Power frequency voltage wet test
- j. Temperature of resistance.
- k. Measurement of resistance.
- l. Test to prove the capability of carrying the rated peak short circuit current and the rated short time current.
- m. Mainly active load breaking capacity test.
- n. Transformer off-load breaking test.
- o. Line charging breaking capacity test.
- p. Operation tests.
- q. Mechanical endurance test.
- r. Mechanical strength test for the post insulator as per IS-2544/1973.
- s. Test for galvanization of metal (ferrous) parts as perm IS-2633/1973.

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## 29.0 11 kV 200 A 3 POLE HG FUSE

### GENERAL TECHNICAL PARTICULARS

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 61109
5	Rated Voltage	12 kV
6	Rated Frequency	50 Hz
7	<b>Lightning Impulse Withstand Voltage Positive &amp; Negative Polarity (1.2/50 micro sec wave)</b>	
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	<b>1 Min. Power Frequency Withstand Voltage (Dry &amp; Wet)</b>	
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	<b>11kV Polymer Post Insulator</b>	
a.	Applicable Standard	IEC 61109-2008 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 Post	1 Nos.
f.	Diameter of FRP Rod	16mm
20	Total weight of Horn Gap Fuse	To be Specified by Bidder

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
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 casting 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)	a) Riser cum Connector made out of copper casting (with minimum 95% copper composition having riser size (80 mm height x30mm width x8 mm thickness) and connector of size (80 mmx50mmx 8mm) duly silver plated and machine finishing provided with 2 nos.12 mm dia. brass bolts and double brass nuts with flat brass washers and 2 nos. solderless bimetallic socket per each connector suitable up to 80 mm <sup>2</sup> conductor. 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. stainless steel bolts and nuts with flat & stainless-steel spring washer.
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. Refer TPCO-OTH-010.
24	Connectors	SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable for 80-100 sqmm AAC conductor.
25	Marking/Engraving	TPCODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing.

### **TYPE TEST REPORT**

Bidder shall furnish the type test report of **HG Fuse** for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**

#### **4. HORN GAP FUSE**

- a) Lightning Impulse Voltage Withstand Test
- b) Dry Power Frequency Voltage Withstand Test
- c) Wet Power Frequency Voltage Withstand Test
- d) Temperature Rise Test shall be done at 100A current

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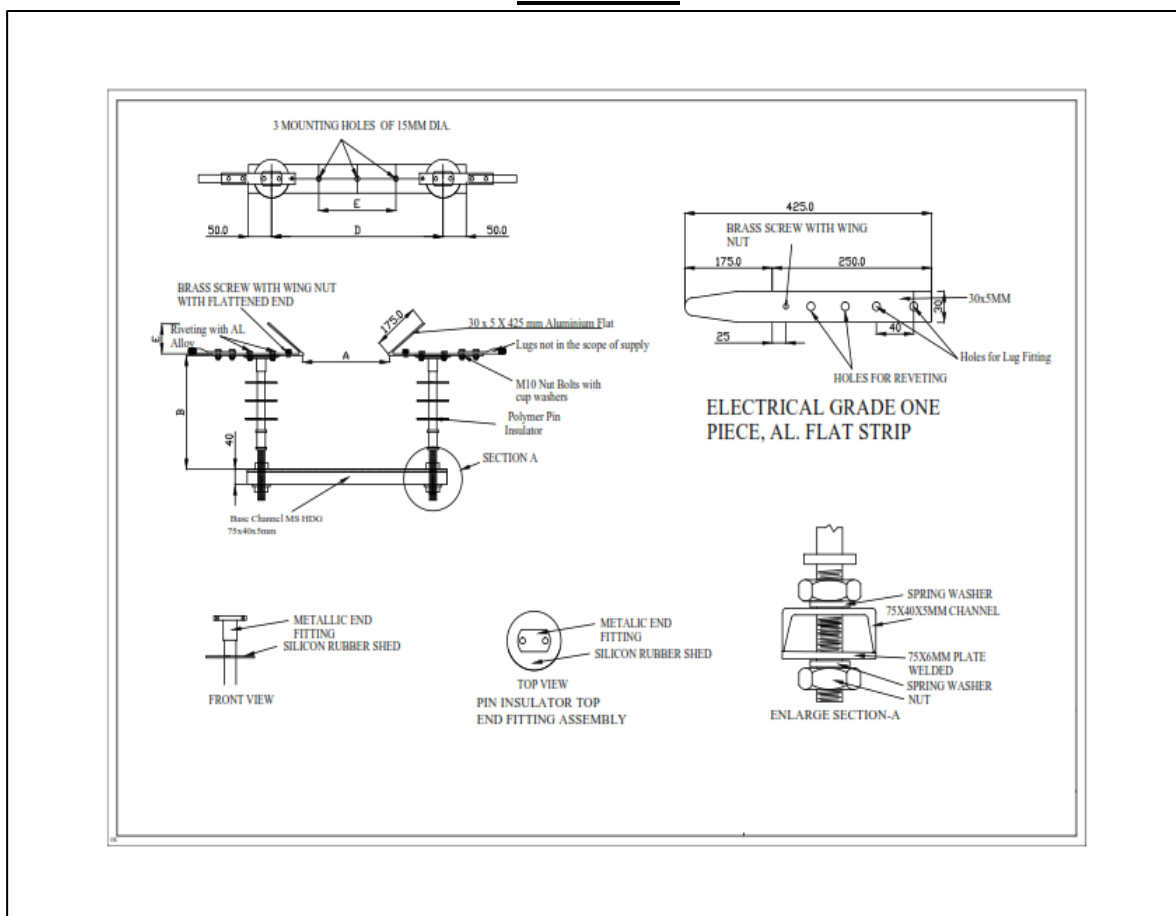
## 5. POST INSULATOR

Sr No.	Type Test	Test Procedure/Standard
1.	Dry Lightning Impulse Withstand Voltage test	IEC 61109 (Clause No.11.1)
2.	Wet power frequency test	IEC 61109 (Clause No.11.1)
3.	Damage Limit proof test and test of tightness of the interface between end fittings & Insulator housing	IEC 61109 (Clause No.11.2)
4.	Radio Interference test	IEC 60437
5.	Recovery of Hydrophobicity test	Annexure „A“

## 6. Tests on Insulator units

- RIV Test (Dry)
- Brittle Fracture Resistance Test
- Recovery of Hydrophobicity & Corona test
- Chemical Composition test for Silicon Content

## DRAWINGS




**Note: - All Dimensions are in mm unless noted otherwise specified.**


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**30.0 55mm<sup>2</sup>, 80mm<sup>2</sup>, 100mm<sup>2</sup> AND 148 mm<sup>2</sup> AAA CONDUCTOR**  
**GENERAL TECHNICAL PARTICULARS**

SL. NO.	TECHNICAL PARTICULARS	UNIT	Rabbit (7/3.15)	RACCOON (7 / 3.81mm)	DOG (7 / 4.26mm)	COYOTE (19 / 3.15mm)
			DESIRED VALUE			
1	Make					
a)	Aluminium Alloy rod		HINDALCO/BALCO/ VEDANTA/SAAPI			
b)	Conductor		Name of Company			
2	Type	No/mm	7 / 3.15	7 / 3.81	7 / 4.26	19 / 3.15
3	<b>Particulars of Raw material</b>					
a)	Si	%	0.50 - 0.90	0.50 - 0.90	0.50 - 0.90	0.50 - 0.90
b)	Mg	%	0.60 0.90	0.60 0.90	0.60 0.90	0.60 0.90
c)	FE	%	0.50 max	0.50 max	0.50 max	0.50 max
d)	Cu	%	0.10 max	0.10 max	0.10 max	0.10 max
e)	Mn	%	0.03 max	0.03 max	0.03 max	0.03 max
f)	Cr.	%	0.03 max	0.03 max	0.03 max	0.03 max
g)	Zn	%	0.10 max	0.10 max	0.10 max	0.10 max
h)	B	%	0.06 max	0.06 max	0.06 max	0.06 max
i)	Other Elements (Each)	%	0.03 max	0.03 max	0.03 max	0.03 max
j)	Other Elements (Total)	%	0.10 max	0.10 max	0.10 max	0.10 max
k)	Aluminium	%	Remainder	Remainder	Remainder	Remainder
4	<b>Aluminium Strands after stranding</b>					
i	Diameter (mm)					
a)	Normal	mm	3.15	3.81	4.26	3.15
b)	Maximum	mm	3.18	3.85	4.3	3.18
c)	Minimum	mm	3.12	3.77	4.22	3.12
ii	Cross Section Area of Nominal dia. wire	Sq. mm	7.793	11.4	14.25	7.79
iii	Minimum Breaking Load of Each Strand After Stranding	KN	2.29	3.34	4.18	2.29
iv	Minimum elongation % on gauge length of 200 mm (After Strand)	%	4	4	4	4
v	Maximum DC Resistance of 1 m length (Ohm) at 20° C	Ohm	0.00429	0.002938	0.002345	0.004290
vi	Approx. Total Wt. of Each Strand.	Kg. /Km	21.04	30.78	38.48	21.04
5	<b>AAAC Stranded conductor</b>					
5.1	Nominal Sectional Area	sq.mm	55	80	100	148
5.2	Overall Diameter	mm	9.45	11.43	12.78	15.75
5.3	Approximate Wt. of the Conductor	Kg. /Km	149.2	218.26	272.86	406.91
5.4	Minimum Ultimate Breaking Load of Conductor	KN	16.03	23.41	29.26	43.5
5.5	Lay ratio of conductor ((Min. / Max.)		10 / 14	10 / 14	10 / 14	Inner (10 / 14)

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SL. NO.	TECHNICAL PARTICULARS	UNIT	Rabbit (7/3.15)	RACCOON (7 / 3.81mm)	DOG (7 / 4.26mm)	COYOTE (19 / 3.15mm)
			DESIRED VALUE			
						Outer (10 / 16)
5.6	Calculated Max. resistance of conductor at 20° C	Ohm/ Km.	0.621	0.425	0.3390	0.2290
6	Standard length of conductor (meter)	Mtr.	5000	2000	2000	2000
6.1	Continuous max. current carrying capacity in still air at 40°C ambient temperature	Amp		290	285	425
6.2	Temperature rise for above current		35° Cover the ambient			
6.3	Tolerance on standard length of Conductor (%)	%	±5			
6.4	Direction of lay for outside layer		Right Hand			
7	Modulus of Elasticity	Kg. / Cm <sup>2</sup>	0.6324 x 10 <sup>6</sup>	0.6324 x 10 <sup>6</sup>	0.6324 x 10 <sup>6</sup>	0.6324 x 10 <sup>6</sup>
8	Applicable Standard		IS 398 (Part-4) :1994			
9	Other particulars, if any		Nil	Nil	Nil	Nil
10	Joints- There shall be no joints in any wire of a stranded conductor containing continuation.					
11	Co-efficient of liner expansion per deg. C	°C	23*10 <sup>-6</sup>	23*10 <sup>-6</sup>	23*10 <sup>-6</sup>	23*10 <sup>-6</sup>
12	Density	Kg/ dm <sup>3</sup>	2.7			
13	Resistivity of Wire	Ohm mm <sup>2</sup> / m	0.0328			
14	Drum Marking		Each drum shall have the following information stencilled on it in indelible ink along with other essential data: (a) Contract/Award letter number (b) Name and address of consignee. (c) Manufacture's name and address. (d) Drum and lot number (e) Size and type of conductor (f) Length of conductor in meters (g) Arrow marking for unwinding (h) Position of the conductor ends (i) Number of turns in the outer most layer. (j) Gross weight of the drum after putting lagging. (k) Average weight of the drum without lagging. (l) ISI mark			

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**31.0 3x95+1x70+1x16 mm<sup>2</sup>, 3x70+1x50+1x16 mm<sup>2</sup>, 3x50+1x35+1x16 mm<sup>2</sup>,  
3x35+1x25+1x16 mm<sup>2</sup>, 3x50+1x35 mm<sup>2</sup>, 1x35+1x25 mm<sup>2</sup>, 3x35+1x25 mm<sup>2</sup> LT  
XLPE AB CABLE**

**GENERAL TECHNICAL PARTICULARS**

SL NO	DESCRIPTION	UNITS	3C×95 mm <sup>2</sup> (P)+1C×70 mm <sup>2</sup> (M)+1CX1 6 mm <sup>2</sup> (Street Light)	3C X 70 mm <sup>2</sup> (P)+ 1C X 50 mm <sup>2</sup> (M) +1C x 16 mm (Street Light)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)+1CX1 6 mm <sup>2</sup> (Street Light)	3C X 35 mm <sup>2</sup> (P) + 1C X 25(M)+ 1C x 16 mm <sup>2</sup> (Street Light)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase neutral and street lighting core twisted around the insulated earth cum messenger wire.			
2	Size of Aerial Bunched cable		3C×95 mm <sup>2</sup> (P)+1C×70 mm <sup>2</sup> (M)+1CX1 6 mm <sup>2</sup> (Street Light)	3C X 70 mm <sup>2</sup> (P)+ 1C X 50 mm <sup>2</sup> (M) +1C x 16 mm (Street Light)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)+1CX1 6 mm <sup>2</sup> (Street Light)	3C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)+ 1C x 16 mm <sup>2</sup> (Street Light)
3	Rated Voltage	kv	1.1	1.1	1.1	1.1
4	System Voltage	kv	0.415	0.415	0.415	0.415
5	Nominal Area of Phase Conductor	mm <sup>2</sup>	95	70	50	35
6	Nominal Area of Messenger	mm <sup>2</sup>	70	50	35	25
7	Phase Core		Stranded compacted circular aluminium conductor, Extruded XLPE insulated			
8	Neutral core & Messenger Wire		Stranded compacted circular aluminium alloy conductor, Extruded XLPE insulated			
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	<b>Phase Core RYB insulated</b>					
a)	<b>Conductor</b>					
(i)	Material		EC Grade Aluminium of H4 Grade to IS: 8130:1984	EC Grade Aluminium of H4 Grade to IS: 8130:1984	EC Grade Aluminium of H4 Grade to IS: 8130:1984	EC Grade Aluminium of H4 Grade to IS: 8130:1984
(ii)	No. of Cores & Nominal Size	mm <sup>2</sup>	3C*95	3C*70	3C*50	3C*35
(iii)	Minimum number of wires		15/2.54 before stranding	12/2.24 before stranding	6/3.1 before stranding	6/2.54 before stranding

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SL NO	DESCRIPTION	UNITS	3C×95 mm <sup>2</sup> (P)+1C×70 mm <sup>2</sup> (M)+1CX1 6 mm <sup>2</sup> (Street Light)	3C X 70 mm <sup>2</sup> (P)+ 1C X 50 mm <sup>2</sup> (M) +1C x 16 mm (Street Light)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)+1CX1 6 mm <sup>2</sup> (Street Light)	3C X 35 mm <sup>2</sup> (P) + 1C X 25(M)+ 1C x 16 mm <sup>2</sup> (Street Light)
(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)	<b>Insulation</b>					
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			
<b>12</b>	<b>Street light core</b>					
a)	<b>Conductor</b>					
i)	Material		EC grade aluminium of H4 grade to IS: 8130:1984			
ii)	Nominal size	mm <sup>2</sup>	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)			
v)	Shape of conductor		Stranded compacted circular			
b)	<b>Insulation</b>					
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			
<b>13</b>	<b>Neutral Cum Messenger Wire</b>					
a)	<b>Messenger wire</b>					
i)	Material		Aluminium Alloy Wire	Aluminium Alloy Wire	Aluminium Alloy Wire	Aluminium Alloy Wire
ii)	Nominal size	mm <sup>2</sup>	70	50	35	25
iii)	No. and Nominal Dia. of each strand	No./m	7/3.57	7/3.02	7/2.54	7/2.14




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SL NO	DESCRIPTION	UNITS	3C×95 mm <sup>2</sup> (P)+1C×70 mm <sup>2</sup> (M)+1CX16 mm <sup>2</sup> (Street Light)	3C X 70 mm <sup>2</sup> (P)+ 1C X 50 mm <sup>2</sup> (M) +1C x 16 mm (Street Light)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)+1CX16 mm <sup>2</sup> (Street Light)	3C X 35 mm <sup>2</sup> (P) + 1C X 25(M)+ 1C x 16 mm <sup>2</sup> (Street Light)
iv)	Calculated Maximum resistance at 20 degC	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	XLPE Insulation as per IS 14255	XLPE Insulation as per IS 14255	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 ft.			
15	Formation of cable		3 phase cores & 1 street lighting core xlp insulated are laid up over insulated messenger with R-H direction of lay	3 phase cores & 1 street lighting core xlp insulated are laid up over insulated messenger with R-H direction of lay	3 phase cores & 1 street lighting core xlp insulated are laid up over insulated messenger with R-H direction of lay	3 phase cores & 1 street lighting core xlp insulated are laid up over insulated messenger with R-H direction of lay
16	Continuous current rating in air at 40DegC of phase conductor	A	230	200	149	125
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			

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SL NO	DESCRIPTION	UNITS	3C×95 mm <sup>2</sup> (P)+1C×70 mm <sup>2</sup> (M)+1CX16 mm <sup>2</sup> (Street Light)	3C X 70 mm <sup>2</sup> (P)+ 1C X 50 mm <sup>2</sup> (M) +1C x 16 mm (Street Light)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)+1CX16 mm <sup>2</sup> (Street Light)	3C X 35 mm <sup>2</sup> (P) + 1C X 25(M)+ 1C x 16 mm <sup>2</sup> (Street Light)
22	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100 V , size of cable , ISI, month & year of manufacturing, Property of TPCODL, PO number & date			
23	Marking on Drum		<p>The cable shall carry the following information either stenciled on the drum or contained in a label attached to it:</p> <ul style="list-style-type: none"> <li>a) Reference to the Standards.</li> <li>b) Manufacturer's name.</li> <li>c) Type of cable.</li> <li>d) Voltage grade.</li> <li>e) Number of cores.</li> <li>f) Nominal cross-section area of the conductor.</li> <li>g) Length of the cable on the drum.</li> <li>h) Length of the cable per m.</li> <li>i) Marking of PO</li> <li>j) Direction of rotation of the drum.</li> <li>k) Gross mass.</li> <li>l) Country of manufacture.</li> <li>m) Year of manufacture.</li> <li>n) ISI Certification mark.</li> </ul>			

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SL NO	DESCRIPTION	UNITS	1C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)	3C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)
1	Type of Cable		LT ABC cable with cross linked polyethylene insulated Phase core twisted around the insulated earth cum messenger wire		
2	Size of Aerial Bunched cable		1C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)	3C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)
3	Rated Voltage	kV	1.1	1.1	1.1
4	System Voltage	kV	0.415	0.415	0.415
5	Nominal Area of Phase Conductor	mm <sup>2</sup>	35	50	35
6	Nominal Area of Messenger	mm <sup>2</sup>	25	35	25
7	Phase Core		Stranded compacted circular Aluminium Conductor, Extruded XLPE Insulated		
8	Neutral core & Messenger Wire		Stranded compacted circular aluminium alloy conductor, Extruded XLPE insulated		
9	Maximum conductor temperature during continuous operation	Deg C	90	90	90
10	Maximum conductor temperature during short circuit	Deg C	250	250	250
<b>11</b>	<b>Phase Core RYB insulated</b>				
a)	<b>Conductor</b>				
(i)	Material		EC Grade Aluminium of H4 Grade to IS: 8130:1984	EC Grade Aluminium of H4 Grade to IS: 8130:1984	EC Grade Aluminium of H4 Grade to IS: 8130:1984
(ii)	No. of Cores & Nominal Size	mm <sup>2</sup>	1C*35	3C*50	3C*35
(iii)	Minimum number of wires		6	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	0.868	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

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SL NO	DESCRIPTION	UNITS	1C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)	3C×50 mm <sup>2</sup> (P)+1C×35 mm <sup>2</sup> (M)	3C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)
(viii)	Continuous current rating in air at 40Deg. C	A	125	149	125
b)	<b>Insulation</b>				
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		
a)	<b>Messenger wire</b>				
i)	Material		Aluminium Alloy Wire	Aluminium Alloy Wire	Aluminium Alloy Wire
ii)	Nominal size	mm <sup>2</sup>	25	35	25
iii)	No. and Nominal Dia. of each strand	No./mm	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 1 sec	kA	2.35	3.29	2.35
vii)	<b>Material of insulation</b>		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
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 ft.		
15	Formation of cable		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	3 phase cores XLPE insulated shall be twisted around the insulated earth cum messenger wire, with R-H direction of lay
16	Continuous current rating in air at 40DegC of phase conductor	A	125	149	125

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SL NO	DESCRIPTION	UNITS	1C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)	3Cx50 mm <sup>2</sup> (P)+1Cx35 mm <sup>2</sup> (M)	3C X 35 mm <sup>2</sup> (P) + 1C X 25 mm <sup>2</sup> (M)
17	Maximum conductor temperature during continuous operation (RYBN)	Deg C	90	90	90
18	Maximum conductor temperature during short circuit (RYBN)	Deg C	250	250	250
19	Standard Drum Length	Mtr	500	500	500
20	Tolerance in Drum length	%	+/-5%	+/-5%	+/-5%
21	Reference Standard		IS 14255		
22	Embossing on XPLE cable		Embossing on phase insulation of the cable: manufacturer name 1100 V, size of cable, ISI, month & year of manufacturing, Property of TPCODL, PO number & date	Embossing on phase insulation of the cable: manufacturer name 1100 V, size of cable, ISI, month & year of manufacturing, Property of TPCODL, PO number & date	Embossing on phase insulation of the cable: manufacturer name 1100 V, size of cable, ISI, month & year of manufacturing, Property of TPCODL, PO number & date
23	Marking on Drum		<p>The cable shall carry the following information either stencilled on the drum or contained in a label attached to it:</p> <ul style="list-style-type: none"> <li>a) Reference to the Standards.</li> <li>b) Manufacturer's name.</li> <li>c) Type of cable.</li> <li>d) Voltage grade.</li> <li>e) Number of cores.</li> <li>f) Nominal cross-section area of the conductor.</li> <li>g) Length of the cable on the drum.</li> <li>h) Length of the cable per m.</li> <li>i) Marking of PO</li> <li>j) Direction of rotation of the drum.</li> <li>k) Gross mass.</li> <li>l) Country of manufacture.</li> <li>m) Year of manufacture.</li> <li>n) ISI Certification mark.</li> </ul>		

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## **TYPE TEST REPORT**

Bidder shall furnish the type test report of **LT AB** cable for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**


1. Tests on phase/street light Conductor
  - a. Tensile Test
  - b. Wrapping Test.
  - c. Resistance Test
2. Tests on Messenger Conductor
  - a. Breaking Load Test
  - b. Elongation Test
  - c. Resistance Test
3. Physical Test For XLPE Insulation
  - 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
    - Content
    - Dispersion
4. Insulation resistance (Volume resistivity) test
5. Test for thickness insulation
6. High Voltage Test

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## 32.0 1.1 kV,4C XLPE ALUMINIUM ARMoured CABLE

### GENERAL TECHNICAL PARTICULARS


1.	SCOPE	<p>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.</p> <p>Applicable for 1.1 kV LT XLPE insulated Power Cable of following sizes:</p> <ul style="list-style-type: none"> <li>a) 4C X 300 sq.mm. (Aluminium conductor cable)</li> <li>b) 4C X 240 sq.mm. (Aluminium conductor cable)</li> <li>c) 4C X 185 sq.mm. (Aluminium conductor cable)</li> <li>d) 4C X 150 sq.mm. (Aluminium conductor cable)</li> <li>e) 4C X 120 sq.mm. (Aluminium conductor cable)</li> <li>f) 4C X 95 sq.mm. (Aluminium conductor cable)</li> <li>g) 4C X 50 sq.mm. (Aluminium conductor cable)</li> <li>h) 4C X 35 sq.mm. (Aluminium conductor cable)</li> <li>i) 4C X 25 sq.mm. (Aluminium conductor cable)</li> <li>j) 4C X 16 sq.mm. (Aluminium conductor cable)</li> <li>k) 2C X 50 sq. mm. (Aluminium conductor cable)</li> <li>l) 2C X 25 sq. mm. (Aluminium conductor cable)</li> <li>m) 2C X 16 sq. mm. (Aluminium conductor cable)</li> <li>n) 2C X 10 sq. mm. (Aluminium conductor cable)</li> <li>o) 1C X 630 sq. mm. (Aluminium conductor cable)</li> <li>p) 1C X 300 sq. mm. (Aluminium conductor cable)</li> <li>q) 1C X 185 sq. mm. (Aluminium conductor cable)</li> <li>r) 1C X 95 sq. mm. (Aluminium conductor cable)</li> <li>s) 1C X 25 sq. mm. (Aluminium conductor cable)</li> <li>t) 1C X 4 sq. mm. (Aluminium conductor cable)</li> <li>u) 1C X 2.5 sq. mm. (Aluminium conductor cable)</li> <li>v) 1C X 50 sq. mm. (Copper conductor cable)</li> <li>w) 2C X 50 sq. mm. (Copper conductor cable)</li> </ul>										
		<p>The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International standards / IEC and shall conform to the regulations of the local authorities.</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Standards</th> <th>Title</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>IS-7098 (Part-I):1988</td> <td>Specifications for Cross Linked Polyethylene PVC Sheathed Cables: Part 1-For Working Voltages up to and including 1100 Volts</td> </tr> <tr> <td>2</td> <td>IS-8130:1984</td> <td>Conductor for insulated electric cables &amp; flexible cords.</td> </tr> <tr> <td>3</td> <td>IS-398(Part-IV):1994</td> <td>Aluminum Conductors for overhead transmission purposes, Part 4: Aluminum alloy stranded conductors (aluminum magnesium silicon type)</td> </tr> </tbody> </table>	S. No.	Standards	Title	1	IS-7098 (Part-I):1988	Specifications for Cross Linked Polyethylene PVC Sheathed Cables: Part 1-For Working Voltages up to and including 1100 Volts	2	IS-8130:1984	Conductor for insulated electric cables & flexible cords.	3
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3	IS-398(Part-IV):1994	Aluminum Conductors for overhead transmission purposes, Part 4: Aluminum alloy stranded conductors (aluminum magnesium silicon type)										
2.	APPLICABLE STANDARDS											

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	4	IS-5831:1984	PVC insulation and sheath of electric cables.
	5	IEC-60228/3-2004	Conductor of insulated cables
	6	IEC-60502/1-2004	Extruded solid dielectric insulated power cables for rated voltage from 1 kV up to 30 kV
	7	IS-3975:1999	Mild steel wires, round wires and tapes for armouring of cables
	8	IS 10418: 1982	Specification for Drums of Electric cables

3.	<b>CLIMATIC CONDITIONS OF THE INSTALLATION</b>	For TPCODL:		
		1	Maximum ambient temperature	50 deg. C
		2	Max. Daily average ambient temp	40 deg. C
		3	Min Ambient Temperature	0 deg. C
		4	Maximum Humidity	100%
		5	Minimum Humidity	10%
		6	Average Annual Rainfall	1500mm
		7	Average No. of rainy days per annum	60
		8	Rainy months	June to Oct.
		9	Altitude above MSL not exceeding	300m
	10	Wind Pressure	300 kg/m <sup>2</sup> up an elevation of 10 m	
<p>The atmosphere is generally laden with Saline and dust suspended during dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to</p> <p>Withstand seismic forces corresponding to an acceleration of 0.3 g.</p>				
	1	Elevation	Around 300 m above sea level	
	2	Climate	Tropical with ambient temperature of 40 deg. C. Average over a 24 hour period and 45 deg. C maximum. Extremely wet conditions for four months in the year conducive to fungus growth and mild dew. Average rainfall 1500 M	
	3	Type of laying	Laying in ground and cable trenches. At road, railway crossings, to be laid through RCC/HDPE	




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				pipes.																																														
		4	Minimum depth of laying	1 meter																																														
		5	Maximum soil temperature of cable depth	30 deg. C																																														
		6	Characteristics of soil at cable laying	Generally clay																																														
		7	Estimated soil Thermal resistivity	120 deg. C-cm/W																																														
		8	Type of road surface	Asphalted or paved or concreted																																														
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11	Insulation		High grade XLPE insulation by extrusion process as per IS: 7098 (Part-I) - 1988								
	12	Inner sheath		Extruded PVC Compound Type ST2 as per IS:5831-1984							
		Armour		Galvanized steel round wire as per IS:3975-1999							
	14	Outer sheath		Extruded FRLSH PVC Compound Type ST2 as per IS:5831-1984							
	15	Standard length of cable on a drum with tolerance	M	As mentioned in Clause No.12 of this specification							
<b>1.1 kV Single Core XLPE insulated unarmoured cable conforming to IS 7098:1988</b>											
S No.	Parameter	Unit	Requirement								
	Size of Cable	sq.m m.	2.5	4	25	50	95	185	300	630	
1	Conductor										
a.	Type		Al	Al	Al	Cu	Al	Al	Al	Al	
b.	Grade		H2	H2	H4	H4	H4	H4	H4	H4	
c.	No. of Cores	Nos.	1	1	1	1	1	1	1	1	
d.	Maximum D.C. resistance of conductor at 20 deg C	Ohm/ Km	-	7.4 1	1.2 0	0.38 7	0.3 20	0.1 64	0.1 00	0.04 69	
e.	A.C. resistance at operating temperature of	Ohm/ Km	-	9.5 0	1.5 4	0.49 6	0.4 10	0.2 12	0.1 30	0.06 4	

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			90 deg C								
f.	Short circuit capacity for 1 second	kA	0.24	0.38	2.36	7.15	9	17.5	28.3	59.43	
g.	Continuous current rating at 40 deg C	A	20	31	98	222	230	360	501	814	
h.	Minimum no. of wires in the conductor	Nos.	3	3	6	6	15	30	30	53	
i.	Shape of conductor		Non-compact ed	Stranded Compact Circular or Compact shaped							
2	Insulation										
a.	Nominal thickness	mm	0.70	0.70	0.90	1.0	1.10	1.60	1.80	2.40	
b.	Minimum thickness(at any point of measurement)	mm	0.55	0.55	0.75	0.95	0.90	1.35	1.55	2.10	
3	Inner sheath		Not Applicable								
4	Armour		Not Applicable								
5	Outer Sheath										
a.	Nominal thickness	mm	1.80	1.80	1.80	1.80	1.80	2.00	2.00	2.20	
b.	Minimum thickness(at any point of measurement)	mm	1.24	1.24	1.24	1.24	1.24	1.40	1.40	1.56	

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1.1 kV Two Core XLPE insulated armoured cable conforming to IS 7098:1988							
S No.	Parameter	Unit	Requirement				
	Size of Cable	sq.mm.	10	16	25	50	50
1	Conductor						
a.	Type		Al	Al	Al	Al	Cu
b.	Grade		H2	H4	H4	H4	H4
c.	No. of Cores	Nos.	2	2	2	2	2
d.	Maximum D.C. resistance of conductor at 20 deg C	Ohm/K m	3.08	1.91	1.20	0.641	0.387
e.	A.C. resistance at operating temperature of 90 deg C	Ohm/K m	3.95	2.45	1.539	0.822	0.495
f.	Short circuit capacity for 1 second	kA	0.94	1.5	2.35	4.7	7.2
g.	Continuous current rating at 40 deg C	A	67	88	117	176	228
h.	Minimum no. of wires in the conductor	Nos.	7	6	6	6	7
i.	Shape of conductor		Non-compacted circular	Stranded Compact Circular or Compact shaped			
2	Insulation						
a.	Nominal thickness	mm	0.70	0.70	0.90	1.00	1.00

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b.	Minimum thickness(at any point of measurement)	mm	0.55	0.55	0.75	0.80	0.80	
3	Inner sheath							
a.	Type		Extruded PVC FRLSH (Flame)retardant cables with reduced halogen evolution and smoke)					
b.	Minimum thickness(at any point of measurement)	mm	0.30	0.30	0.30	0.30	0.30	
4	Armour							
a.	Type		GS round wire					
b.	Nominal diameter	mm	1.4	1.4	1.6	1.6	1.6	
c.	Tolerance	mm	plus/minus 0.040	plus/minus 0.045	plus/minus 0.045	plus/minus 0.045	plus/minus 0.045	
d.	No. of wires	Nos.	Total number should be such that these are closely laid over inner sheath with a gap of less than the diameter of single wire of armour.					
e.	Type of zinc coating		Medium	Medium	Medium	Medium	Medium	
f.	Mass of zinc coating	g/sq.m.	95	95	95	95	95	
g.	No. of dips		1 dip for 1 min.	1 dip for 1 min.	1 dip for 1 min.	1 dip for 1 min.	1 dip for 1 min.	

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	5	Outer Sheath							
	a.	Minimum thickness(at any point of measurement)	mm	1.24	1.40	1.40	1.56	1.56	
	1.1 kV Four Core XLPE insulated armoured cable conforming to IS 7098:1988								
	S No.	Parameter	Unit	Requirement					
	B	Size of cable	sq.mm	4C*120	4C*150	4C*185	4C*240	4C*300	
	1.	Conductor							
	a.	Type		Aluminum					
	b.	Grade		H4					
	c.	No. of cores	Nos.	4	4	4	4	4	
	d.	Maximum dc resistance of conductor at 20°C	ohm/km	0.253	0.206	0.164	0.125	0.100	
	e.	Short circuit capacity for one second	kA	11.34	14.17	17.48	22.68	28.34	
	f.	Continuous current rating at 40degC	A	264	305	350	418	488	
	g.	Minimum number of wires in the conductor	Nos.	15	15	30	30	30	
	h.	Shape of conductor		Stranded sector shaped					


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	2.	Insulation						
	a.	Nominal thickness	mm	1.2	1.4	1.6	1.7	1.8
	b.	Minimum thickness (at any point of measurement)	mm	1.15	1.20	1.54	1.65	1.55
	4.	Inner sheath						
	a.	Type	Extruded PVC FRLSH (Flame retardant cables with reduced halogen evolution and smoke)					
	b.	Minimum thickness (at any point of measurement)	mm	0.5	0.5	0.5	0.6	0.7
	3.	Armour						
	a.	Type of armour	GS Round Wire					
	b.	Nominal Diameter	mm	2.0	2.5	2.50	2.50	3.15
	c.	Tolerance	mm		±0.065			±0.080
	d.	Type of Zinc coating		Medium	Medium	Medium	Medium	Medium
	e.	Mass of Zinc coating	g/m <sup>2</sup>		110			120
	f.	Number of dips		1 dip for 1 minute and 1 dip	1 dip for 1 minute and 1 dip	1 dip for 1 minute and 1 dip	1 dip for 1 minute and 1 dip	1 dip for 1 minute and 1 dip


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a.	Minimum thickness (at any point of measurement)	mm	1.88	2.04	2.20	2.36	2.52																																																																																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th><i>S No.</i></th> <th><i>Parameter</i></th> <th><i>Unit</i></th> <th colspan="5"><i>Requirement</i></th> </tr> </thead> <tbody> <tr> <td><i>B</i></td> <td><i>Size of cable</i></td> <td><i>sq.mm</i></td> <td><i>4C*16</i></td> <td><i>4C*25</i></td> <td><i>4C*35</i></td> <td><i>4C*50</i></td> <td><i>4C*95</i></td> </tr> <tr> <td><i>1.</i></td> <td><i>Conductor</i></td> <td></td> <td colspan="5"><i>Aluminum</i></td> </tr> <tr> <td><i>a.</i></td> <td><i>Type</i></td> <td></td> <td colspan="5"></td> </tr> <tr> <td><i>b.</i></td> <td><i>Grade</i></td> <td></td> <td colspan="5"><i>H4</i></td> </tr> <tr> <td><i>c.</i></td> <td><i>No. of cores</i></td> <td><i>Nos.</i></td> <td><i>4</i></td> <td><i>4</i></td> <td><i>4</i></td> <td><i>4</i></td> <td><i>4</i></td> </tr> <tr> <td><i>d.</i></td> <td><i>Maximum dc resistance of conductor at 20°C</i></td> <td><i>ohm/km</i></td> <td><i>1.91</i></td> <td><i>1.2</i></td> <td><i>0.868</i></td> <td><i>0.641</i></td> <td><i>0.320</i></td> </tr> <tr> <td><i>e.</i></td> <td><i>Short circuit capacity for one second</i></td> <td><i>kA</i></td> <td><i>1.5</i></td> <td><i>2.35</i></td> <td><i>3.31</i></td> <td><i>4.7</i></td> <td><i>8.93</i></td> </tr> <tr> <td><i>f.</i></td> <td><i>Continuous current rating at 40degC</i></td> <td><i>A</i></td> <td><i>74</i></td> <td><i>96</i></td> <td><i>118</i></td> <td><i>142</i></td> <td><i>222</i></td> </tr> <tr> <td><i>g.</i></td> <td><i>Minimum number of wires in the conductor</i></td> <td><i>Nos.</i></td> <td><i>6</i></td> <td><i>6</i></td> <td><i>6</i></td> <td><i>6</i></td> <td><i>15</i></td> </tr> <tr> <td><i>h.</i></td> <td><i>Shape of conductor</i></td> <td></td> <td colspan="5"><i>Stranded sector shaped</i></td> </tr> </tbody> </table>								<i>S No.</i>	<i>Parameter</i>	<i>Unit</i>	<i>Requirement</i>					<i>B</i>	<i>Size of cable</i>	<i>sq.mm</i>	<i>4C*16</i>	<i>4C*25</i>	<i>4C*35</i>	<i>4C*50</i>	<i>4C*95</i>	<i>1.</i>	<i>Conductor</i>		<i>Aluminum</i>					<i>a.</i>	<i>Type</i>							<i>b.</i>	<i>Grade</i>		<i>H4</i>					<i>c.</i>	<i>No. of cores</i>	<i>Nos.</i>	<i>4</i>	<i>4</i>	<i>4</i>	<i>4</i>	<i>4</i>	<i>d.</i>	<i>Maximum dc resistance of conductor at 20°C</i>	<i>ohm/km</i>	<i>1.91</i>	<i>1.2</i>	<i>0.868</i>	<i>0.641</i>	<i>0.320</i>	<i>e.</i>	<i>Short circuit capacity for one second</i>	<i>kA</i>	<i>1.5</i>	<i>2.35</i>	<i>3.31</i>	<i>4.7</i>	<i>8.93</i>	<i>f.</i>	<i>Continuous current rating at 40degC</i>	<i>A</i>	<i>74</i>	<i>96</i>	<i>118</i>	<i>142</i>	<i>222</i>	<i>g.</i>	<i>Minimum number of wires in the conductor</i>	<i>Nos.</i>	<i>6</i>	<i>6</i>	<i>6</i>	<i>6</i>	<i>15</i>	<i>h.</i>	<i>Shape of conductor</i>		<i>Stranded sector shaped</i>				
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		2.	<i>Insulation</i>						
		a.	<i>Nominal thickness</i>	<i>mm</i>	0.7	0.9	0.9	1.0	1.1
		b.	<i>Minimum thickness (at any point of measurement)</i>	<i>mm</i>	0.6	0.75	0.75	0.80	0.90
		4.	<i>Inner sheath</i>						
		a.	<i>Type</i>		<i>For TPCODL-Extruded PVC FRLSH (Flame retardant cables with reduced halogen evolution and smoke)</i> <i>For TPCODL-Extruded PVC</i>				
		b.	<i>Minimum thickness (at any point of measurement)</i>	<i>mm</i>	0.3	0.3	0.3	0.3	0.4
		3.	<i>Armour</i>						
		a.	<i>Type of armour</i>		<i>GS round Wire</i>				
		b.	<i>Nominal Diameter</i>	<i>mm</i>	1.6	1.6	1.6	1.6	2.0
		c.	<i>Tolerance</i>	<i>mm</i>	±0.045	±0.045	±0.045	±0.045	±0.050
		d.	<i>Type of Zinc coating</i>		<i>Medium</i>	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>
		e.	<i>Mass of Zinc coating</i>	<i>g/m<sup>2</sup></i>	95	95	95	95	105
		f.	<i>Number of dips</i>		<i>1 dip for 1 minute</i>	<i>1 dip for 1 minute</i>	<i>1 dip for 1 Minute</i>	<i>1 dip for 1</i>	<i>1 dip for 1</i>


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						<i>minute</i>	<i>Minute</i>
5.	<i>Outer Sheath</i>						
a.	<i>Minimum thickness (at any point of measurement)</i>	<i>mm</i>	<i>1.4</i>	<i>1.4</i>	<i>1.4</i>	<i>1.56</i>	<i>1.72</i>


5.0	GENERAL CONSTRUCTION	<p>1.1 kV Power Cable shall be manufactured and tested strictly in accordance with the Indian Standard IS 7098 (Part – I):1988 and its latest amendments.</p> <p>All material used in the manufacturing of cables shall be new and shall be selected as the best available for the intended use.</p>	
		Conductor	
		Material	<p>a) Class 2, high electrical conductivity plain Aluminum, Stranded, Grade H2/H4. Or, b) Plain Copper, Stranded Note: For cable size ≤ 10 sq.mm, H2 grade conductor is required For cable size &gt; 10 sq.mm, H4 grade conductor is required</p>
		Shape	<p>Before stranding, the conductor shall be circular in cross-section, uniform in Quality, solid, smooth and free from scale, sharp edges and other defects. Shape as per no. of cores: a) for 4C cables - sector shaped b) for 2C - compacted circular/shaped c) for 1C - compacted circular as per IS 8130:1984</p>
Permissible joints	<p>Conductors shall conform to relevant standard 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.</p>		

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		Insulation	
		Material	<p>The insulating material shall be Cross Linked Polyethylene (XLPE) cured by dry curing process and applied by extrusion process as per IS-7098 (Part I):1988 and its latest amendments. The insulation properties shall be stable under thermal conditions arising out of continuous operation at conductor temperature of 90 degree Centigrade rising momentarily to 250 degree Centigrade under short circuit conditions.</p> <p>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. The quality of insulation shall be good and shall not deteriorate when exposed to climatic conditions and shall be uniform, free from voids, scratches and longitudinal grooves. Surface should be smooth.</p>
		Thickness	<p>The average thickness of the insulation shall be as per IS 7098 (Part-I):1988 with latest amendments or as specified in GTP, whichever is greater with tolerance as per IS 7098 (Part-I):1988. The smallest value of thickness of insulation shall not fall below the nominal value (ti) as specified in IS 7098 (Part 1):1988 by more than 0.1 mm+/- 0.1 (ti).</p>
		Insulation fitting	<p>It shall fit tightly to the conductor and shall be applied concentrically about the Conductor in thickness consistent with the voltage classification. The insulation shall be so applied that it shall be possible to remove it without Damaging the conductor.</p>
		Core identification	
		4C Cable	<p>Coloured strips or coloured insulation shall be applied on core for identification of cores in 4C cable. Red, Yellow and Blue strips shall be used to identify different phase conductors and black strip shall be used to identify neutral conductor.</p> <p>Bright Red line shall represent - R ph  Bright Yellow line shall represent - Y ph  Bright Blue line shall represent - B ph</p> <p>For 150 sq. mm. and above, the colored line shall be (3 mm width X 0.5 mm depth from insulation surface) extruded/embedded on the insulation surface.</p>

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		<p>Below 150 sq. mm, the colored line shall be (2 mm width X 0.3 mm depth from insulation surface) extruded/embedded on the insulation surface.</p> <p>For neutral, as core is already black, extruded line is not required.</p>
	2C Cable	For two core cables, cores shall be identified by insulation colored Red and Black.
	1C Cable	For single core cable, natural XLPE Colour with blue PVC outer sheath.
Laying up of Cores		
	Laying up	In twin, three and multi-core cables, the cores shall be laid up together with a suitable lay, the outermost layer shall have be right-hand lay and successive layer shall be laid with opposite lay. Where necessary, the interstices shall be filled with non-hygroscopic material to make the laid-up cores circular. The layup plan of multi cores shall be as per IS 7098 (Part-I):1988.
Fillers		
	4C Cable	Fillers are not required.
	For 1C & 2C Cable	Fillers or bedding used shall be non-wicking and non-moisture absorbing Thermoplastic material. Fillers shall be so chosen as to be compatible with the temperature ratings of the cables and shall have no deleterious effect on any other component of the cable.
Inner Sheath		
	Material	The inner sheath material shall be of polyvinyl chloride (PVC) FRLSH (Flame retardant cables with reduced halogen evolution and smoke) compound conforming to the requirements of type ST 2 compound of IS: 5831:1984 with latest amendments. *Note: 1C cables shall not have any inner sheath.
	Laying up	The laid up cores shall be provided with an inner sheath applied by pressurized Extrusion process. It shall be ensured that it is as circular as possible. The inner sheath shall be so applied that it fits closely on the laid up cores and it shall be possible to remove it without damage to the underlying insulation of the cores. When one or more layers of proofed plastic tape are applied over the laid up cores as a binder, the thickness of such tapes shall not be construed as part of the extruded inner sheath.
	Thickness	The thickness of the inner sheath shall be as per IS-7098 (Part-I):1988.
Armouring		
	Material	The armouring shall be of galvanized round steel wires complying the requirements of IS: 3975:1999 along with latest amendments. The resistance measured for galvanized wires/strips when corrected to 20°C, shall comply with appropriate values mentioned in IS: 7098 (Part - I):1988.

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			<p>The round steel wires taken from the cable shall meet the following:</p> <ol style="list-style-type: none"> <li>Tensile strength not less than 250 N/mm<sup>2</sup> and not more than 580 N/mm<sup>2</sup></li> <li>Elongation at the break of round steel wires shall not be less than 6%</li> <li>Round steel wire shall meet the requirement of torsion test. The gauge length between vices and minimum no. of turns without break shall be as per IS 3975:1999.</li> <li>The zinc coating shall not show any cracks and shall not flake off on rubbing by the bare finger when the round steel wire is subjected to winding test.</li> <li>The uniformity of round steel wire shall comply to requirement of IS 3975:1999.</li> <li>The mass of zinc coating of round steel wire shall not be less than 95 % that of mentioned in IS 3975:1999.</li> </ol> <p>The resistivity of round steel wire shall meet the requirement of IS 3975:1999.</p> <p>*Note: 1C cables shall not be provided with armouring.</p>	
		Laying up	The armouring shall be applied over the inner sheath in multi core cables. The armour wires shall be applied as closely as practicable (less than the diameter of single wire in between the interstices). The direction of lay of the armour shall be left hand.	
		Thickness	The dimensions of armour round wires shall be as per IS-7098(Part-I):1988.	
		Joints	The joints in armour wire shall be made by brazing or welding and the surface Irregularities shall be removed. A joint in any wire shall be at least 300mm from the nearest joint in any other armour wire in the completed cable.	
		<b>Outer Sheath</b>		
		Material	<p>The outer sheath shall be of polyvinyl chloride (PVC) FRLSH (Flame retardant cables with reduced halogen evolution and smoke) compound conforming to the requirements of Type ST-2 of IS – 5831:1984 with latest amendments. Surface should be smooth.</p> <p>The sheath shall be ultraviolet protected for operation in direct sunlight. It shall be free from voids/bubbles/ bulges &amp; mechanical scratches and damages. Surface should be smooth.</p>	
		Laying up	<p>The outer sheath shall be applied by extrusion process, It shall be tightly applied:</p> <ol style="list-style-type: none"> <li>Over the insulation in case of unarmoured single core cables.</li> <li>Over the armouring in case of armoured cables.</li> </ol>	
		Thickness	The thickness of the outer sheath shall be as per IS: 7098 (Part - I):1988.	
		Colour	The outer sheath shall be blue in color	
		6.0	NAME PLATE AND MARKING	<p>Following information shall be either stenciled on both sides of the drum or contained in a label attached to it:</p> <ol style="list-style-type: none"> <li>Reference to the Standards</li> <li>Purchase Order number</li> </ol>

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		<p>c) Manufacturer's name</p> <p>d) Type of Cable (INCLUDING FRLSH)</p> <p>e) Voltage Grade</p> <p>f) Drum serial number</p> <p>g) Number of cores</p> <p>h) Nominal Cross sectional Area of the conductor/Cable size</p> <p>i) Cable code</p> <p>j) Length of the cable on the drum</p> <p>k) Number of lengths on the drum (if more than one)</p> <p>l) Direction of the rotation of the drum</p> <p>m) Gross mass</p> <p>n) Country of manufacture</p> <p>o) Year and month of manufacture</p> <p>Following details shall be printed on both sides of outer sheath at regular interval of every meter and 180° apart:</p> <p>a) TPCODL</p> <p>b) Name of manufacturer</p> <p>c) Year of manufacture</p> <p>d) Voltage Grade</p> <p>e) No. of cores</p> <p>f) Size of the cable</p> <p>g) Type of cable (FRLSH type)</p> <p>h) Sequential length marking at every meter distance throughout the cable length with letter font size 12 mm should be embossed on the cable in bold letters.</p>
7.0	TESTS	<p>All routine, acceptance &amp; type tests shall be carried out in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by TPCODL's authorized representative. All the components should also be type tested as per the relevant standards. Following tests shall be necessarily conducted on the 1.1 kV cables in additions to others specified in IS/IEC standards.</p> <p>A. Type tests:</p> <p>1. Tests on Conductor</p> <p>a) Tensile test</p> <p>b) Wrapping test</p> <p>c) Resistance test</p> <p>2. Test for armouring wires as per IS 3975:1999</p> <p>a) Dimensional check</p> <p>b) Tensile strength</p> <p>c) Elongation at break</p> <p>d) Torsion test(for round wires)</p> <p>e) Winding test(for round wires)</p> <p>f) Uniformity of zinc coating</p> <p>g) Mass of zinc coating</p> <p>h) Resistivity</p> <p>3. Test for thickness for insulation and sheath</p> <p>4. Physical tests for insulation</p> <p>a) Tensile strength and elongation at break</p> <p>b) Ageing in air oven</p> <p>c) Hot set test</p> <p>d) Shrinkage test</p>


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		e) Water absorption/gravimetric  5. Physical tests for outer sheath a) Tensile strength and elongation at break b) Ageing in air oven c) Loss of mass in air oven d) Shrinkage test e) Hot deformation f) Heat shock g) Thermal stability  6. Insulation resistance ( Volume resistivity ) test 7. High voltage test 8. Flammability test  B. Routine tests: 1. Conductor Resistance test 2. High Voltage test  C. Acceptance tests: 1. Annealing test 2. Tensile test (for non-compacted conductor) 3. Wrapping test (for non-compacted conductor) 4. Conductor Resistance Test 5. Test for thickness of insulation and sheath 6. Hot set test for insulation and outer sheath 7. Tensile strength and elongation at break test for insulation and sheath 8. High Voltage test 9. Insulation resistance (Volume resistivity) test 10. Flammability test on outer sheath 11. Cold impact test on outer sheath 12. Uniformity of zinc coating on armour wires 13. Dimensional test on armour wires 14. Oxygen index test
8.0	TYPE TEST CERTIFICATES	<p>The bidder shall furnish the type test certificates of the 1.1 kV Power cable for the tests as mentioned</p> <p>Above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA Labs 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 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. In case type test is being carried beyond 5years up to 10years, bidder shall have to submit on their company letter head confirming for no change in basic design of the item. TPCODLhas rights to accept/reject the same.</p> <p>Additional certification should be provided as:  The cable produced is expected to meet long duration performance criteria based on quality and consistency of manufacturing.</p>
9.0	PRE-DISPATCH INSPECTION	<p>The material shall be subject to inspection by a duly authorized representative of TPCODL. Inspection may be made at any stage of manufacture at the discretion of TPCODL 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 representative(s) at all times when the work is in progress. Inspection by TPCODL its authorized representatives shall not relieve the bidder of his obligation of</p>


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		<p>furnishing equipment in accordance with the specifications. TPCODL's authorized representatives shall have the right to inspect the design, materials and workmanship and to report thereon, at any stage of manufacture, if found necessary. All facilities shall be extended to TPCODL representatives for witnessing the tests. Due advance notice shall be given to enable to depute TPCODL's representatives for stage inspection.</p> <p>Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL.</p> <p>Following documents shall be sent along with material</p> <ol style="list-style-type: none"> <li>Test reports</li> <li>MDCC issued by TPCODL</li> <li>Invoice in duplicate</li> <li>Packing list</li> <li>Drawings &amp; Catalogue</li> <li>Guarantee / Warrantee card</li> <li>Delivery Challan</li> <li>Other Documents (as applicable)</li> </ol>
10.0	INSPECTION AFTER RECEIPT AT STORES	<p>The material received at TPCODL's 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 of TPCODL.</p>
11.0	GUARANTEE	<p>Bidder shall stand guarantee towards design, material, workmanship &amp; quality of process / manufacturing of item 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 TPCODL 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 their own cost, within mutually agreed time frame, and to the entire satisfaction of TPCODL, failing which the later will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus TPCODL'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 TPCODL.</p>
12.0	PACKING	<p>The cable shall be wound on strong weatherproof and non-returnable wooden drums packed in coil lengths as specified below and 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. Cable drums shall be so constructed as to have required mechanical strength so that the drum flanges and other components do not break during transportation or in storage. The flanges and the outside surface of the barrel shall be free from protruding parts or projections or unevenness which might be damaging to the cable or hands of operator during rotation of drums. A protective covering of polymeric sheet shall be applied inside the drum before winding the cable on the drum. 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.</p> <p>Drum lengths for 4C cables should be as follows:</p> <ul style="list-style-type: none"> <li>1.1kV 4C 300 sq mm XLPE cable – 500 m</li> <li>1.1kV 4C 240 sq mm XLPE cable – 500 m</li> <li>1.1kV 4C 185 sq mm XLPE cable – 500 m</li> <li>1.1kV 4C 120 sq mm XLPE cable – 500 m</li> </ul>



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		1.1kV 4C 95 sq mm XLPE cable – 500 m 1.1kV 4C 50 sq mm XLPE cable – 500 m 1.1kV 4C 35 sq mm XLPE cable – 1000 m 1.1kV 4C 25 sq mm XLPE cable – 1000 m 1.1kV 4C 16 sq mm XLPE cable – 1000 m For 2C and 1C cables – 1000 m												
13.0	Tender Sample	Bidder shall submit the sample of material (0.3 meter of length of cable) as specified by TPCODL.												
14.0	QUALITY CONTROL	The bidder shall submit with the offer, Quality Assurance Plan indicating: a) Various stages of inspection plan b) Tests and checks for each inspection stage which is scheduled to be carried out on the material of construction/ components during manufacturing 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 period of delivery schedule shall be furnished by the bidder. TPCODL reserves the sole right for getting type test of a random sample from the lot and in case of any discrepancy or deviation from the type test certificates submitted along with the bid; the complete lot shall be rejected. TPCODL's nominated representative shall have free access to the bidder's works to carry out inspections.												
15.0	MINIMUM TESTING FACILITIES	Bidder shall have adequate in house testing facilities for carrying out 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	Not applicable												
18.0	DRAWINGS AND DOCUMENTS	Following mentioned drawings and documents shall be prepared based on TPCODL specification and statutory requirements and shall be submitted with the bid: a) Completely filled-in Technical Particulars b) Type test Certificates c) Quality Assurance Plan d) General description of the equipment and all components including brochures e) Experience List f) Cross sectional diagram of the cable g) Bill of material Note: From a) to c) to be submitted as per TPCODL's required format. Else to be submitted as per specification. Following drawings/documents to be submitted by the bidder after the award of the contract:												
		<table border="1"> <thead> <tr> <th><i>S No.</i></th> <th><i>Description</i></th> <th><i>For Approval</i></th> <th><i>For Review / Information</i></th> <th><i>Final Submission</i></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Technical Parameters</td> <td>√</td> <td></td> <td>√</td> </tr> </tbody> </table>	<i>S No.</i>	<i>Description</i>	<i>For Approval</i>	<i>For Review / Information</i>	<i>Final Submission</i>	1	Technical Parameters	√		√		
<i>S No.</i>	<i>Description</i>	<i>For Approval</i>	<i>For Review / Information</i>	<i>Final Submission</i>										
1	Technical Parameters	√		√										

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	2	Manual/Catalogues/drawings of all components		√	
	3	Installation Instruction		√	√
	4	Cross sectional diagram of the cable	√		√
	5	Instruction for use		√	√
	6	Transport/shipping dimension drawing		√	√
	7	QA & QC Plan	√	√	√
	8	Routine, Acceptance a Type test Certificates	√	√	√

All the documents and drawings shall be in English language.  
After the award of the contract four (4) copies of cross-sectional drawing of cable, GTP and test certificates shall be forwarded for approval from TPCODL.


19.0	GUARANTEED TECHNICAL PARTICULARS	S. No.	Description	Units	Requirement
		1	Voltage grade	kV	To be furnished by the bidder
		2	System Voltage	V	
		3	Variation in supply voltage	%	
		4	Variation in supply frequency	Hz	
		5	Number of phases		
		6	System grounding		

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		7	Fault level										
		8	Type of Cable										
		9	Core										
		10	Conductor										
		11	Insulation										
		12	Inner sheath										
		13	Armour										
		14	Outer sheath										
		15	Standard length of cable on a drum with tolerance	m									
		1.1 kV Single Core XLPE insulated armoured cable conforming to IS 7098:1988											
		S No.	Parameter	Unit		Requirement							
			Size of Cable	sq.mm.		2.5	4	25	50(Cu)	95	185	300	630
		1	Conductor										

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		a.	Type		To be furnished by the bidder
		b.	Grade		
		c.	No. of Cores		
		d.	Maximum D.C. resistance of conductor at 20 deg C		
		e.	A.C. resistance at operating temperature of 90 deg C		
		f.	Short circuit capacity for 1 second		
		g.	Continuous current rating at 40 deg C		
		h.	Minimum no. of wires in the conductor		
		i.	Shape of conductor		To be furnished by the bidder
		2	Insulation		
a.	Nominal thickness				

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		b.	Minimum thickness(at any point of measurement)							
		3	Inner sheath							
		4	Armour							
		5	Outer Sheath							
		a.	Nominal thickness							
		b.	Minimum thickness(at any point of measurement)							
		<b>1.1 kV Two Core XLPE insulated armoured cable conforming to IS 7098:1988</b>								
		S No.	Parameter	Unit		Requirement				
			Size of Cable	sq.mm.		10	16	25	50	50
		1	Conductor							
a.	Type		Al	Al	Al	Al	Cu			
b.	Grade		To be furnished by bidder							
c.	No. of Cores	Nos.								

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		d.	Maximum D.C. resistance of conductor at 20 deg C	Ohm/Km
		e.	A.C. resistance at operating temperature of 90 deg C	Ohm/Km
		f.	Short circuit capacity for 1 second	kA
		g.	Continuous current rating at 40 deg C	A
		h.	Minimum no. of wires in the conductor	Nos.
		i.	Shape of conductor	
		2	Insulation	
		a.	Nominal thickness	mm
		b.	Minimum thickness(at any point of measurement)	mm
		3	Inner sheath	
		a.	Type	
		b.	Minimum thickness(at any point of measurement)	mm

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	4	Armour				
	a.	Type				
	b.	Nominal diameter	mm			
	c.	Tolerance	mm			
	d.	No. of wires	Nos.			
	e.	Type of zinc coating				
	f.	Mass of zinc coating	g/sq.m.			
	g.	No. of dips				
	5	Outer Sheath				
	a.	Minimum thickness(at any point of measurement)	mm			
	1.1 kV Four Core XLPE insulated armoured cable conforming to IS 7098:1988					
	S No.	Parameter	Unit	Requirement		
	B	Size of cable				
	1.	Conductor				
	a.	Type				
b.	Grade					
c.	No. of cores					


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		d.	Maximum dc resistance of conductor at 20°C		To be furnished by bidder
		e.	Short circuit capacity for one second		
		f.	Continuous current rating at 40degC		
		g.	Minimum number of wires in the conduct or		
		h.	Shape of conduct or		
		2.	Insulation		
		a.	Nominal thicknes s		
		b.	Minimum thicknes s (at any point of measurement)		
		4.	Inner sheath		
		a.	Type		




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		b.	Minimum thickness (at any point of measurement)															
		3.	Armour															
		a.	Type of armour															
		b.	Nominal Diameter															
		c.	Tolerance															
		d.	Type of Zinc coating															
		e.	Mass of Zinc coating															
		f.	Number of dips															
		5.	Outer Sheath															
		a.	Minimum thickness (at any point of measurement)															
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		<i>S No.</i>	<i>Parameter</i>		<i>Unit</i>	<i>Requirement</i>												
		<i>B</i>	<i>Size of cable</i>															
		<i>1.</i>	<i>Conductor</i>															

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		a.	Type	To be furnished by bidder
		b.	Grade	
		c.	No. of cores	
		d.	Maximum dc resistance of conductor at 20°C	
		e.	Short circuit capacity for one second	
		f.	Continuous current rating at 40degC	
		g.	Minimum number of wires in the conductor	
		h.	Shape of conductor	
		2.	Insulation	
		a.	Nominal thickness	
		b.	Minimum thickness (at any point of measurement)	
		4.	Inner sheath	
		a.	Type	
		b.	Minimum thickness (at any point of measurement)	

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		3.	<i>Armour</i>	
		a.	<i>Type of armour</i>	
		b.	<i>Nominal Diameter</i>	
		c.	<i>Tolerance</i>	
		d.	<i>Type of Zinc coating</i>	
		e.	<i>Mass of Zinc coating</i>	
		f.	<i>Number of dips</i>	
		5.	<i>Outer Sheath</i>	
		a.	<i>Minimum thickness (at any point of measurement)</i>	
20.0	SCHEDULE OF DEVIATIONS	(TO BE ENCLOSED WITH TECHNICAL BID)		
<p><i>All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule.</i></p> <p><i>Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's Specifications.</i></p>				

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S.No.	Clause No.	Details of deviation with justifications
<p>We confirm that there are no deviations apart from those detailed above.</p> <p>Seal of the Company <span style="float: right;">Signature :</span></p> <p style="text-align: right;">Designation</p>		

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### 33.0 11kV 3x95 mm<sup>2</sup>, 3x120 mm<sup>2</sup>, 3x300 mm<sup>2</sup> AND 3x400 mm<sup>2</sup> XLPE ALUMINIUM ARMoured CABLE

#### GENERAL TECHNICAL PARTICULARS

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
1.	Voltage grade	11 kV (Earthed system)
2	Max System voltage	12 kV
3	Frequency	50 Hz
4	Variation in frequency	+/- 5%
5	Cable components	3 Core cable
	Conductor	Watertight Stranded Aluminium (compacted circular)
	Conductor screen	Semi conducting tape and screen
	Insulation	Extruded XLPE
	Insulation screen	Shall have three layers: a) Bonded Semiconducting, b) Semiconducting water swellable tape, c) Metallic copper tape
	Core identification strip	Beneath copper screen
	Inner sheath	Pressure Extruded PVC ST- 2 with PP fillers
	Armour:	GI wire round binded with rubberized cotton binding tape
	Outer sheath	PVC ST-2 FRLSH type of colour 'Crimson Red shade' code: 540 as per IS 5:2007
	Outer sheath (For co-extruded cable)	Shall have two layers: a) Inner layer: HDPE ST-7, Crimson Red shade b) Outer sheath: HDPE ST-7, Black colour
6	Marking On Drum and Cable Outer Sheath	<p>i. Following details shall be provided on <b>flanges of drum</b>:</p> <ol style="list-style-type: none"> <li>Manufacturer's name</li> <li>Type of Cable</li> <li>Size of Cable</li> <li>Voltage Grade</li> <li>Length of the cable on the drum</li> <li>Direction of the rotation of the drum</li> <li>Gross mass</li> <li>Country of manufacture</li> <li>Year and month of manufacture</li> <li>Purchase Order no.</li> <li>Drum No.</li> <li>ISI Mark</li> </ol> <p>ii. Embossing on Cable shall be clearly visible. At interval of</p>

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SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
		every 1 meter, following details to be embossed: a. Sequential meter marking ( <i>shall be marked through printing</i> ) b. TPCODL c. Manufacturer name d. Month & Year of Manufacturing e. Voltage grade f. Size of the cable g. Purchase Order no. h. Cable coding i. ISI Mark

### CONDUCTOR

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE			
1	Conductor	As per IS 8130			
2	Class	Class II			
3	Material	Plain Aluminium, grade H2/H4			
4	Shape	Stranded Compacted Circular			
5	No. of strands & electrical parameters	Nominal size of conductor mm <sup>2</sup>	Min. number of strands	Max. DC resistance @ 20 deg C (Ohm/km)	Conductor Short circuit current rating for 1 second
		95	15	0.320	9 kA
		120	15	0.253	11.3 kA
		150	15	0.206	14.2 kA
		300	30	0.10	28.3 kA
		400	53	0.0778	37.7 kA
		630	53	0.0469	59.4 kA
1000	53	0.0291	94.3 kA		
6	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			

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SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
		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.	
7	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 & aluminium dust. Conductor (after stranding) shall be super cleaned. c) Traces of aluminium dust on conductor or conductor screen shall not be acceptable.	
8	Raw material supplier	Conductor raw material shall be procured from reputed suppliers viz., BALCO/ HINDALCO/ NALCO/ Vedanta only.	
9	Conductor jointing	Not acceptable in any strand or in any conductor after it is stranded.	
10	Diameter of conductor	To be specified by bidder	
11	Weight of conductor/km (approx.)	Nominal size of conductor mm <sup>2</sup>	Min. weight of conductor (kg/km/core)
		95	244
		120	308
		150	390
		300	780
		400	1080
		630	1650
		1000	2600

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### CONDUCTOR SCREEN

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Material	<b>1<sup>st</sup> layer:</b> Semi-conducting tape <b>2<sup>nd</sup> layer:</b> Semi-conducting compound
2	Configuration	<b>1<sup>st</sup> layer:</b> Semi-conducting tape shall be applied over conductor with nominal thickness of 0.2 mm. <b>2<sup>nd</sup> layer:</b> Semi-conducting conductor screen shall be applied through triple extrusion process.
3	Min. thickness	Minimum thickness of conductor screen shall be 0.5 mm at any point of measurement.
4	Resistivity	Resistivity of semiconducting conductor screen shall not exceed 1000 $\Omega$ -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

### INSULATION (XLPE as per IS-7098(Pt-1)/88 Latest)

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
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) <b>XLPE compound shall be super cleaned and procured from reputed raw material suppliers viz., Dow/Borealis/Hanwa only.</b> b) Both XLPE and semi conductive compounds shall be used from same raw material supplier.
3	Thickness and Eccentricity	a) Minimum thickness of insulation shall be 3.14 mm at any point of measurement. b) Nominal thickness shall be 3.6 mm. 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.




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SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
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.

### INSULATION SCREEN & CORE IDENTIFICATION STRIP

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE		
1	Material	a) <b>1<sup>st</sup> layer:</b> Semi-conducting compound b) <b>2<sup>nd</sup> layer:</b> Semi-conducting water swellable tape c) <b>3<sup>rd</sup> layer:</b> Annealed copper tape		
2	Configuration	a) <b>1<sup>st</sup> layer: Non-Metallic Part:</b> Extruded Insulation semiconducting screen shall be bonded type. Resistivity shall not exceed 500 $\Omega$ -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) <b>2<sup>nd</sup> layer: Water Swellable tape:</b> 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%. <b>Core identification strip:</b> <table border="1"> <thead> <tr> <th>3 CORE CABLE</th> </tr> </thead> <tbody> <tr> <td>Each of the three core identification strips shall be applied longitudinally beneath copper screen. Width of the coloured strip shall be 7-10 mm.</td> </tr> </tbody> </table> c) <b>3<sup>rd</sup> layer: Metallic Part:</b> 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 CORE CABLE	Each of the three core identification strips shall be applied longitudinally beneath copper screen. Width of the coloured strip shall be 7-10 mm.
3 CORE CABLE				
Each of the three core identification strips shall be applied longitudinally beneath copper screen. Width of the coloured strip shall be 7-10 mm.				
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		


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### FILLERS

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Material	Virgin Polypropylene fibers of natural colour
2	Configuration	Virgin Polypropylene fibers shall be tightly filled in empty space as fillers.


### INNER SHEATH

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE										
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.</p> <p>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>										
3	Raw material supplier	<b>PVC compound shall be procured from reputed raw material suppliers viz., Shakun, Kalpana, KLJ, DCM ShriRam.</b> PVC compound from cable manufacturer shall be considered only after factory evaluation for the same.										
4	Min. thickness At any point of measurement	<table border="1"> <tr> <td>3CX95 sq.mm.</td> <td>0.6 mm</td> </tr> <tr> <td>3CX120 sq.mm.</td> <td>0.6 mm</td> </tr> <tr> <td>3CX150 sq.mm.</td> <td>0.6 mm</td> </tr> <tr> <td>3CX300 sq.mm.</td> <td>0.7 mm</td> </tr> <tr> <td>3CX400 sq.mm.</td> <td>0.7 mm</td> </tr> </table>	3CX95 sq.mm.	0.6 mm	3CX120 sq.mm.	0.6 mm	3CX150 sq.mm.	0.6 mm	3CX300 sq.mm.	0.7 mm	3CX400 sq.mm.	0.7 mm
3CX95 sq.mm.	0.6 mm											
3CX120 sq.mm.	0.6 mm											
3CX150 sq.mm.	0.6 mm											
3CX300 sq.mm.	0.7 mm											
3CX400 sq.mm.	0.7 mm											

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## ARMOUR

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
1	Material	Low carbon annealed hot dipped galvanized round steel 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 heavily coated as per IS 4826:1979.	
3	Nominal Dimensions (dia. in mm)	3CX95 sq.mm.	2.5 mm (GI wire)
		3CX120 sq.mm.	2.5 mm (GI wire)
		3CX150 sq.mm.	2.5 mm (GI wire)
		3CX300 sq.mm.	3.15 mm (GI Wire)
		3CX400 sq.mm.	4.00 mm (GI wire)
4	Approx. Armour Short circuit rating of armour for 1 sec (kA)	3CX95 sq.mm.	12
		3CX120 sq.mm.	13
		3CX150 sq.mm.	14
		3CX300 sq.mm.	23
		3CX400 sq.mm.	31
5	Jointing in the armour wires	Not acceptable in any armour wire	
6	Laying of armour	The armour 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 armour wires such that it shall not affect the electrical properties of the armour wires and the overall cable.	
8	Weight of armour	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.	

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### OUTER SHEATH

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE	
1	Material	Polyvinyl chloride (PVC) ST-2 <b>FRLSH</b> type compound with 'lead naphenate' additive	
2	Configuration	Polyvinyl chloride (PVC) ST-2 <b>FRLSH</b> type compound with 'lead naphenate' additive as 'termite & rodent repellent' applied by extrusion process.	
3	Min. Thickness at any point of measurement	3CX95 sq.mm.	2.2 mm
		3CX120 sq.mm.	2.2 mm
		3CX150 sq.mm.	2.36 mm
		3CX300 sq.mm.	2.84 mm
		3CX400 sq.mm.	3.00 mm
4	Colour	Crimson Red, 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	<b>PVC compound shall be procured from reputed raw material suppliers viz.,</b> 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	

### OUTER SHEATH (FOR CO-EXTRUDED)

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
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	<b>HDPE shall be procured from reputed raw material suppliers viz.,</b> Shakun, Kalpana, KLJ, SCJ Plastics, and Borealis only.
5	Weight of outer sheath/km	To be provided by bidder
6	Weight of total HDPE/km	To be provided by bidder

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### SEALING END CAP

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
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.


### OTHER REQUIREMENTS

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Overall diameter of cable	To be provided by bidder
2	Weight of Overall cable	To be provided by bidder


### TYPE TEST REPORT

Bidder shall furnish the type test report of **11 kV** cable for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**


SL. No.	Test	Specific value		Test method	
		Clause No.	Reference Standard	Clause No.	Reference Standard
<b>Tests on Conductor</b>					
1	Conductor resistance test	Table 2	IS 8130	10	IS 10810 part 5
2	Conductor water penetration test	IEC 60502/ ICEA T-31-610	IEC 60502/ ICEA T-31-610	Annexure F	IEC 60502/ ICEA T-31-610
<b>Tests on Insulation</b>					
3	Tensile strength & Elongation at break (Before ageing)	Table 1 of Clause No.5	IS 7098-part 2	8	IS 10810 part 7
4	Ageing in air oven	Table 1 of Clause No.5	IS 7098-part 2	8	IS 10810 part 11
5	Tensile strength & Elongation at break	Table 1 of Clause No.5	IS 7098-part 2	8	IS 10810 part 7
6	Tests for thickness of insulation	Table 4	IS 7098-part 2	8	IS 10810 part 6
7	Eccentricity and Ovality of insulation	12.4	IS 7098-part 2	Annexure A	IS 7098-part 2

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SL. No.	Test	Specific value		Test method	
		Clause No.	Reference Standard	Clause No.	Reference Standard
8	Hot set test	Table 1 of Clause No.5	IS 7098-part 2	8	IS 10810 part 30
9	Shrinkage test	Table 1 of Clause No.5	IS 7098-part 2	8	IS 10810 part 12
10	Gravimetric test (Water absorption)	Table 1 of Clause No.5	IS 7098-part 2	8	IS 10810 part 33
11	Volume resistivity/ Insulation Resistance	Table 1 of Clause No.5	IS 7098-part 2	8	IS 10810 part 43
<b>Tests on Inner Sheath</b>					
12	PVC thickness	Table 5	IS 7098-part 2	8	IS 10810 part 6
<b>Tests on Extruded semi-conducting screen</b>					
13	Volume resistivity test of conductor screen	Table 2	IS 7098-part 2	Annexure E	IS 7098-part 2
14	Volume resistivity test of core screen	Table 2	IS 7098-part 2	Annexure E	IS 7098-part 2
<b>Tests on Outer Sheath (PVC)</b>					
15	Flammability test for outer sheath	As per IEC 332-part 1			
16	Thickness	Table 7	IS 7098-part 2		
17	Tensile strength and Elongation at break (Before ageing)	Table 2	IS 5831	8	IS 10810 part 7
18	Tensile strength and Elongation at break (after ageing)	Table 2	IS 5831	8	IS 10810 part 7
19	Variation due to ageing	Table 2	IS 5831	8	IS 10810 part 7
20	Loss of mass test	Table 2	IS 5831	8	IS 10810 part 10
21	Shrinkage test	Table 2	IS 5831	8	IS 10810 part 12
22	Hot deformation test	Table 2	IS 5831	8	IS 10810 part 15
23	Heat shock test	Table 2	IS 5831	8	IS 10810 part 14
24	Thermal stability test	Table 2	IS 5831	Appendix B	IS 5831:1984
25	Oxygen index	As per ASTM 2863			
26	Temperature index	ASTM 2863			
27	Acid gas generation	IEC 60754			
28	Smoke density	ASTM 2843			
<b>Tests on Outer Sheath – HDPE ST 7 (For co-extruded cable)</b>					
29	Thickness	As per Specification			

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SL. No.	Test	Specific value		Test method	
		Clause No.	Reference Standard	Clause No.	Reference Standard
30	Tensile strength & Elongation at break (before ageing)	Table 7	IS 7098-part 2	Annexure G	IS 7098-part 2
31	Tensile strength & Elongation at break (after ageing)	Table 7	IS 7098-part 2	12.4.4.3	IS 7098-part 2
32	Shrinkage test	Table 8	IS 7098-part 2	12.4.14	IS 7098-part 2
33	Carbon black content	12.4.12.2	IS 7098-part 2	12.4.12	IS 7098-part 2
<b>Tests on Armour</b>					
34	Tensile test	8	IS 3975	6	IS 1608
35	Torsion test	8	IS 3975	7	IS 1717
36	Wrapping test	8	IS 3975	5	IS 1755
37	Resistance test	8	IS 3975	8	IS 10810 Part 42
38	Mass of zinc coating	Table 1	IS 4826	6	IS 6745
39	Uniformity of zinc coating	9	IS 3975	4	IS 2633
40	Adhesion test	9	IS 3975	9.3	IS 3975
<b>Tests on complete cable</b>					
45	Partial discharge test	20.2	IS 7098-part 2	8	IS 10810 Part 46
46	Thermal ageing test	20.9	IS 7098-part 2	20.9	IS 7098-part 2
47	Bending test	20.3	IS 7098-part 2	20.3	IS 7098-part 2
48	Dielectric power factor test	20.4	IS 7098-part 2	20.4	IS 7098-part 2
49	High voltage test	21 kV for 5 minutes As per Clause no. 20.7.2	IS 7098-part 2	20.7	IS 7098-part 2
50	Heat cycle test	20.5	IS 7098-part 2	20.5	IS 7098-part 2
51	Impulse withstand test	20.6	IS 7098-part 2	20.6	IS 7098-part 2

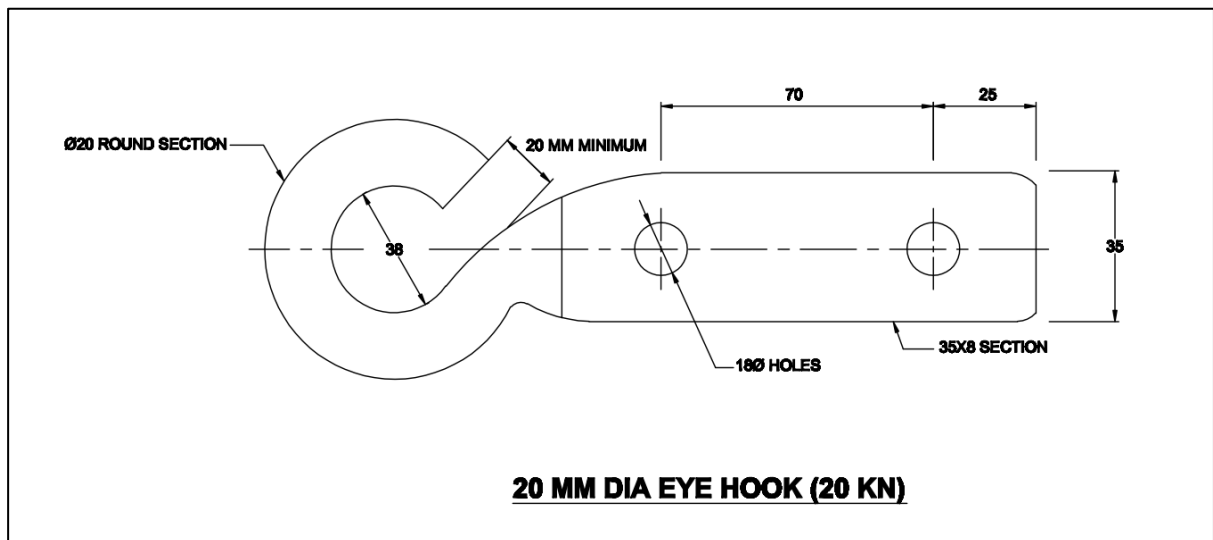
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### 34.0 I HOOK

#### GENERAL TECHNICAL PARTICULARS

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, TPCO-OTH-010
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, Manufacture's name or trademark, Month & Year of Manufacturing.

#### DRAWING



**Note:** - All Dimensions are in mm unless noted otherwise specified.



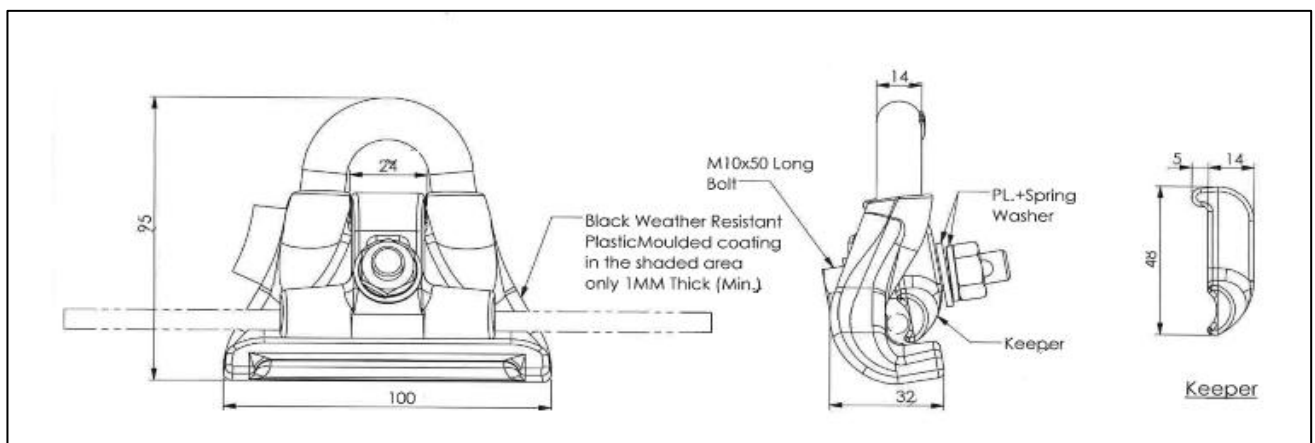
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## 35.0 SUSPENSION CLAMP

### GENERAL TECHNICAL PARTICULARS

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	25-70 mm <sup>2</sup> Insulated Messenger Wire
4	Type of design	Bolted type
6	Material for clamp Body	Aluminium Alloy (A6 as per IS 617)
7	Colour of Non-metallic parts	Black
8	All ferrous Part shall be Hot dip Galvanised as per IS 2633	Yes
9	Breaking Strength (KN)	20KN
10	Slip	25% of UTS of relevant messenger cable
11	Nut & Bolt	IS: 2062 (Refer Item No 18)
12	Tolerance	+/-5%
13	Marking	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.

### DRAWINGS



Item No.	Item Description	Material	Finish	Qty.
1	Body	Al. Alloy-LM6 with Plastic mould coating	-	1
2	Keeper	Al. Alloy-LM6	-	1
3	M16 x 65 x 30	Grade 5.6	HDG	1
4	Plain Washer(10mm)	Mild Steel	HDG	2
5	Nut-M10	Grade 5.0	HDG	1
6	Spring Washer	Sp. Steel	EG	1

**Note: - All Dimensions are in mm unless noted otherwise specified.**

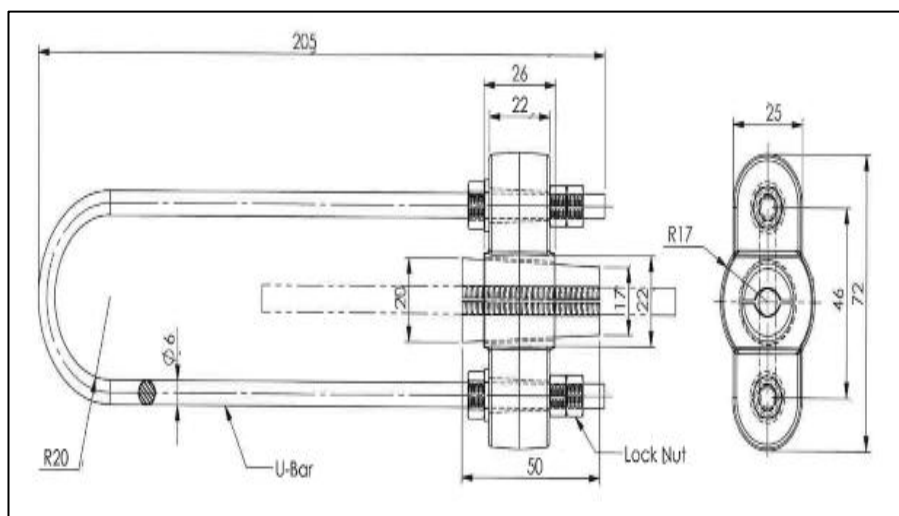
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### 36.0 DEAD END CLAMP

#### GENERAL TECHNICAL PARTICULARS

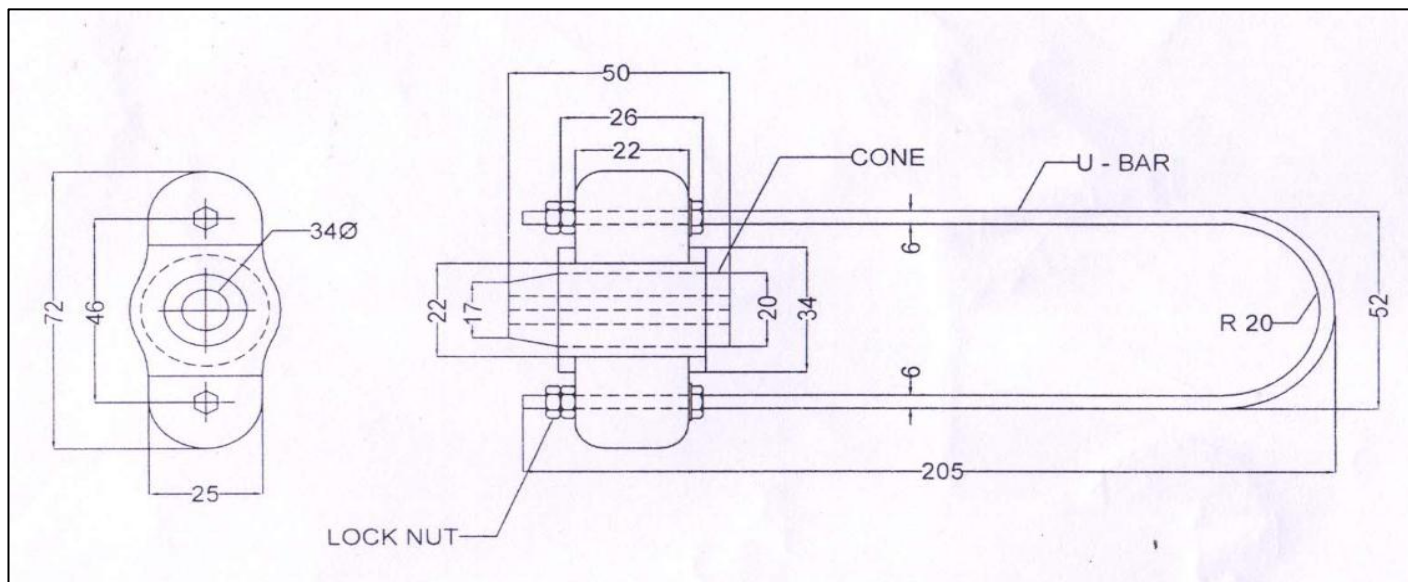
SL.NO	TECHNICAL PARTICULARS	DESIRED VALUE (25-35 mm <sup>2</sup> Insulated Messenger Wire)	DESIRED VALUE (35-70 mm <sup>2</sup> Insulated Messenger Wire)
1	Name & Address of the Manufacturer	To be furnished by Bidder	
2	Standard	NFC 33-041	
3	Range of messenger size	25-35 mm <sup>2</sup> Insulated Messenger Wire	35-70mm <sup>2</sup> Insulated Messenger Wire
4	Type of design	Bolted Type Al Alloy Clamp	
5	Material of Clamp	Clamp body shall be Al Alloy confirming to IS 617-1975	
6	Nut & Bolt	IS: 2062 (Refer Item No 18)	
7	Dimensions (mm)	As per Drawing	
8	Approximate weight (Kg)	To be furnished by Bidder	
9	Breaking Load (KN)	20	45
10	Slip	95% of UTS of relevant messenger cable	
11	Galvanization	All ferrous Part shall be Hot dip Galvanised as per IS 2633/2629, TPCO-OTH-010	
12	Tolerance	+/-5%	
13	Marking	TPCODL, Manufacture's name or trademark, Month & Year of Manufacturing.	

#### DRAWINGS




Bill of Materials			
SL. No.	Item	Material	Qty
1	U-Bar with 6 Nuts & 2 Pl. Washers	Steel, HDG	1 Set
2	Body	Aluminium Alloy	1
3	Cone	Aluminium Alloy	1

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Bill of Materials			
SL. No.	Item	Material	Qty
1	U-Bar with 6 Nuts & 2 Pl. Washers	Steel, HDG	1 Set
2	Body	Aluminium Alloy	1
3	Cone	Aluminium Alloy	1

**Note: - All Dimensions are in mm unless noted otherwise specified.**

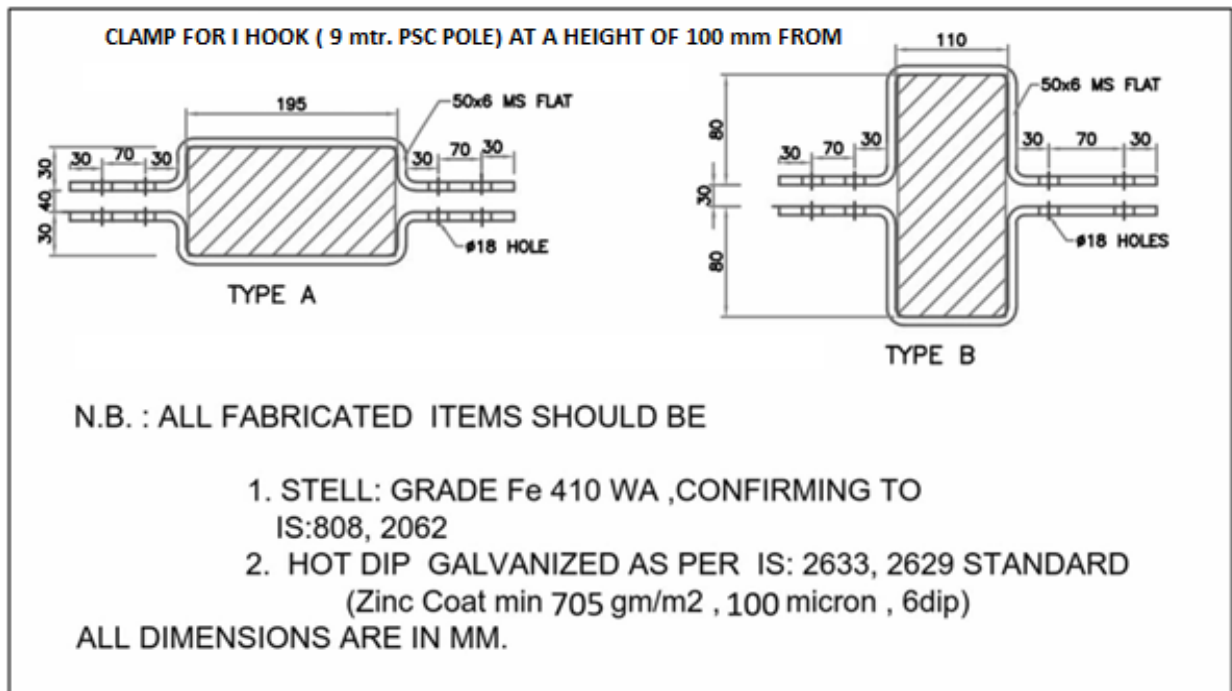
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### 37.0 LT POLE CLAMP FOR FIXING I HOOK

#### GENERAL TECHNICAL PARTICULARS

SL. NO.	DESCRIPTION	DESIRED VALUE
1	Material	Hot-Dip Galvanized Flat (50X6) GI Flat
2	Relevant Standard	IS: 2062, IS 2633, IS 2629 TPCO-OTH-010.
3	Unit Weight	To be specified by bidder
4	Minimum Tensile Strength	410 N/mm <sup>2</sup>
5	Yield Stress	250 N/mm <sup>2</sup>
6	Percentage Elongation (Min.) at Gauge Length	23%
7	Bend Test (Internal Dia)	Min-2t
8	Mass of Zinc Coating	705 gm/m <sup>2</sup>
9	Zinc Coating Thickness	100 microns
10	Chemical composition	Grade: E 250 (As per IS: 2062)

#### DRAWINGS



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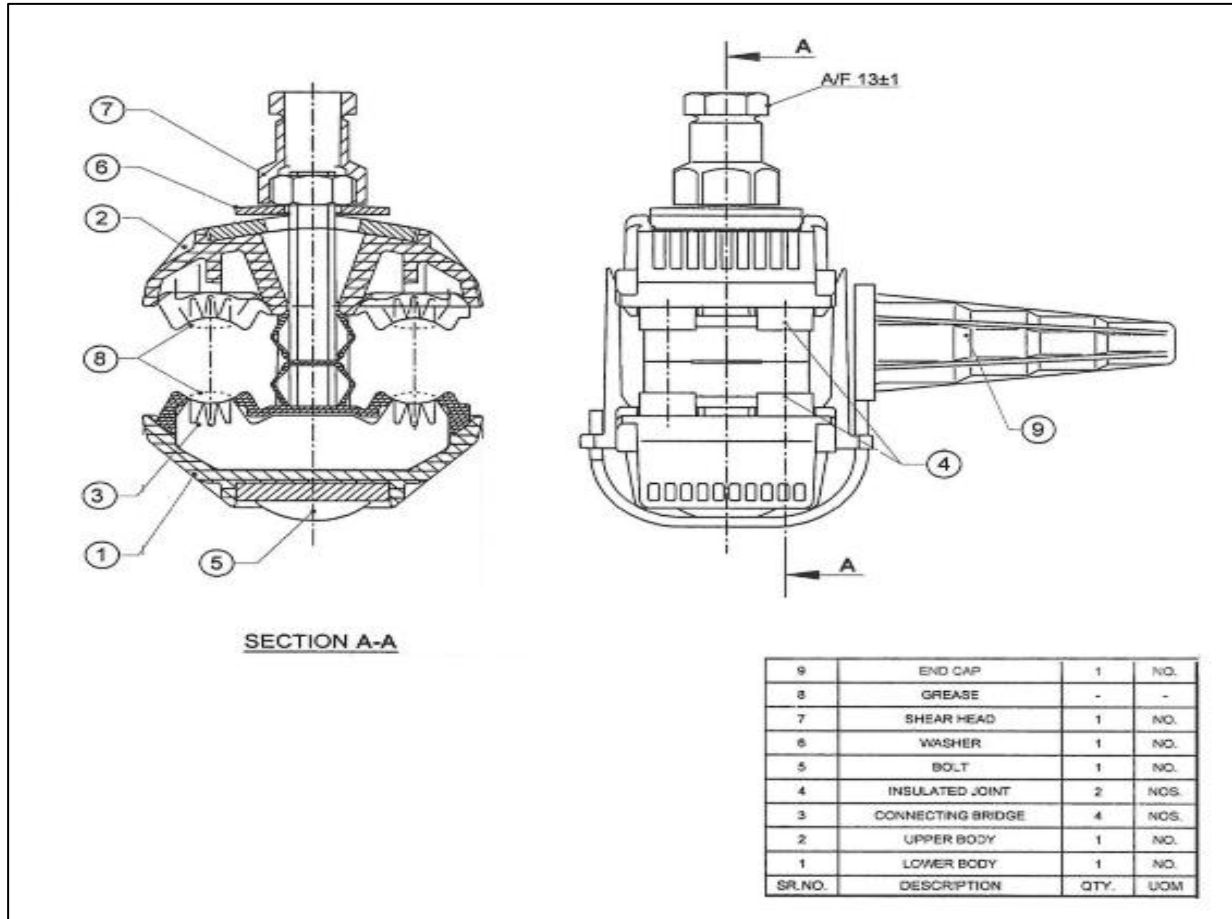
## 38.0 INSULATED PIERCING CONNECTOR

### GENERAL TECHNICAL PARTICULARS

SL. NO.	DESCRIPTION	DESIRED VALUE		
		Main Size	Branch Size	Current Rating
1	IPC Type A	50 - 150 sq.mm.	50-150 sq.mm.	350 A
2	IPC Type B	25 - 150 sq.mm.	6-35 sq.mm.	200 A
3	IPC Type C	16 -95 sq.mm.	1.5 - 16 sq.mm.	100 A
4	IPC Type D	10 -50 sq.mm.	1.5 - 10 sq.mm.	100 A
5	Rated Voltage	0.415 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 fibre reinforced black thermoplastic.		
10	Contact Plates	Tinned Aluminium Alloy grade 6082 with T6 hardness with profiled teeth have sufficient area to cater specified current ratings		
11	No. of contact bridges	Bidder shall specify the nos. of contact bridges		
12	Coating on contact plates	Copper coating shall be provided on Aluminium Alloy contact plates. Minimum 6 microns (at any point of measurement) of tin coating on copper coating shall be provided		
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.		
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	4kV in 1 Min		

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### 39.0 25 kVA, 63kVA AND 100kVA 11/.4 kV TRANSFORMER GENERAL TECHNICAL PARTICULARS

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE		
		25 kVA	63 kVA	100 kVA
1	Continuous Rated Capacity (kVA)	25 kVA	63 kVA	100 kVA
2	Application	Outdoor	Outdoor	Outdoor
3	System voltage (max.)	12 kV	12 kV	12 kV
4	Rated voltage HV (kV)	11	11	11
5	Rated voltage LV (V)	433-250	433-250	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	50 Hz	50 Hz
9	No. of Phases	Three	Three	Three
10	Connection HV	Delta	Delta	Delta
11	Connection LV	Star (Neutral Brought out)	Star (Neutral Brought out)	Star (Neutral Brought out)
12	Vector group	Dyn-11	Dyn-11	Dyn-11
13	Type of cooling	ONAN	ONAN	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)	190	340	475
17	Max. Total Losses at 100% loading) at 75°C (Watts)	635	1140	1650
18	Short circuit impedance voltage at 75°C (±10% tolerance)	4.50%	4.50%	4.50%
19	Insulation Class	A	A	A
20	Normal Flux Density (at rated voltage and frequency)	<1.6 T	<1.6 T	<1.6 T
21	Maximum flux density (Increase of +12.5% combined voltage and frequency variation from rated voltage and frequency)	1.8 T (Max.)	1.8 T (Max.)	1.8 T (Max.)
22	Maximum current density (A/mm <sup>2</sup> )	2.5	2.5	2.5
23	Impulse withstand voltage	75 kVp	75 kVp	75 kVp
24	Power frequency withstand voltage	28 kV	28 kV	28 kV
25	Voltage fluctuations permissible	+12.5% to -12.5%	+12.5% to -12.5%	+12.5% to -12.5%
26	Neutral terminal			
<b>27</b>	<b>Minimum clearances in air (mm) :</b>			
27.1	HV phase to phase/ phase to earth	255 / 140	255 / 140	255 / 140

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SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE		
27.2	LV phase to phase/ phase to earth	75 / 40	75 / 40	75 / 40
<b>28</b>	<b>Minimum clearances in Cable Box (mm):</b>			
28.1	HV phase to phase/ phase to earth	130 / 80	130 / 80	130 / 80
28.2	LV phase to phase/ phase to earth	25 / 20	25 / 20	25 / 20
29	Wheels	Only item codes in tender having mention of 'Plinth Mounted' those DT shall have rollers. When same is not mentioned in item code then the DT shall be without rollers.		


### GENERAL CONSTRUCTION

1.	<b>GENERAL CONSTRUCTION</b>	<ol style="list-style-type: none"> <li>The transformer shall be stacked core, copper coil, oil immersed, naturally cooled (ONAN), non-sealed type with plain rectangular tank.</li> <li>The transformer shall be suitable for service with fluctuations in supply voltage up to +12.5% to -12.5%.</li> <li>The transformer shall be designed suitable for service life of 25years.</li> <li>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.</li> <li>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.</li> <li>All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.</li> </ol>
1.1	<b>CORE</b>	<ol style="list-style-type: none"> <li>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.</li> <li>The core shall have low loss and good grain properties.</li> <li>Core should be coated with hot oil proof insulation, bolted together with frames to prevent vibration and noise.</li> <li>All core clamping bolts (if any) shall be effectively insulated.</li> <li>The <b>core thickness should be 0.23mm or less and grade should be M3 or better.</b></li> <li>Only one grade and one thickness of core shall be accepted and mixing of different grades shall not be allowed.</li> <li>The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.</li> <li>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.</li> <li>The handling of core lamination and stacking should be smooth and uniform.</li> <li>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.</li> <li>The <b>No Load current shall not exceed 3% of the Full Load current</b> and will be measured by energizing the transformer at rated voltage and frequency. <b>Increase of 12.5% of rated voltage shall not increase the no-load current by 6% maximum of full load current.</b></li> </ol>



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		<p>12. The bidder shall be required to submit the following documents in regard to procurement of core material during stage inspection:</p> <ul style="list-style-type: none"> <li>- Invoice of supplier</li> <li>- Mill's test certificate</li> <li>- Packing list</li> <li>- Bill of landing</li> <li>- Bill of entry certificate by custom (if required)</li> <li>- Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.</li> </ul> <p>13. 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.</p> <p>14. Transformer core assembly shall have enclosed lifting lug for lifting arrangement.</p> <p>15. Bidder shall provide the below details in below table:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Sl. No.</th> <th style="width: 65%;">Description</th> <th style="width: 10%;">Unit</th> <th style="width: 20%;">As furnished by bidder</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Magnetizing (No Load) Current</td> <td></td> <td></td> </tr> <tr> <td></td> <td>90% Voltage</td> <td>%</td> <td></td> </tr> <tr> <td></td> <td>100% Voltage</td> <td>%</td> <td></td> </tr> <tr> <td></td> <td>112.5% Voltage</td> <td>%</td> <td></td> </tr> <tr> <td>2.</td> <td>Core grade</td> <td></td> <td></td> </tr> <tr> <td>3.</td> <td>Thickness of core</td> <td>Mm</td> <td></td> </tr> <tr> <td>4.</td> <td>Core Dimension: Length X height X diameter</td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td>5.</td> <td>Gross core area</td> <td>Sq.cm</td> <td></td> </tr> <tr> <td>6.</td> <td>Net core area</td> <td>Sq.cm</td> <td></td> </tr> <tr> <td>7.</td> <td>Flux density (calculated)</td> <td>Tesla</td> <td></td> </tr> <tr> <td>8.</td> <td>Over fluxing without saturation (BH curve to be submitted)</td> <td>Tesla</td> <td></td> </tr> <tr> <td>9.</td> <td>Mass of core</td> <td>Kg</td> <td></td> </tr> <tr> <td>10.</td> <td>Loss per Kg of core at the above specified flux density</td> <td>Watt</td> <td></td> </tr> <tr> <td>11.</td> <td>Core window height</td> <td>Mm</td> <td></td> </tr> <tr> <td>12.</td> <td>Center to center distance of the core</td> <td>Mm</td> <td></td> </tr> </tbody> </table>	Sl. No.	Description	Unit	As furnished by bidder	1	Magnetizing (No Load) Current				90% Voltage	%			100% Voltage	%			112.5% Voltage	%		2.	Core grade			3.	Thickness of core	Mm		4.	Core Dimension: Length X height X diameter	mm x 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 density	Watt		11.	Core window height	Mm		12.	Center to center distance of the core	Mm	
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		13	Mass of Core Lamination (min.)	Kg	
		14	Make of Core offered		
1.2	WINDING CONNECTIONS	<ol style="list-style-type: none"> <li>1. Primary and secondary windings shall be constructed from high-conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 30% overlap per layer of paper &amp; TPC with 25% overlap per layer.</li> <li>2. The conductor should be drawn uniformly without any deformation and any burr.</li> <li>3. No metallic or non-metallic dust should be present in-between DPC conductor.</li> <li>4. The current density for HV and LV winding should not be more than 2.5 Ampere per sq.mm.</li> <li>5. The insulation between core and bolts, core and clamps shall withstand <b>2.5 kV for one minute.</b></li> <li>6. Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted as per standards.</li> <li>7. 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.</li> <li>8. <b>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.</b></li> <li>9. LV winding shall be such that neutral formation is at the top.</li> <li>10. Bidder shall provide the below details in below table:</li> </ol>			
		<b>Sl. No.</b>	<b>Description</b>	<b>Unit</b>	<b>As furnished by bidder</b>
		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 (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 (DPC)	mm x mm	
		14.	Conductivity of LV conductor	%	
		15.	Purity of LV conductor	%	
16.	No. of LV Turns	Nos.			

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		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 <sup>0</sup> C		
		a	HV winding	Ohm	
		b	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		
1.3	<b>INSULATING PAPER AND INSULATING PRESSBOARD</b>	<ol style="list-style-type: none"> <li>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.</li> <li>Primary and secondary windings shall be constructed from high-conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 30% overlap per layer of paper &amp; TPC with 25% overlap per layer.</li> <li>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.</li> <li>Kraft paper and Pressboard should be of class A (105°C) insulation material.</li> <li>All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard.</li> <li>All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.</li> <li>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.</li> <li>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.</li> <li>Below required values could be verified if required at any stage of the inspection and it should fulfill the requirement as per below table:</li> </ol>			
		<b>Characteristics</b>	<b>Kraft Paper</b>	<b>Pressboard (all Sizes)</b>	
		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 <sup>3</sup>	as per IS 1576 w.r.t Thickness	

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		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: <ol style="list-style-type: none"> <li>Substance (Grammage) (g/m<sup>3</sup>)</li> <li>Compressibility</li> <li>Tensile strength</li> <li>Conductivity of water extract</li> <li>Shrinkage in air</li> <li>Flexibility</li> <li>Cohesion between plies<sup>1</sup>.</li> <li>Elongation</li> <li>Air permeability</li> <li>Bidder shall provide the below details in below table</li> </ol>																																																																			
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1.4	LOSSES	<p>1. 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.</p> <p>2. 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) :</p> <table border="1"> <thead> <tr> <th rowspan="2">Description</th> <th colspan="3">Rating (kVA)</th> </tr> <tr> <th>25</th> <th>63</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>Maximum total Losses at 50% loading at 75°C (Watts)</td> <td>190</td> <td>340</td> <td>475</td> </tr> <tr> <td>Maximum total Losses at 100% loading at 75°C (Watts)</td> <td>635</td> <td>1140</td> <td>1650</td> </tr> </tbody> </table> <p>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.</p> <p>3. 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.</p>				Description	Rating (kVA)			25	63	100	Maximum total Losses at 50% loading at 75°C (Watts)	190	340	475	Maximum total Losses at 100% loading at 75°C (Watts)	635	1140	1650
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		<p>4. 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.</p> <p>5. During testing at Bidder's works, if the temperature rise exceeds the specified values, the entire lot shall be rejected by TPCODL.</p> <p>6. 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.</p> <p>7. 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.</p> <p>8. Bidder shall provide the below details in below table:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sl. No.</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Unit</th> <th style="text-align: center;">As furnished by bidder</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1</td><td>No Load losses</td><td style="text-align: center;">Watt</td><td></td></tr> <tr><td style="text-align: center;">2</td><td>Load losses at 50%loading at 75° C</td><td style="text-align: center;">Watt</td><td></td></tr> <tr><td style="text-align: center;">3</td><td>Load losses at 100% loading at 75° C</td><td style="text-align: center;">Watt</td><td></td></tr> <tr><td style="text-align: center;">4</td><td>Total losses at 50%load at 75° C</td><td style="text-align: center;">Watt</td><td></td></tr> <tr><td style="text-align: center;">5</td><td>Total losses at 100% load at 75° C</td><td style="text-align: center;">Watt</td><td></td></tr> <tr><td style="text-align: center;">6</td><td><b>Efficiency at 75 deg. C</b></td><td></td><td></td></tr> <tr><td style="text-align: center;">7</td><td><b>Efficiency at Unity P.F.</b></td><td></td><td></td></tr> <tr><td style="text-align: center;">7.1</td><td>100% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">7.2</td><td>80% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">7.3</td><td>60% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">7.4</td><td>40% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">7.5</td><td>20% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">8</td><td><b>Efficiency at 0.8 P.F.</b></td><td></td><td></td></tr> <tr><td style="text-align: center;">8.1</td><td>100% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">8.2</td><td>80% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">8.3</td><td>60% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">8.4</td><td>40% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">8.5</td><td>20% load</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">9</td><td><b>Regulation at:</b></td><td></td><td></td></tr> <tr><td style="text-align: center;">9.1</td><td>Unity P.F. at 75 deg. C</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">9.2</td><td>0.8 P.F. at 75 deg. C</td><td style="text-align: center;">%</td><td></td></tr> <tr><td style="text-align: center;">9.3</td><td>% Impedance at 75 deg. C</td><td style="text-align: center;">%</td><td></td></tr> </tbody> </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	<b>Efficiency at 75 deg. C</b>			7	<b>Efficiency at Unity P.F.</b>			7.1	100% load	%		7.2	80% load	%		7.3	60% load	%		7.4	40% load	%		7.5	20% load	%		8	<b>Efficiency at 0.8 P.F.</b>			8.1	100% load	%		8.2	80% load	%		8.3	60% load	%		8.4	40% load	%		8.5	20% load	%		9	<b>Regulation at:</b>			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	%	
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<b>1.5</b>	<b>TRANSFORMER TANK AND TANK CONSTRUCTION</b>	<p>1. The transformer tank shall be of robust construction, <b>rectangular in shape</b> and shall be built up of electrically tested welded mild steel plates.</p> <p>2. 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.</p> <p>3. All welding operations should be carried by <b>qualified welders</b> (performance qualification certificates to the customer) as per the relevant ASME standards and a copy of the <b>welding procedure</b> has to be submitted to TPCODL at the time of drawing approval.</p> <p>4. The <b>thickness of tank</b> should be as below:  For top and bottom: 5 mm (minimum)  For Sides: 3.15 mm (minimum)</p>																																																																																												


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		<p><b>Tolerance shall be applicable as per IS 1852 as per above thickness.</b></p> <p>5. In addition, the cover of the main tank shall be provided with an <b>air release plug</b>.</p> <p>6. 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.</p> <p>7. The transformer tank cover shall be bolted with tank rim so as to make a leak proof joint.</p> <p>8. 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.</p> <p>9. The tank cover shall have slight slope (10 mm <math>\pm</math> 2mm) towards HV side to drain rain water.</p> <p>10. 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 <b>pressure generated inside the tank does not exceed 0.4 kg/sq. cm positive or negative</b> and the tank shall be of adequate mechanical strength to withstand it.</p> <p>11. The transformer should be capable of <b>withstanding 0.8kg/sq.cm air pressure and a vacuum of 0.7kg/sq.cm</b>. 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:</p> <table border="1"> <thead> <tr> <th>Length of Plate</th> <th>Deflection</th> </tr> </thead> <tbody> <tr> <td>Up to 750 mm</td> <td>5.0 mm</td> </tr> <tr> <td>751 mm to 1250 mm</td> <td>6.5 mm</td> </tr> <tr> <td>1251 mm to 1750 mm</td> <td>8.0 mm</td> </tr> <tr> <td>Above 1750 mm</td> <td>9.0 mm</td> </tr> </tbody> </table> <p>12. <b>The tank design shall be such that the core and the windings can be lifted freely without dismantling the bushings.</b></p> <p>13. All joints of tank and fittings shall be oil tight and no bulging shall occur during service.</p> <p>14. 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.</p> <p>15. The tightening torque chart to be provided for all bolts used in specific rating. This shall be submitted along with each rating drawings.</p> <p>16. The transformer shall be provided with four pulling lugs of MS plate of 8mm thick to pull the transformer horizontally.</p> <p>17. The maximum overall size of DTs (including tolerance) shall be as mentioned below:</p> <table border="1"> <thead> <tr> <th>Rating</th> <th>Size (LXB) in mm</th> </tr> </thead> <tbody> <tr> <td>Up to 500KVA</td> <td>1800 X 1800</td> </tr> </tbody> </table> <p><b>Lifting lugs:</b></p> <p>18. 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 10mm 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.</p> <p>19. 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.</p> <p>20. There shall be facilities for lifting the core coil assembly separately.</p>	Length of Plate	Deflection	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	Rating	Size (LXB) in mm	Up to 500KVA	1800 X 1800
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		<p>21. 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</p> <p>22. 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/cm<sup>2</sup> as per ANSI C.57.12.10. All calculation to be done for considering lifting on any diagonal opposite two lugs conditions.</p> <p>23. 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 (min. 110mm for 25KVA and higher as per rating and load) and location on tank along with stiffener support for all rating and all lugs.</p> <p>24. Bidder shall provide the transformer size and clearances in below table:</p> <p>25.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Sl. No.</th> <th style="width: 65%;">Description</th> <th style="width: 15%;">Unit</th> <th style="width: 15%;">As furnished by bidder</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><b>Transformer overall Length x Height x width</b></td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td>2</td> <td><b>Only Tank overall Length x Height x width</b></td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td>3</td> <td>HV Cable box overall LxWxH</td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td>4</td> <td>LV Cable box overall LxWxH</td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td>5</td> <td><b>Clearances</b></td> <td></td> <td></td> </tr> <tr> <td>5.1</td> <td>Core and LV (minimum 5mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>5.2</td> <td>LV and HV (minimum 8mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>5.3</td> <td>HV Phase to phase (minimum 10mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>5.4</td> <td>Between HV winding and Yoke (minimum 20mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>5.5</td> <td>Between LV winding and Yoke (minimum 5mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>5.6</td> <td>Between yoke and inside of tank to cover (minimum 100mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>5.7</td> <td>Between yoke and bottom (minimum 10mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>5.8</td> <td>Any point of winding to tank (minimum 20mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>6</td> <td><b>Calculated Impedance</b></td> <td>%</td> <td></td> </tr> <tr> <td>7.1</td> <td>HV to Earth Creepage distance in oil (minimum 15mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>7.2</td> <td>LV to Earth Creepage distance in oil (minimum 5mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td>8.</td> <td>Conservator dimension (dia x</td> <td>Mm x mm</td> <td></td> </tr> </tbody> </table>	Sl. No.	Description	Unit	As furnished by bidder	1	<b>Transformer overall Length x Height x width</b>	mm x mm x mm		2	<b>Only Tank overall Length x Height x width</b>	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	<b>Clearances</b>			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	<b>Calculated Impedance</b>	%		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	Mm x mm	
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		Length)						
		9.	Size of Pipe used for conservator to Tank	Mm				
		10.	Size of Pipe used for Valves	Mm				
		11.	Base Channel size	Mm x mm x mm				
		12.	No. of Radiators	Nos				
		13.	No. of fins per Radiator	Nos				
		14.	Dimension of radiator fins (L x W)	Mm x mm				
		15.	Make of Tank material					
1.6	RADIATORS	<ol style="list-style-type: none"> <li>Radiators of pressed steel type conforming to the design requirement suitable for mineral oil type transformer.</li> <li>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.</li> <li><b>Thickness</b> of sheet for radiators shall be <b>1.20 mm (min)</b>.</li> <li>The <b>mounting</b> of the radiators shall be <b>non-detachable</b> (i.e., they should be welded permanently with the tank).</li> <li>The number / cross section / length / fixing arrangement of radiators shall be indicated in the general assembly drawing.</li> <li>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.</li> <li>Corrugated designs are not accepted.</li> </ol>						
1.7	GASKET	<ol style="list-style-type: none"> <li><b>Cork rubber gaskets</b> conforming to Type C, grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing &amp; water ingress resistant requirements for components like HV &amp; LV bushings bottom gasket, HV &amp; LV terminal box, Top Cover, Conservator, Valves etc.</li> <li><b>Nitrile/Neoprene rubber gaskets</b> conforming to Type IV – 4C (heat and oil resistant) as per IS 11149 shall be provided for bushing O ring (oil gaskets).</li> <li><b>Only Joint free Gasket to be used.</b></li> <li>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.</li> </ol>						
1.8	TAPS	Not Applicable						
1.9	BUSHINGS AND TERMINAL CONNECTORS	<ol style="list-style-type: none"> <li><b>HT Bushings (12 kV/250 A):</b></li> <li>The bushings shall be outdoor type and external part shall be made of porcelain material. Rods and nuts (Tightening Nut along with Check Nut) shall be made of tinned brass material.</li> <li>IS to be followed: IS 8603(Part- I) for porcelain IS 3347 part3 section 2 for metal part and IS 2099 for complete bushing.</li> <li>The bushing stud sizes to be followed are, <table border="1"> <tr> <td>Rating</td> <td>Size of stem</td> </tr> <tr> <td>Up to 160kVA</td> <td>M12</td> </tr> </table> </li> </ol> <p><b>For Pole mounted transformers: Top cover mounting bushing (Except 25kVA)</b></p> <ol style="list-style-type: none"> <li>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 <b>80 microns</b> (minimum at any point).</li> <li>The HV bushing shall be fitted with molded heat shrinkable insulating covers suitable for to provide protection on the bushing connector. Conductor entry size shall be 18mm.</li> </ol>			Rating	Size of stem	Up to 160kVA	M12
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		<p>7. Tinned Brass/ bimetallic connectors shall be provided connected on HV bushing rods suitable for bare dog conductor connections in horizontal &amp; vertical direction.</p> <p>8. 25kVA DT shall have side inclined HV bushing being without conservator</p> <p><b>For Plinth mounted transformers:</b></p> <p>9. Transformer shall be with HT cable box on sidewall of tank having porcelain bushing as specified above.</p> <p><b>B. LT Bushings (1.1kV/suitable current rating):</b></p> <p>1. The bushings shall be of outdoor type made of porcelain material and rods and nuts (Tightening Nut along with Check Nut) shall be made of tinned brass material.</p> <p>10. 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).</p> <p>11. The metal portion of the internal HV &amp; LV bushing inside the tank shall remain dipped in oil in all operating condition.</p> <p>12. The LV bushings shall be provided on the side wall of tank along with cable box.</p> <p>13. The bushing stud sizes to be followed are,</p> <table border="1"> <tr> <td>Rating</td> <td>Size of stem</td> </tr> <tr> <td>Up to 160kVA</td> <td>M12</td> </tr> </table>	Rating	Size of stem	Up to 160kVA	M12								
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<b>1.10</b>	<b>CABLE BOXES</b>	<p>1. For HV side, bare bushings shall be provided on top transformers suitable for bare jumper connections. For plinth mount DTs in these ratings, sidewall mounted bushings with cable box are to be provided.</p> <table border="1"> <thead> <tr> <th>Rating (kVA)</th> <th>25</th> <th>63</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>HV side</td> <td colspan="3">Bare bushings on top of transformer when plinth mount not mentioned. When item name has mentioned of plinth mounted then cable box with glands to be provided.</td> </tr> <tr> <td>LV side</td> <td colspan="3">Cable Box with single compression brass glands to be provided.</td> </tr> </tbody> </table> <p>2. 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.</p> <p>3. Water should not accumulate on cable boxes and proper slope shall be provided in order to ensure drainage of water.</p> <p>4. Cable box protection shall be IP 55. Test reports to be submitted from NABL accredited lab.</p> <p>5. Cable box should be painted in same way as that of tank painting with treatment.</p> <p>6. 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.</p> <p>7. Canopy shall be provided on all gasket joints, the bend edges of cover overlapping gasket to protect from rain and sunlight shall also accepted.</p> <p>8. 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.</p> <p>9. For Cable clamping, Fire retardant nylon grade material to be used for oval shaped clamping arrangement with GI nut bolt on both HV &amp; LV Side.</p> <p>10. 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</p>	Rating (kVA)	25	63	100	HV side	Bare bushings on top of transformer when plinth mount not mentioned. When item name has mentioned of plinth mounted then cable box with glands to be provided.			LV side	Cable Box with single compression brass glands to be provided.		
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		<p>removed.</p> <p>11. 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.</p> <p>12. Gland plates shall be mounted separately with nut &amp; bolt arrangement and gasket in between them.</p> <p>13. The size of the cable box cover should be moderate so that only one or two people is enough to lift it.</p> <p>14. The bidder shall submit <b>drawings for the box with internal details</b> along with the transformer for approval.</p> <p><b><u>HV CABLE BOX:</u></b></p> <p>15. 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.</p> <p>16. HV box gland plate shall have Single compression gland designed for 11kV, 3C X 150 or 3CX400 sq.mm XLPE Cable.</p> <p>17. The distance between HV gland plate and HV bushings should be minimum 650 mm.</p> <p>18. Earthing provision (Body earth- outside and for cable earthing- inside of box) shall be provided in the HV box with M12 SS bolt &amp; SS washers.</p> <p>19. Gland shall be SCG 18 single compression brass gland suitable for diameter of 91mm cable.</p> <p><b><u>LV CABLE BOX:</u></b></p> <p>20. Neutral terminal of LV winding shall be brought out on LV phase terminals to form four wire system.</p> <p>21. Epoxy Insulators shall be provided from top side in LV box to support LV busbar.</p> <p>22. LV busbar shall be of AL material &amp; shall have clearances as mentioned in GTP.</p> <p>23. The clearance above bushing shall be 120mm and below busbar cable mounting bolt shall be 450mm up to gland plate.</p> <p>24. Lugs shall be of AL material with tin coating &amp; shall comply the IS requirements.</p> <p>25. Arrangement in the LV box shall be BYRN from left to right when viewed from front.</p> <p>26. 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.</p> <p>27. The Neutral to be brought out from box through bushing and shall have same dimension as that of phase bushing.</p> <p>28. GI earth strip (Size - 50 x 6 mm) shall be provided from neutral bushing to both side of the box. The GI strip shall extend to the bottom of the terminal box on both sides.</p> <p>29. Insulator support to be provided on terminal box both sides for GI earth strip so as to avoid tension on secondary neutral bushing.</p> <p>30. Earthing provision (Body earth) shall be provided in the LV box with M12 bolt.</p> <p>31. Gland shall be SCG 7 single compression brass gland suitable for diameter of 27mm cable.</p> <p>32. The no. and size of cables for installation on LV side shall be as follows:</p> <table border="1"> <thead> <tr> <th>Transformer Rating</th> <th>Size of cable for Phase &amp; Neutral</th> <th>No. of runs per phase</th> <th>No. of runs for neutral</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Transformer Rating	Size of cable for Phase & Neutral	No. of runs per phase	No. of runs for neutral				
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		The LV busbar shall be one continuous conductor strip with 160mm length for 100kVA with top insulator support at the end. Busbar shall be connected on four bolts on brass palm connector.			
1.11	TERMINAL CONNECTORS	<p><b>HT TERMINAL CONNECTOR:</b></p> <ol style="list-style-type: none"> <li>Tinned Brass connectors shall be provided connected with HV bushing rods for bare top plate bushing.</li> <li>UV resistant polymeric insulating shrouds shall be provided on the HV bare bushing terminals.</li> <li>For plinth mounted DT connector not required.</li> </ol> <p><b>LT TERMINAL CONNECTOR:</b></p> <ol style="list-style-type: none"> <li>Tinned Brass palm connector (with current rating w.r.t Load current), and Aluminium busbar (current density: not more than 1 A/mm<sup>2</sup>) shall be provided.</li> <li>Busbar shall be supported with insulator at the top portion of terminal box.</li> </ol>			
1.12	Metering CT	Not applicable			
1.13	Auxiliary TERMINAL BOX	Not applicable			
1.14	EQUILISING/ EQUIPOTENTIAL STRIP	<ol style="list-style-type: none"> <li>The Transformer top cover shall be connected with main tank using <b>tinned copper strip (30mm wide, 0.7mm thick)</b> at two places (diagonally opposite with each other).</li> <li>The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip.</li> <li>All the covers like inspection cover, LV box cover, HV box cover, Conservator cover must be electrically connected using <b>tinned copper strip (30mm wide, 0.7mm thick)</b>.</li> <li>Separate arrangement to be made and cover tightening bolt not to be used for equipotential strips.</li> </ol>			
1.15	EARTHING CONNECTIONS	<p><b>NEUTRAL EARTHING:</b></p> <ol style="list-style-type: none"> <li>Separate LV neutral bushing to be provided on top of LV box for neutral earthing.</li> <li>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 <b>86 microns</b> (minimum at any point)).</li> <li>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.</li> </ol> <p><b>BODY EARTHING:</b></p> <ol style="list-style-type: none"> <li>Two body earthing terminals pads/boss arrangement shall be provided on Transformer tank with M12 SS Bolt with 70 sq. mm lug. with SS plain washer and spring washer.</li> <li>It shall be located on the lower side of the transformer, diagonally opposite to each other.</li> </ol>			

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1.16	OIL	<p><b>Note: Default Oil shall be Mineral oil only if not specified / asked for other oil.</b></p> <p><b>Mineral Oil: In case of Mineral Oil below are the requirements to be fulfilled:</b></p> <ol style="list-style-type: none"> <li>All transformers shall be filled with new, unused, clean, standard mineral oil in compliance with IS 335/ IEC 296- type II and shall be free from all traces of polychlorinated biphenyl (PCB) compounds.</li> <li>The use of recycled oil is not acceptable.</li> <li>Oil shall be filled under vacuum before filling it shall be filtered and tested (as per IS 6103).</li> <li>The test parameters should be as per the table below:</li> </ol> <table border="1"> <thead> <tr> <th>Test parameters</th> <th>Values</th> </tr> </thead> <tbody> <tr> <td>Break Down Voltage (min )</td> <td>60 kV</td> </tr> <tr> <td>Water content ppm, (max.)</td> <td>20 ppm</td> </tr> </tbody> </table> <p>Bidder has to provide the oil data in below table:</p> <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Unit</th> <th>As furnished by bidder</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Type of oil</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Oil Qty. for first filling</td> <td>Ltr.</td> <td></td> </tr> <tr> <td>3</td> <td>Grade of Oil</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>Maker's name</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td>BDV at the time of first filling</td> <td>kV</td> <td></td> </tr> </tbody> </table>	Test parameters	Values	Break Down Voltage (min )	60 kV	Water content ppm, (max.)	20 ppm	Sl. No.	Description	Unit	As 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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1.17	CONSERVATOR	<ol style="list-style-type: none"> <li>25kVA DT shall be without conservator and self-cooled type.</li> <li>The conservator shall be supported / fixed on the main body of the transformer tank.</li> <li>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 <b>10% quantity of the oil used in transformer</b>. Normally, at least <b>30% volume of conservator</b> shall be filled with Oil.</li> <li>The connecting pipe of the conservator shall be so fitted to transformer tank that the pipe can be detached from the tank.</li> <li>Jointless pipe shall be used which shall be connected with round flanges.</li> <li>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.</li> <li>The conservator oil filling cap/hole shall be of 32mm diameter &amp; female type cap to be provided.</li> <li>The conservator breather pipe should be taken below half of the body of transformer. The pipe size shall be suitable for breather as specified in this document.</li> <li>The Oil conservator shall be provided with: <ul style="list-style-type: none"> <li><b>Oil level indicator</b> (as per clause no. 5.18).</li> <li><b>Dehydrating breather</b> (as per clause no. 5.22).</li> <li><b>Drain plug and Oil filling hole</b> (1.25 inch/32mm with thread size of BSP 1.25inch, 11TPI) with cover.</li> <li><b>Detachable end plate</b> on one side (the side on which the gauge glass is fitted), to enable the maintenance staff to periodically clean the inside of</li> </ul> </li> </ol>																														

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		<p>the conservator tank.</p> <ul style="list-style-type: none"> <li>• <b>All caps/air plug to be fixed with Teflon tape such way that atmospheric air should not pass inside conservator, only filtered air from breather shall go in conservator tank.</b></li> </ul>
1.18	<b>OIL LEVEL INDICATOR</b>	<ol style="list-style-type: none"> <li>1. Oil level indicator with <b>prismatic glass and red colour background</b> shall be provided.</li> <li>2. The oil gauge glass shall be removable and so embodied in the end plate so as to prevent oil leakage.</li> <li>3. The Oil level indicator should indicate oil level at minimum, normal and maximum as -5°C, 30°C and 90°C respectively.</li> </ol>
1.19	<b>EXPLOSION VENT / PRESSURE RELEASE DEVICE</b>	<ol style="list-style-type: none"> <li>1. Explosion vent shall be provided on the top cover for DT.</li> <li>2. Double diaphragm with oil observation gauge (prismatic Type) shall be provided on explosion vent pipe.</li> <li>3. All plinth mounted DT shall be provided with PRV/PRD with auxiliary contacts. The contact to be wired up in the auxiliary terminal box.</li> <li>4. PRV shall be provided to operate before reaching the test pressure as specified in the above class.</li> <li>5. PRV shall not have air release arrangement.</li> <li>6. The PRV shall seal-off after the excess pressure has been released and it shall have mechanical flag arrangement.</li> <li>7. The PRV shall have NO, NC contacts wired up in auxiliary terminal box.</li> </ol>
1.20	<b>AIR RELEASE PLUG</b>	The cover of the main tank shall be provided with an <b>air release plug on all ratings.</b>
1.21	<b>DRAIN VALVE AND FILTER VALVE</b>	<ol style="list-style-type: none"> <li>1. The drain valve and filter valve shall be of Brass with gate valve.</li> <li>2. Brass metal wheel valve of size 3/4" to be used for both drain cum sampling valve.</li> <li>3. The drain valve and filter valve shall be provided with embossed name plate stating drain valve and filter valve.</li> <li>4. The drain valve shall be located on the bottom and filter valve shall be provided at side top of tank.</li> <li>5. Locking arrangement shall be provided to stop movement of hand wheel.</li> <li>6. The valves shall be covered with a MS box by welding on tank.</li> </ol>
1.22	<b>DEHYDRATING BREATHER</b>	<ol style="list-style-type: none"> <li>1. The breather pipe shall enter the conservator from the upper side of the conservator.</li> <li>2. The breather shall contain 500 gm. Of silica gel for 160 kVA DTs.</li> <li>3. The silica gel shall be blue colored as per IS: 3401 – 1992. The granules size should be 3-5 mesh (4 to 6.73mm).</li> <li>4. The body of the breather shall be unbreakable, transparent, UV stabilized seamless polycarbonate tube of minimum thickness 3mm</li> <li>5. The top cover shall be of pressure die cast aluminum and powder coated.</li> <li>6. The oil cup shall be of UV protected polycarbonate.</li> <li>7. Oil cup shall have marking of oil filling level</li> <li>8. The breather shall be supplied as per approved make and as per specifications.</li> <li>9. The gasket should be of Class 3B, Type III as per IS 11149 Nitrile rubber (Oil resistant gaskets)</li> <li>10. All tie rods and all hardware should be of stainless steel material ( SS 304)</li> <li>11. Breather mounting arrangement,</li> <li>12. Silica gel breather shall have top threaded mounting arrangement with 1/2" pipe size having BSP threading.</li> <li>13. While fixing of breather on transformer Teflon tape should be used to make it air tight &amp; water tight. This shall be checked during inspection and after receipt at our stores on each transformer.</li> </ol>


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		14. 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/cm <sup>2</sup> (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.																												
1.23	<b>OIL TEMPERATURE INDICATOR</b>	1. 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. 2. Range: 0- 120 °C, Accuracy: $\pm 4^{\circ}\text{C}$ . 3. The OTI shall be IP55 tested.																												
1.24	<b>FASTENERS</b>	1. 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. 2. All nuts/bolts/washers exposed to atmosphere shall be as follows: <table border="1"> <tr> <td>Size 12mm (or below)</td> <td>Stainless Steel</td> </tr> <tr> <td>Above 12mm</td> <td>Steel with antirust coating, Hot dip galvanized</td> </tr> </table> 3. All ferrous bolts, nuts and washers placed in outdoor positions shall be <b>hot dip galvanized</b> 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. The cup type washers to be used as spring washers, cut spring washers are not accepted. 6. <b>Taper washers</b> shall be provided where necessary. <b>Protective washers</b> of suitable material shall be provided on front and back of the securing screws. 7. 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. 8. Core bolts shall be black colored high tensile grade-8.8	Size 12mm (or below)	Stainless Steel	Above 12mm	Steel with antirust coating, Hot dip galvanized																								
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1.25	<b>SURFACE PREPARATION AND PAINTING</b>	1. The paint shall be applied by airless spray. 2. Steel surfaces shall be prepared by <b>shot blast cleaning</b> (IS-9954) to grade Sq.2.5 of ISO 8501-1 or <b>chemical cleaning</b> including phosphating of the appropriate quality (IS 3618). 3. <b>Heat resistant (Hot oil proof) paint</b> shall be used for the <b>inside surface</b> and whereas for <b>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.</b> as per table given below: <table border="1"> <thead> <tr> <th>S. No.</th> <th>Paint type (Should be UV restraint, non-fading)</th> <th>Area to be painted</th> <th>No of coats</th> <th>Total dry film thickness (min); micron</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1.</td> <td rowspan="2">Thermosetting powder paint</td> <td>Inside</td> <td>01</td> <td>30</td> </tr> <tr> <td>Outside</td> <td>01</td> <td>60</td> </tr> <tr> <td>2.</td> <td><b>Liquid Paint</b></td> <td></td> <td></td> <td></td> </tr> <tr> <td>a.</td> <td>Epoxy (primer)</td> <td>Outside</td> <td>01</td> <td>30</td> </tr> <tr> <td>b.</td> <td>P.U. Paint (finish</td> <td>Outside</td> <td>02</td> <td>25 (each)</td> </tr> </tbody> </table>	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.	<b>Liquid Paint</b>				a.	Epoxy (primer)	Outside	01	30	b.	P.U. Paint (finish	Outside	02	25 (each)
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	paint)											
c.	Hot oil resistant paint	Inside	01	35								
<b>1.26</b>	<b>RADIO INTEREFENCE</b>	When operated at voltages up to <b>12.5%</b> 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.										
<b>1.27</b>	<b>OVERLOAD CAPACITY</b>	The transformer shall be suitable for loading as per 2026 part-7.										
<b>1.28</b>	<b>FITTINGS</b>	<p>The following standard fittings shall be provided:</p> <ol style="list-style-type: none"> <li>Two earthing terminal pads/ boss with earthing symbol <math>\perp</math> for body earthing on opposite sides with 70sq.mm AL lug and M12 SS bolt and washers.</li> <li>Air Release Device.</li> <li>Thermometer Pocket with cap.</li> <li>Drain cum Sampling Valve of brass metal wheel (0.75 inch nominal size thread, IS 554) with locking arrangement and a valve cover made of M.S.steel.</li> <li>Explosion vent.</li> <li>LV cable Boxes.</li> <li>Terminal Connectors for HV (Tinned brass without any joint) / LV side (tinned brass palm connector, Al busbar with support insulator on top and Al lugs).</li> <li>HV and LV two-part Gland plates (Non-Magnetic and with Single compression Brass glands).</li> <li>HV bushing terminal bird guards.</li> <li>Dehydrating Breather.</li> <li>Prismatic Oil level Gauge.</li> <li>Lifting lugs (enclosed type) for the top cover, complete transformer and core and winding assembly.</li> <li>Pulling Lugs.</li> <li>Stiffener Angle.</li> <li>2 Base channels.</li> <li>Marking Plates as asked in clause 6.1</li> <li>Oil Temperature indicator</li> <li>Two GI strip of Size 50x6 mm for neutral earthing with minimum GI coating thickness of 86 microns. With SS, nut bolts and washers</li> </ol>										
<b>1.29</b>	<b>WINDING TEMPERATURE INDICATOR (WTI)</b>	Not applicable										
<b>1.30</b>	<b>BUCHHOLZ RELAY</b>	Not applicable										
<b>1.31</b>	<b>MARSHALLING BOX AND PROTECTION</b>	Not applicable										
<b>1.32</b>	<b>MAKE OF MAJOR COMPONENTS &amp; RAW</b>	The BA shall procure the following constituent items from the designated vendors as follows:										




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	<b>MATERIALS</b>	<table border="1"> <thead> <tr> <th>S.no</th> <th>RAW MATERIAL/EQUIPMENT</th> <th>MAKE</th> </tr> </thead> <tbody> <tr> <td>a)</td> <td>Copper</td> <td>M/S Sterlite, M/S Hindustan Copper, M/S Hindalco.</td> </tr> <tr> <td>b)</td> <td>Core</td> <td>M/S AK Steels, POSCO, Kawasaki/JFE, Nippon Steel.</td> </tr> <tr> <td>c)</td> <td>Insulation paper and Pressboards</td> <td>ITC, Raman Boards- Mysore, Senapathy Whiteley – Bangalore</td> </tr> <tr> <td>d)</td> <td>Transformer Oil (Mineral oil)</td> <td>Savita, Apar, Gandhar</td> </tr> <tr> <td>e)</td> <td>Gaskets &amp; Corks</td> <td>Nu Cork, Anchor Corks</td> </tr> <tr> <td>f)</td> <td>Steel For Tank</td> <td>M/S TISCO, M/S SAIL, M/S Bhushan Steel, M/S ISSCO, M/S RINL, M/S Jindal Steel</td> </tr> <tr> <td>g)</td> <td>Dehydrating Breather</td> <td>Yogyra, Bharat Casting or equivalent</td> </tr> </tbody> </table>	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, 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 TISCO, M/S SAIL, M/S Bhushan Steel, M/S ISSCO, M/S RINL, M/S Jindal Steel	g)	Dehydrating Breather	Yogyra, Bharat Casting or equivalent
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Also, Bidder has to provide all test certificates from original manufacturers & relevant sourcing documents. BA shall also have shot blasting facility.																										
1.33	<b>Details specific to the location of supply</b>	<ol style="list-style-type: none"> <li>Cable box shall be without breather, louvers, heater &amp; no illumination provision.</li> <li>Single compression brass gland to be provided on HT &amp; LT side as per the cable sizes defined in specs. The brass gland shall fix on complete cable with sheath.</li> <li>The bushing shall have creepage distance of 25mm/kV.</li> </ol>																								
2.	<b>NAME PLATE AND MARKING</b>																									
2.1	<b>MARKING PLATES</b>	<ol style="list-style-type: none"> <li><b><u>Name Plate (Rating) Plate: SS material</u></b> A rating plate shall be fitted to each transformer in a visible position and shall carry all the information as <b>specified in clause no. 6.2</b></li> <li><b><u>Terminal Marking Plate: On rating plate also accepted.</u></b> <ul style="list-style-type: none"> <li>The terminal marking plate shall be provided which shall be strictly in accordance with <b>figure 4 of IS 1180-Part 1: 2014</b>. This plate may be combined with the rating plate or can be provided separately.</li> <li>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.</li> </ul> </li> <li><b><u>Details Plate: MS sheet of 2.5mm with punched data and welded on tank</u></b> A separate plate of <b>size 125 mm x 125 mm</b> shall be provided having following details: <ul style="list-style-type: none"> <li>Name of the firm.</li> <li>Serial No.</li> <li>Rating of transformer.</li> <li>Order no. and date.</li> <li>Date of dispatch.</li> </ul> </li> <li><b><u>Guarantee Plate:</u></b></li> </ol>																								

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		<p>A separate warranty plate made of <b>Stainless Steel</b> with following clause written on it.</p> <p><b>“THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE OF COMMISSIONING OR 60 MONTHS FROM THE DATE OF LAST SUPPLY”</b></p> <p>All the plates described above except 3 should be as followings:</p> <table border="1"> <tr> <td>Material</td> <td>Stainless Steel</td> </tr> <tr> <td>Thickness</td> <td>1 mm</td> </tr> <tr> <td>Engraving</td> <td>The letters on the rating plate shall be engraved black on the white/silver back ground.</td> </tr> <tr> <td>Fixing</td> <td>Fixing screws shall be of stainless steel.</td> </tr> </table> <p><b>5. <u>Danger Plate:</u></b> Danger notice shall have red lettering on a white background on a plate as specified in <b>IS: 2551 – 1982.</b></p> <p><b>6. <u>BIS Certification Mark:</u></b> The Bidder is required to get approval from BIS and display BIS mark on the name plate.</p> <p><b>7. <u>BEE LABEL (up to 200 kVA transformers only):</u></b> 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:</p> <ol style="list-style-type: none"> <li>1. the logo of the Bureau of Energy Efficiency</li> <li>2. that the equipment is a distribution transformer</li> <li>3. that it is an oil filled, naturally cooled type</li> <li>4. name of the manufacturer and brand</li> <li>5. Capacity in KVA as tested</li> <li>6. Voltage is up to 11 KV</li> <li>7. Total losses at 50% loading in watts</li> <li>8. Total losses at 100% loading in watts</li> <li>9. Star level</li> <li>10. Model and year of manufacturing.</li> <li>11. Bureau’s authorisation number</li> </ol> <p><b>8. <u>Control Circuit drawing Plates:</u></b></p> <ul style="list-style-type: none"> <li>• Engraved drawing for control circuit unit shall be available on Marshalling box.</li> </ul> <p>The design, colour, size and content of label shall be as specified in the schedule annexure IV.</p>	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.
Material	Stainless Steel									
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2.2	<b>NAME PLATE DETAILS</b>	<p>The name plate shall be strictly as per <b>IS 1180: 2014 (figure 1)</b>. Additionally, following points shall be displayed:</p> <ol style="list-style-type: none"> <li>1. Actual no load losses of transformer.</li> <li>2. Actual total losses of transformer at 50% load and 100% load.</li> <li>3. Standard mark (BIS certification).</li> </ol>								


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		4. "TPCODL" shall be written in bold letters. 5. PO number with date has to be mentioned. 6. Overall dimensions of the transformer.
2.3	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. 2. 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. 3. The markings shall be done by steel strips in which marks had been engraved in black colour. 4. Colour marking of the bushings shall be done. 5. On the top cover of tank and the core channel, Manufacturer's name and Manufacturer's serial no. shall be engraved. 6. 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. 7. The QR code to be fixed on two places on transformer body having name plate details and warranty details. This is to be fixed on LV terminal box outside and one on conservator on durable QR code stickers.

### **TYPE TEST REPORT**


Bidder shall furnish the type test report for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**

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 [As per IS 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)].
5. Determination of sound levels [IS 2026 (part 10)].
6. No load current at 112.5% voltage
7. BDV and moisture content of oil in transformer (IS 335).
8. Magnetic balance test.
9. Measurement of Zero-phase sequence impedance.
10. Measurement of Harmonics of no-load current.

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11. 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, and 3 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at NABL accredited labs, accreditation certificates to be submitted, in- house tests accepted if in-house lab is NABL accredited for these tests.

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## 40.0 250 kVA AND 500kVA 11/4 kV TRANSFORMER

### GENERAL TECHNICAL PARTICULARS

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUES	
1	Continuous Rated Capacity (kVA)	250 kVA	500 kVA
2	Application	Outdoor	Outdoor
3	System voltage (max.)	12 kV	12 kV
4	Rated voltage HV	11kV	11Kv
5	Rated voltage LV (V)	433-250	433-250
6	Line current HV (A)	13.12 A	26.25 A
7	Line current LV (A)	333.34 A	666.68 A
8	Frequency (Hz)	50 Hz	50 Hz
9	No. of Phases	Three	Three
10	Connection HV	Delta	Delta
11	Connection LV	Star (Neutral Brought out)	Star (Neutral Brought out)
12	Vector group	Dyn-11	Dyn-11
13	Type of cooling	ONAN	ONAN
14	Tap changing arrangement (off load)	+5.0% to -10% in steps of 2.5%	
15.	No. of tap positions	7	7
16	Noise level at rated voltage and frequency	55 dB	56 dB
17	<b>Permissible temperature rise over ambient:</b>		
a	Of top oil	40 °C	40 °C
b	Of winding	45 °C	45 °C
18	Max. Total Losses at 50% loading at 75°C (watts)	980	1510
19	Max. Total Losses at 100% loading) at 75°C (Watts).	2930	4300
20	Short circuit impedance voltage at 75°C (±10% tolerance)	4.50%	4.50%
21	Insulation Class	A	A
22	Normal Flux Density (at rated voltage)	1.6 T	1.6 T


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SL. No.	TECHNICAL PARTICULARS	DESIRED VALUES	
	and frequency)		
23	Maximum current density (A/mm <sup>2</sup> )	2.5	2.5
24	Impulse withstand voltage	75 kVp	75 kVp
25	Power frequency withstand voltage	28 kV	28 kV
26	Max. flux density (Increase of +12.5 % combined voltage & frequency variation from rated voltage & frequency)	1.8 T (Max.)	
27.	Voltage fluctuations permissible	+12.5% to -12.5%	+12.5% to -12.5%
28	<b>Metering CT for LV side</b>	400/5	800/5
28.1	Accuracy Class for metering CT	0.5	0.5
28.2	Burden	20 VA	20 VA
28.3	ISF (Instrument security factor)	5	5
29	Neutral terminal	Two separates 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.	
<b>30</b>	<b>Minimum clearances in air (mm)</b>		
30.1	HV phase to phase/ phase to earth	255 / 140	255 / 140
30.2	LV phase to phase/ phase to earth	75 / 40	75 / 40
<b>31</b>	<b>Minimum clearances in Cable Box (mm):</b>		
31.1	HV phase to phase/ phase to earth	130 / 90	130 / 90
31.2	LV phase to phase / phase to earth	25 / 20	25 / 20
32	<b>Wheels</b>	Only item codes in tender having mention of 'Plinth Mounted' those DT shall have rollers. When same is not mentioned in item code then the DT shall be without rollers.	

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## GENERAL CONSTRUCTION

1.	<b>GENERAL CONSTRUCTION</b>	<ol style="list-style-type: none"> <li>1. The transformer shall be stacked core, copper coil, oil immersed, naturally cooled (ONAN), non-sealed type with plain rectangular tank.</li> <li>2. The transformer shall be suitable for service with fluctuations in supply voltage up to +12.5% to -12.5%.</li> <li>3. The transformer shall be designed suitable for service life of 25years.</li> <li>4. 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.</li> <li>5. 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.</li> <li>6. All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.</li> </ol>
1.1	<b>CORE</b>	<ol style="list-style-type: none"> <li>1. 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.</li> <li>2. The core shall have low loss and good grain properties.</li> <li>3. 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.</li> <li>4. 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.</li> <li>5. The <b>core thickness should be 0.23mm or less</b> and <b>grade should be M3 or better</b>. 23HP85 as per IS 3024 or better with Minimum Polarization in Tesla at a Field Strength of 800 A/m</li> <li>6. Only single grade and same thickness of core stampings shall be accepted and mixing of different grades shall not be allowed.</li> <li>7. The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.</li> <li>8. 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.</li> <li>9. The handling of core lamination and stacking should be smooth and uniform.</li> <li>10. 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.</li> <li>11. The No Load current shall not exceed 2% of the Full Load current for &gt;200kVA (3% for 160kVA) 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 &gt;200kVA rating (6% for 160kVA)</li> <li>12. The bidder shall be required to submit the following documents in regard to procurement of core material during stage inspection: <ul style="list-style-type: none"> <li>- Invoice of supplier</li> </ul> </li> </ol>

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		<ul style="list-style-type: none"> <li>- Mill's test certificate</li> <li>- Packing list</li> <li>- Bill of landing</li> <li>- Bill of entry certificate by custom (if required)</li> <li>- Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.</li> </ul> <p>13. 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.</p> <p>14. Transformer core assembly shall have enclosed type lifting lugs for lifting arrangement.</p> <p>15. Bidder shall provide the below details in below table:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sl. No.</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Unit</th> <th style="text-align: center;">As furnished by bidder</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Magnetizing (No Load) Current</td> <td></td> <td></td> </tr> <tr> <td></td> <td>90% Voltage</td> <td style="text-align: center;">%</td> <td></td> </tr> <tr> <td></td> <td>100% Voltage</td> <td style="text-align: center;">%</td> <td></td> </tr> <tr> <td></td> <td>112.5% Voltage</td> <td style="text-align: center;">%</td> <td></td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Core grade</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Thickness of core Lamination</td> <td style="text-align: center;">Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">4.</td> <td>Core Dimension: Length X height X diameter</td> <td style="text-align: center;">mm x mm x mm</td> <td></td> </tr> <tr> <td style="text-align: center;">5.</td> <td>Gross core area</td> <td style="text-align: center;">Sq.cm</td> <td></td> </tr> <tr> <td style="text-align: center;">6.</td> <td>Net core area</td> <td style="text-align: center;">Sq.cm</td> <td></td> </tr> <tr> <td style="text-align: center;">7.</td> <td>Flux density (calculated)</td> <td style="text-align: center;">Tesla</td> <td></td> </tr> <tr> <td style="text-align: center;">8.</td> <td>Over fluxing without saturation (BH curve to be submitted)</td> <td style="text-align: center;">Tesla</td> <td></td> </tr> <tr> <td style="text-align: center;">9.</td> <td>Mass of core</td> <td style="text-align: center;">Kg</td> <td></td> </tr> <tr> <td style="text-align: center;">10.</td> <td>Loss per Kg of core at the above specified flux density</td> <td style="text-align: center;">Watt</td> <td></td> </tr> <tr> <td style="text-align: center;">11.</td> <td>Core window height</td> <td style="text-align: center;">Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">12.</td> <td>Center to center distance of the core</td> <td style="text-align: center;">Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">13</td> <td>Mass of Core Lamination (min.)</td> <td style="text-align: center;">Kg</td> <td></td> </tr> <tr> <td style="text-align: center;">14</td> <td>Make of Core offered</td> <td></td> <td></td> </tr> </tbody> </table>	Sl. No.	Description	Unit	As 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 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 density	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		
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<b>1.2</b>	<b>WINDING CONNECTIONS</b>	<ol style="list-style-type: none"> <li>1. Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 30% overlap per layer of paper &amp; TPC with 25% overlap per layer.</li> <li>2. The conductor should be drawn uniformly without any deformation and any burr.</li> <li>3. No metallic or non-metallic dust should be present in-between DPC conductor.</li> </ol>																																																																								




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4. The current density for HV and LV winding should not be more than 2.5 Ampere per sq.mm.
5. The insulation between core and bolts, core and clamps shall withstand **2.5 kV for one minute.**
6. Proper bonding of inter layer insulation with the conductor shall be ensured.
7. 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.
- 8. 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.**
9. LV winding shall be such that neutral formation is at the top.
10. Bidder shall provide the below details in below table:

Sl. No.	Description	Unit	As 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 (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 (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 <sup>0</sup> C		
	HV winding	Ohm	
	LV winding	Ohm	
21.	Height of LV winding	Mm	
22.	Height of HV winding	Mm	

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		<table border="1"> <tr><td>23.</td><td>ID of HV winding</td><td>Mm</td><td></td></tr> <tr><td>24.</td><td>OD of HV winding</td><td>Mm</td><td></td></tr> <tr><td>25.</td><td>ID of LV winding</td><td>Mm</td><td></td></tr> <tr><td>26.</td><td>OD of LV winding</td><td>Mm</td><td></td></tr> <tr><td>27.</td><td>Thickness of the duct in LV winding</td><td>Mm</td><td></td></tr> <tr><td>28.</td><td>Thickness of the duct in HV winding</td><td>Mm</td><td></td></tr> <tr><td>29.</td><td>Thickness of the duct between HV &amp; LV</td><td>Mm</td><td></td></tr> <tr><td>30.</td><td>Make of the copper winding conductors</td><td></td><td></td></tr> </table>	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		
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1.3	<b>INSULATING PAPER AND INSULATING PRESSBOARD</b>	<ol style="list-style-type: none"> <li>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.</li> <li>Primary and secondary windings shall be constructed from high- conductivity (copper conductors), Double Paper Covered (DPC) copper conductor with min. 30% overlap per layer of paper &amp; TPC with 25% overlap per layer.</li> <li>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.</li> <li>Kraft paper and Pressboard should be of class A (105°C) insulation material.</li> <li>All spacers, axial wedges / runners used in windings shall be made of pre-compressed solid pressboard.</li> <li>All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.</li> <li>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.</li> <li>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.</li> <li>Below required values could be verified if required at any stage of the inspection and it should fulfill the requirement as per below table:</li> </ol> <table border="1"> <thead> <tr> <th>Characteristics</th> <th>Kraft Paper</th> <th>Pressboard (all Sizes)</th> </tr> </thead> <tbody> <tr> <td>Dimension</td> <td>As specified by bidder with <math>\pm 5\%</math> tolerance.</td> <td>As specified by bidder with tolerance as per IS1576.</td> </tr> <tr> <td>Apparent Density</td> <td><math>&gt;0.80 \text{ g/cm}^3</math></td> <td>as per IS 1576 w.r.t Thickness</td> </tr> <tr> <td>pH of Aqueous extract</td> <td>6-8%</td> <td>6-8%</td> </tr> <tr> <td>Electrical strength</td> <td></td> <td></td> </tr> <tr> <td>i) in air</td> <td>7KV/mm</td> <td>12KV/mm</td> </tr> <tr> <td>ii) In Oil</td> <td>-----</td> <td>35KV/mm</td> </tr> <tr> <td>Ash content</td> <td>Maximum 1%</td> <td>Maximum 0.7</td> </tr> </tbody> </table>	Characteristics	Kraft Paper	Pressboard (all Sizes)	Dimension	As specified by bidder with $\pm 5\%$ tolerance.	As specified by bidder with tolerance as per IS1576.	Apparent Density	$>0.80 \text{ g/cm}^3$	as per IS 1576 w.r.t Thickness	pH of Aqueous extract	6-8%	6-8%	Electrical strength			i) in air	7KV/mm	12KV/mm	ii) In Oil	-----	35KV/mm	Ash content	Maximum 1%	Maximum 0.7								
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Moisture content	Maximum 8%	Maximum 8%
Oil absorption	-----	Minimum 9%
Heat stability	As per IS 9335-part 3	As per IS 1576
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:


1. Substance (Grammage) (g/m<sup>3</sup>)
2. Compressibility
3. Tensile strength
4. Conductivity of water extract
5. Shrinkage in air
6. Flexibility
7. Cohesion between plies1.
8. Elongation
9. Air permeability

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		
	Thickness of Pressboards for Insulation Between HV and LV winding (all size)	mm	
5.	Type of Paper used for insulation between core and LV		

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			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													
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		7.	Material used for top and bottom yoke insulation													
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			Thickness of material used for top and bottom yoke insulation	mm												
		8.	Type of material used for Spanner, wedge and Axial for insulation													
			Type of material used for Spanner, wedge and Axial for insulation													
			Thickness of material used for Spanner, wedge and Axial for insulation (all sizes)	mm												
	1.4 LOSSES	<p>1. 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.</p> <p>2. 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 ) :</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Description</th> <th colspan="2">Rating (kVA)</th> </tr> <tr> <th>250</th> <th>500</th> </tr> </thead> <tbody> <tr> <td>Maximum Losses at 50% loading at 75°C (Watts)</td> <td>980</td> <td>1510</td> </tr> <tr> <td>Maximum Losses at 100% loading at 75°C (Watts)</td> <td>2930</td> <td>4300</td> </tr> </tbody> </table> <p><b>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.</b></p> <p>3. 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</p>				Description	Rating (kVA)		250	500	Maximum Losses at 50% loading at 75°C (Watts)	980	1510	Maximum Losses at 100% loading at 75°C (Watts)	2930	4300
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		<p><b>increase with respect to the values given in specifications.</b></p> <p>4. 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.</p> <p>5. During testing at Bidder's works, if the temperature rise exceeds the specified values, the entire lot shall be rejected by TPCODL.</p> <p>6. 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.</p> <p>7. 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.</p> <p>8. Bidder shall provide the below details in below table:</p> <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Unit</th> <th>As furnished by bidder</th> </tr> </thead> <tbody> <tr><td>1</td><td>No Load losses</td><td>Watt</td><td></td></tr> <tr><td>2</td><td>Load losses at 50%loading at 75° C</td><td>Watt</td><td></td></tr> <tr><td>3</td><td>Load losses at 100% loading at 75° C</td><td>Watt</td><td></td></tr> <tr><td>4</td><td>Total losses at 50%load at 75° C</td><td>Watt</td><td></td></tr> <tr><td>5</td><td>Total losses at 100% load at 75° C</td><td>Watt</td><td></td></tr> <tr><td>6</td><td><b>Efficiency at 75 deg. C</b></td><td></td><td></td></tr> <tr><td>7</td><td><b>Efficiency at Unity P.F.</b></td><td></td><td></td></tr> <tr><td>7.1</td><td>100% load</td><td>%</td><td></td></tr> <tr><td>7.2</td><td>80% load</td><td>%</td><td></td></tr> <tr><td>7.3</td><td>60% load</td><td>%</td><td></td></tr> <tr><td>7.4</td><td>40% load</td><td>%</td><td></td></tr> <tr><td>7.5</td><td>20% load</td><td>%</td><td></td></tr> <tr><td>8</td><td><b>Efficiency at 0.8 P.F.</b></td><td></td><td></td></tr> <tr><td>8.1</td><td>100% load</td><td>%</td><td></td></tr> <tr><td>8.2</td><td>80% load</td><td>%</td><td></td></tr> <tr><td>8.3</td><td>60% load</td><td>%</td><td></td></tr> <tr><td>8.4</td><td>40% load</td><td>%</td><td></td></tr> <tr><td>8.5</td><td>20% load</td><td>%</td><td></td></tr> <tr><td>9</td><td><b>Regulation at:</b></td><td></td><td></td></tr> <tr><td>9.1</td><td>Unity P.F. at 75 deg. C</td><td>%</td><td></td></tr> <tr><td>9.2</td><td>0.8 P.F. at 75 deg. C</td><td>%</td><td></td></tr> <tr><td>9.3</td><td>% Impedance at 75 deg. C</td><td>%</td><td></td></tr> </tbody> </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	<b>Efficiency at 75 deg. C</b>			7	<b>Efficiency at Unity P.F.</b>			7.1	100% load	%		7.2	80% load	%		7.3	60% load	%		7.4	40% load	%		7.5	20% load	%		8	<b>Efficiency at 0.8 P.F.</b>			8.1	100% load	%		8.2	80% load	%		8.3	60% load	%		8.4	40% load	%		8.5	20% load	%		9	<b>Regulation at:</b>			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	%	
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1.5	<b>TRANSFORMER TANK AND TANK CONSTRUCTION</b>	<p>1. The transformer tank shall be of robust construction, <b>rectangular in shape</b> and shall be built up of electrically tested welded mild steel plates.</p> <p>2. 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.</p> <p>3. All welding operations should be carried by <b>qualified welders</b> (performance qualification certificates to the customer) as per the relevant ASME standards and a copy of the <b>welding procedure</b> has to be submitted to TPCODL at the time of drawing approval.</p>																																																																																												

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4. The **thickness of tank** should be as below:
5. For top and bottom: 6 mm (min.)
6. For Sides: 5 mm (min.)
7. Tolerance shall be applicable as per IS 1852 as per above thickness band.
8. In addition, the cover of the main tank shall be provided with an **air release plug**.
9. 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.
10. The transformer tank cover shall be bolted with tank rim so as to make a leak proof joint.
11. 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.
12. The tank cover shall have slight slope (10 mm  $\pm$  2mm) towards HV side to drain rain water.
13. 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.
14. 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

15. **The tank design shall be such that the core and the windings can be lifted freely without dismantling the bushings.**
16. All joints of tank and fittings shall be oil tight and no bulging shall occur during service.
17. 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.
18. The tightening torque chart to be provided for all bolts used. This shall be submitted along with each rating drawings.
19. The transformer shall be provided with four pulling lugs of MS plate of 8mm thick to pull the transformer horizontally.
20. The maximum overall size of DTs(including tolerance) shall be as mentioned below:


<u>Rating</u>	<u>Size (LXB) in mm</u>
Up to 500KVA	1800 X 1800

**Lifting lugs:**

21. The transformer shall be provided with a minimum of four welded heavy


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		<p>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.</p> <p>22. 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.</p> <p>23. There shall be facilities for lifting the core coil assembly separately.</p> <p>24. 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</p> <p>25. 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/cm<sup>2</sup> as per ANSI C.57.12.10. All calculation to be done for considering lifting on any diagonal opposite two lugs conditions.</p> <p>26. 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 (min. 120mm for 160KVA and higher as per rating and load) and location on tank along with stiffener support for all rating and all lugs.</p> <p>27. Bidder shall provide the transformer size and clearances in below table:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Sl. No.</th> <th style="width: 65%;">Description</th> <th style="width: 15%;">Unit</th> <th style="width: 15%;">As furnished by bidder</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td><b>Transformer overall Length x Height x width</b></td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td><b>Only Tank overall Length x Height x width</b></td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td style="text-align: center;">3</td> <td>HV Cable box overall LxWxH</td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td style="text-align: center;">4</td> <td>LV Cable box overall LxWxH</td> <td>mm x mm x mm</td> <td></td> </tr> <tr> <td style="text-align: center;">5</td> <td><b>Clearances</b></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">5.1</td> <td>Core and LV (minimum 5mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">5.2</td> <td>LV and HV (minimum 8mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">5.3</td> <td>HV Phase to phase (minimum 10mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">5.4</td> <td>Between HV winding and Yoke (minimum 20mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">5.5</td> <td>Between LV winding and Yoke (minimum 5mm)</td> <td>Mm</td> <td></td> </tr> <tr> <td style="text-align: center;">5.6</td> <td>Between yoke and inside of tank</td> <td>Mm</td> <td></td> </tr> </tbody> </table>	Sl. No.	Description	Unit	As furnished by bidder	1	<b>Transformer overall Length x Height x width</b>	mm x mm x mm		2	<b>Only Tank overall Length x Height x width</b>	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	<b>Clearances</b>			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	Mm	
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			to cover (minimum 100mm)		
		5.7	Between yoke and bottom (minimum 10mm)	Mm	
		5.8	Any point of winding to tank (minimum 20mm)	Mm	
		6	<b>Calculated Impedance</b>	%	
		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 x mm	
		9.	Size of Pipe used for conservator to Tank	Mm	
		10.	Size of Pipe used for Valves	Mm	
		11.	Base Channel size	Mm x mm x mm	
		12.	No. of Radiators	Nos	
		13.	No. of fins per Radiator	Nos	
		14.	Dimension of radiator fins (L x W)	Mm x mm	
		15.	Make of Tank material		
<b>1.6</b>	<b>RADIATORS</b>	<ol style="list-style-type: none"> <li>Radiators of pressed steel type conforming to the design requirement suitable for mineral oil and Ester oil (all type) type transformer.</li> <li>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.</li> <li><b>Thickness</b> of sheet for radiators shall be <b>1.20 mm (min)</b>.</li> <li>The <b>mounting</b> of the radiators shall be <b>non-detachable</b> (i.e., they should be welded permanently with the tank).</li> <li>The number / cross section / length / fixing arrangement of radiators shall be indicated in the general assembly drawing.</li> <li>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.</li> <li>Corrugated designs are not accepted.</li> </ol>			
<b>1.7</b>	<b>GASKET</b>	<ol style="list-style-type: none"> <li><b>Cork rubber gaskets</b> conforming to Type C , grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing &amp; water ingress resistant requirements for components like HV &amp; LV bushings bottom gasket, HV &amp; LV terminal box, Top Cover, Conservator, Valves etc.</li> <li><b>Nitrile/Neoprene rubber gaskets</b> conforming to Type IV – 4C (heat and oil resistant) as per IS 11149 shall be provided for bushing O ring (oil gaskets).</li> <li><b>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.</b></li> <li>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.</li> </ol>			
<b>1.8</b>	<b>TAPS</b>	<ol style="list-style-type: none"> <li>Rotary/Ring type tap changing mechanism to be mounted on side of the</li> </ol>			




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		<p>transformer in such way that could be easily operated in smooth way.</p> <ol style="list-style-type: none"> <li>Tap changing shall be carried out by means of an externally operated self-position switch and when the transformer is in de-energised condition.</li> <li>The taps shall be provided in HV winding and each tap change shall result in voltage variation of 2.5%.</li> <li>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%).</li> <li>Tap no. 3 to be considered as principal tap position.</li> <li>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.</li> </ol>						
1.9	<b>BUSHINGS AND TERMINAL CONNECTORS</b>	<p><b>A. HT Bushings (12 kV/250 A):</b></p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol> <p><b>For Pole mounted transformers: Top cover mounting bushing</b></p> <ol style="list-style-type: none"> <li>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 <b>86 microns</b> (minimum at any point).</li> <li>The HV bushing shall be fitted with bird guard on the bushing connector.</li> <li>Completer 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</li> </ol> <p><b>For Plinth mounted transformers:</b></p> <ol style="list-style-type: none"> <li>Transformer shall be with HT cable box on sidewall of tank having porcelain bushing as specified above.</li> </ol> <p><b>B. LT Bushings (1.1kV/suitable current rating):</b></p> <ol style="list-style-type: none"> <li>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.</li> <li>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).</li> <li>The metal portion of the internal HV &amp; LV bushing inside the tank shall remain dipped in oil in all operating condition.</li> <li>The LV bushings shall be provided on the side wall of tank along with cable box.</li> <li>The bushing tinned copper stem sizes to be followed are,</li> </ol> <table border="1"> <thead> <tr> <th>Rating</th> <th>Size of stem</th> </tr> </thead> <tbody> <tr> <td>250kVA</td> <td>M20</td> </tr> <tr> <td>500kVA</td> <td>M30</td> </tr> </tbody> </table>	Rating	Size of stem	250kVA	M20	500kVA	M30
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<b>1.10 CABLE BOXES</b>	<p>1. For HV side, bare bushings shall be provided on top for 160 kVA, 250 kVA, 315 kVA, 400 kVA and 500 kVA transformers suitable for bare jumper connections. For plinth mount DTs in these ratings, sidewall mounted bushings with cable box are to be provided.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Rating (kVA)</th> <th>250</th> <th>500</th> </tr> </thead> <tbody> <tr> <td>HV side</td> <td colspan="2">Bare bushings on top of transformer when plinth mount not mentioned. When item name has mentioned of plinth mounted then cable box with glands to be provided.</td> </tr> <tr> <td>LV side</td> <td colspan="2">Cable Box with single compression brass glands to be provided.</td> </tr> </tbody> </table> <p>2. 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.</p> <p>3. Water should not accumulate on cable boxes and proper slope shall be provided in order to ensure drainage of water.</p> <p>4. Cable box protection shall be IP 55. Test reports to be submitted from NABL accredited lab.</p> <p>5. Cable box should be painted in same way as that of tank painting with treatment.</p> <p>6. 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.</p> <p>7. Canopy shall be provided on all gasket joints, the bend edges of cover overlapping gasket to protect from rain and sunlight shall also accepted.</p> <p>8. 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.</p> <p>9. For Cable clamping, <b>Fire retardant nylon grade material to be used for oval shaped clamping arrangement with GI nut bolt</b> on both HV &amp; LV Side.</p> <p>10. 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.</p> <p>11. 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.</p> <p>12. Gland plates shall be mounted separately with nut &amp; bolt arrangement and gasket in between them.</p> <p>13. The size of the cable box cover should be moderate so that only one or two people is enough to lift it.</p> <p>14. The bidder shall submit <b>drawings for the box</b> with internal details along with the transformer for approval.</p> <p><b><u>HV CABLE BOX:</u></b></p> <p>1. 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.</p>	Rating (kVA)	250	500	HV side	Bare bushings on top of transformer when plinth mount not mentioned. When item name has mentioned of plinth mounted then cable box with glands to be provided.		LV side	Cable Box with single compression brass glands to be provided.	
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		<ol style="list-style-type: none"> <li>2. 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.</li> <li>3. Distance between HV gland plate and HV bushings should be minimum 650 mm.</li> <li>4. Earthing provision (Body earth- outside and for cable earthing- inside of box) shall be provided in the HV box with M12 SS bolt &amp; SS washers.</li> <li>5. Gland shall be SCG 18 single compression brass gland suitable for diameter of 91mm cable.</li> <li>6. Bolted type terminal cover with M14/M16 HDG bolts (M12 bolts for 160 and 250KVA DT) with danger marking</li> </ol> <p><b><u>LV CABLE BOX:</u></b></p> <ol style="list-style-type: none"> <li>1. Neutral terminal of LV winding shall be brought out on LV phase terminals to form four wire system.</li> <li>2. Epoxy Insulators shall be provided from top side in LV box to support LV busbar.</li> <li>3. LV busbar shall be of AL material &amp; shall have clearances as mentioned in GTP.</li> <li>4. Lugs shall be of AL material with tin coating &amp; shall comply the IS requirements.</li> <li>5. Arrangement in the LV box shall be BYRN from left to right when viewed from LV front.</li> <li>6. 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.</li> <li>7. The Neutral to be brought out from box through bushing and shall have same dimension as that of phase bushing.</li> <li>8. 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.</li> <li>9. Insulator support to be provided on terminal box both sides for GI earth strip so as to avoid tension on secondary neutral bushing.</li> <li>10. 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.</li> <li>11. For Transformer up to 800kVA ratings, In LV box, there must be provision for flexible mounting arrangement to fix multiple sized CT.</li> <li>12. 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 &amp; wires to be taken out and connected in the Metering terminal box.</li> </ol>
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		Transformer Rating	Size of cable for Phase & Neutral	Gland Size for LV Box	No. of runs per phase	No. of runs for neutral
		500 kVA	1C x 630 sq. mm (1.1 kV Class)	SCG10	2	2
		250 kVA	1C x 300sq.mm (1.1 kV class)	SCG7	1	1
		13. Earthing provision (Body earth) shall be provided in the LV box with M12 bolt. 14. The clearance above bushing shall be 120mm and below busbar cable mounting bolt shall be 450mm up to gland plate. 15. The no. and size of cables for installation on LV side shall be as follows: 16. The LV busbar shall be one continuous conductor strip with current density of 1 mm and length should be min. 160mm long for 160kVA and 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. 17. Bolted type terminal cover with M14/M16 HDG bolts (M12 bolts for 160 and 250KVA DT) with danger marking.				
1.11	<b>TERMINAL CONNECTORS</b>	<p><b><u>HT TERMINAL CONNECTOR:</u></b></p> 1. Tinned Brass connectors shall be provided connected with HV bushing rods for bare top plate bushings of 160 to 500kVA rating. 2. UV resistant polymeric insulating shrouds shall be provided on the HV bare bushing terminals. 3. For plinth mounted & 630kVA and above ratings Aluminium lugs (with minimum of 2 hole) suitable for 3CX400 sq.mm XLPE shall be provided at HT side for cable connection. <p><b><u>LT TERMINAL CONNECTOR:</u></b></p> 1. Tinned Brass palm connector (with current rating w.r.t Load current), and Aluminum busbar (current density: not more than 1 A/mm <sup>2</sup> ) shall be provided. 2. Busbar shall be supported with insulator at the top portion of terminal box. 3. 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)				
1.12	<b>METERING CURRENT TRANSFORMERS</b>	<p><b>Note: Metering CTs shall be required for transformers of 250kVA and above ratings.</b></p> 1. Cast Resin Type CTs shall be provided for transformers on the LT side for metering purpose. 2. 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. 3. 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.				

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		<ol style="list-style-type: none"> <li>4. The grade of the Core shall be M4 or better.</li> <li>5. 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.</li> <li>6. 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.</li> <li>7. The Copper wire used shall be super enameled as per the IS 4800 Part IX/ IEC 317.</li> <li>8. The wiring shall be enclosed in such a way that it can't be disturbed during maintenance activities.</li> <li>9. The CT shall be mounted outside the tank with suitable clamping arrangement (fiber glass material).</li> <li>10. The position of secondary terminals shall be such that, it will face towards outside after installation on bushing or bus bar of transformer.</li> <li>11. Mounting arrangement should be such that the CT shall be replaceable at site.</li> <li>12. The terminals shall have shorting facility and it should not get saturated up to 200% of rated current.</li> <li>13. The weight of the Ring type CTs shall not exceed approx. 2.5 Kg +/- 10%.</li> <li>14. The CTs shall have following parameters.</li> </ol> <table border="1"> <tr> <td>Accuracy class</td> <td>0.5</td> </tr> <tr> <td>Burden</td> <td>20 VA</td> </tr> <tr> <td>Application</td> <td>Metering</td> </tr> <tr> <td>ISF</td> <td>5</td> </tr> <tr> <td>CT ratio for</td> <td>As mentioned in clause 4.28</td> </tr> </table>	Accuracy class	0.5	Burden	20 VA	Application	Metering	ISF	5	CT ratio for	As mentioned in clause 4.28
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1.13	Auxiliary TERMINAL BOX	<p><b>Note: Aux. Terminal Box shall be required for 250kVA to 1MVA and ratings above 1MVA marshalling box shall be required.</b></p> <ol style="list-style-type: none"> <li>1. Aux. terminal box of suitable size made up of <b>Mild Steel</b> and with <b>theft proof locking arrangement</b> for box.</li> <li>2. Box shall be provided with Stud Type terminal blocks with 2 spare terminals. shorting links required for CT connections.</li> <li>3. 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.</li> <li>4. PVC ferrules engraved with black letters shall be used to mark the wires coming from LV box for CT and voltage.</li> <li>5. <b>PVC ferrules</b> engraved with black letters shall be used to mark the wires in the terminal box.</li> <li>6. 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.</li> <li>7. 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.</li> </ol>										

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		8. Terminal box shall have IP 55 protection with rubber gasket and bend cover canopy over joints. 9. Terminal box must have provision for connecting I-type or U-type pin arrangement without spring arrangement.								
1.14	EQUILISING/ EQUIPOTENTIAL STRIP	1. The Transformer top cover shall be connected with main tank using <b>tinned copper strip (30mm wide, 0.7mm thick)</b> at two places (diagonally opposite with each other). 2. The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip. 3. All the covers like inspection cover, LV box cover, HV box cover, Conservator cover must be electrically connected using <b>tinned copper strip (30mm wide, 0.7mm thick)</b> . 4. Separate arrangement to be made and cover tightening bolt not to be used for equipotential strips.								
1.15	EARTHING CONNECTIONS	<p><b>NEUTRAL EARTHING:</b></p> 1. Separate LV neutral bushing to be provided on top of LV box for neutral earthing. 2. 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 <b>86 microns</b> (minimum at any point)). 3. 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.								
		<p><b>BODY EARTHING:</b></p> 1. Two body earthing terminals pads (630kVA and above)/ 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. 2. It shall be located on the lower side of the transformer, diagonally opposite to each other. 3. 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.								
1.16	OIL	<p><b>Note: Default Oil shall be Mineral oil only if not specified / asked for other oil.</b></p> <p><b>Mineral Oil: In case of Mineral Oil below are the requirements to be fulfilled:</b></p> 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:								
		<table border="1"> <thead> <tr> <th>Test parameters</th> <th>Values</th> </tr> </thead> <tbody> <tr> <td>Break Down Voltage (min)</td> <td>60 kV</td> </tr> <tr> <td>Water content ppm, (max.)</td> <td>20 ppm</td> </tr> <tr> <td>Specific resistance (min.) (at 27° C )</td> <td>2.5 × 10<sup>12</sup> ohm-cm</td> </tr> </tbody> </table>	Test parameters	Values	Break Down Voltage (min)	60 kV	Water content ppm, (max.)	20 ppm	Specific resistance (min.) (at 27° C )	2.5 × 10 <sup>12</sup> ohm-cm
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		<p>Bidder has to provide the oil data in below table:</p> <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Unit</th> <th>As furnished by bidder</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Type of oil</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Oil Qty. for first filling</td> <td>Ltr.</td> <td></td> </tr> <tr> <td>3</td> <td>Grade of Oil</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>Maker's name</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td>BDV at the time of first filling</td> <td>V</td> <td></td> </tr> </tbody> </table>	Sl. No.	Description	Unit	As 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	V	
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1.17	CONSERVATOR	<ol style="list-style-type: none"> <li>The conservator shall be supported / fixed on the main body of the transformer tank.</li> <li>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 <b>10% quantity of the oil used in transformer</b>. Normally, at least <b>30% volume of conservator</b> shall be filled with Oil.</li> <li>The connecting pipe of the conservator shall be so fitted to transformer tank that the pipe can be detached from the tank.</li> <li>Jointless pipe shall be used which shall be connected with round flanges.</li> <li>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.</li> <li>The conservator oil filling cap/hole shall be of 32mm diameter &amp; female type cap to be provided.</li> <li>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.</li> <li>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.</li> <li>The Oil conservator shall be provided with: <ul style="list-style-type: none"> <li><b>Oil level indicator</b> (as per clause no. 5.18).</li> <li><b>Dehydrating breather</b> (as per clause no. 5.22).</li> <li><b>Drain plug</b></li> <li><b>Oil filling hole</b> (1.25 inch/32mm with thread size of BSP 1.25inch, 11TPI) with cover.</li> <li><b>Detachable end plate</b> 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.</li> </ul> </li> </ol>																								
1.18	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																								


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		at lower height such that the transformer should be stable on flat surface ground and while lifting at lifting hooks.
1.19	<b>OIL LEVEL INDICATOR</b>	<ol style="list-style-type: none"> <li>Oil level indicator with <b>prismatic glass and red colour background</b> shall be provided.</li> <li>The oil gauge glass shall be removable and so embodied in the end plate so as to prevent oil leakage.</li> <li>The Oil level indicator should indicate oil level at minimum, normal and maximum as -5°C, 30°C and 90°C respectively.</li> </ol>
1.20	<b>EXPLOSION VENT/ PRESSURE RELEASE DEVICE</b>	<ol style="list-style-type: none"> <li>Explosion vent shall be provided on the top cover for DT up to 500kVA pole mounted only. Plinth mount shall have PRV.</li> <li>Double diaphragm with oil observation gauge (prismatic Type) shall be provided on explosion vent pipe.</li> <li>All plinth mounted DT &amp; 630kVA and above DT shall be provided with PRV/PRD with auxiliary contacts. The contact to be wired up in the auxiliary terminal box.</li> <li>PRV shall be provided to operate before reaching the test pressure as specified in the above class.</li> <li>PRV shall not have air release arrangement.</li> <li>The PRV shall seal-off after the excess pressure has been released and it shall have mechanical flag arrangement.</li> <li>The PRV shall have NO, NC contacts wired up in auxiliary terminal box.</li> </ol>
1.21	<b>AIR RELEASE PLUG</b>	The cover of the main tank shall be provided with an <b>air release plug on all ratings.</b>
1.22	<b>DRAIN VALVE AND FILTER VALVE</b>	<ol style="list-style-type: none"> <li>The drain valve and filter valve shall be of Brass with gate valve.</li> <li>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.</li> <li>The drain valve and filter valve shall be provided with embossed name plate stating drain valve and filter valve.</li> <li>The drain valve shall be located on the bottom and filter valve shall be provided at side top of tank.</li> <li>Locking arrangement shall be provided to stop movement of hand wheel.</li> <li>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.</li> </ol>
1.23	<b>DEHYDRATING BREATHER</b>	<ol style="list-style-type: none"> <li>The breather pipe shall enter the conservator from the upper side of the conservator.</li> <li>The breather shall contain 500 gm. Of silica gel for 160 kVA DTs and 1 kg of silica gel for 250/315/400/500/630 kVA/800kVA &amp; 1MVA DTs and 2kg for above 1 MVA rating.</li> <li>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.</li> <li>The body of the breather shall be unbreakable, transparent, UV stabilized seamless polycarbonate tube of minimum thickness 3mm</li> <li>The top cover shall be of pressure die cast aluminum and powder coated.</li> <li>The oil cup shall be of UV protected polycarbonate.</li> <li>Oil cup shall have marking of oil filling level</li> <li>The breather shall be supplied as per approved make and as per specifications.</li> <li>The gasket should be of Class 3B, Type III as per IS 11149 Nitrile rubber (Oil resistant gaskets)</li> </ol>




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		<p>10. All tie rods and all hardware should be of stainless steel material ( SS 304)</p> <p>11. Breather mounting arrangement,</p> <p>a. Up to 2 kg capacity of Silicagel breather shall have top threaded mounting arrangement with 1/2" pipe having BSP threading.</p> <p>b. 2kg and above capacity shall have flange mounting with 4 holes of 12mm diameter on 83 PCD.</p> <p>12. While fixing of breather on transformer Teflon tape should be used to make it air tight &amp; water tight. This shall be checked during inspection and after receipt at our stores on each transformer.</p> <p>13. 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/cm<sup>2</sup> (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.</p>				
1.24	OIL TEMPERATURE INDICATOR	<p>1. 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.</p> <p>2. Range: 0- 120 °C, Accuracy: ± 4 °C.</p> <p>3. 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.</p> <p>4. The IP65 gland should be used for dial for taking out auxiliary wires.</p> <p>5. The OTI shall be IP55 tested.</p>				
1.25	FASTENERS	<p>1. All the bolts or studs shall be <b>at least 6 mm in diameter</b> except when used for small wiring terminals. <b>All bolts shall be of grade 8.8.</b></p> <p>2. All nuts/bolts/washers exposed to atmosphere shall be as follows:</p> <table border="1"> <tr> <td>Size 12mm (or below)</td> <td>Stainless Steel</td> </tr> <tr> <td>Above 12mm</td> <td>Steel with antirust coating (aluzinc coated), Hot dip galvanized</td> </tr> </table> <p>3. All ferrous bolts, nuts and washers placed in outdoor positions shall be <b>hot dip galvanized</b> to prevent corrosion (except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals).</p> <p>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.</p> <p>5. The cup type washers to be used as spring washers, cut spring washers are not accepted.</p> <p>6. <b>Taper washers</b> shall be provided where necessary. <b>Protective washers</b> of suitable material shall be provided on front and back of the securing screws.</p> <p>7. 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.</p> <p>8. Core bolts shall be black colored high tensile grade-8.8</p>	Size 12mm (or below)	Stainless Steel	Above 12mm	Steel with antirust coating (aluzinc coated), Hot dip galvanized
Size 12mm (or below)	Stainless Steel					
Above 12mm	Steel with antirust coating (aluzinc coated), Hot dip galvanized					
1.26	SURFACE PREPARATION AND	<p>1. The paint shall be applied by airless spray.</p> <p>2. Steel surfaces shall be prepared by shot blast cleaning (IS-9954) to grade</p>				

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	<b>PAINTING</b>	<p>Sq.2.5 of ISO 8501-1 or chemical cleaning including phosphating of the appropriate quality (IS 3618).</p> <p>3. 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:</p> <table border="1"> <thead> <tr> <th>S.No.</th> <th>Paint type (should be UV restraint, non-fading)</th> <th>Area to be painted</th> <th>No of coat s</th> <th>Total dry film thickness (min); micron s</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Thermosetting powder paint</td> <td>Inside Outside</td> <td>01 01</td> <td>30 60</td> </tr> <tr> <td>2.</td> <td>Liquid Paint</td> <td></td> <td></td> <td></td> </tr> <tr> <td>a.</td> <td>Epoxy (primer)</td> <td>Outside</td> <td>01</td> <td>30</td> </tr> <tr> <td>b.</td> <td>P.U. Paint (finish paint)</td> <td>Outside</td> <td>02</td> <td>25 (each)</td> </tr> <tr> <td>c.</td> <td>Hot oil resistant paint</td> <td>Inside</td> <td>01</td> <td>35</td> </tr> </tbody> </table> <p>The two coats shall be of oil and weather-resistant nature with final coat as flossy and non-fading paint of shade 631 as per IS 5.</p> <p>4. The dry film thickness shall not exceed the specified minimum dry film thickens by more than 25%.</p> <p>5. 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.</p> <p>6. Painting shall not affect by weather changes &amp; performance against pilling out or fading etc. to be guaranteed for 5 Years.</p>	S.No.	Paint type (should be UV restraint, non-fading)	Area to be painted	No of coat s	Total dry film thickness (min); micron s	1.	Thermosetting powder paint	Inside Outside	01 01	30 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
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1.27	<b>RADIO INTEREFENCE</b>	When operated at voltages up to <b>12.5%</b> 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.																														
1.28	<b>OVERLOAD CAPACITY</b>	The transformer shall be suitable for loading as per IS 2026-part 7																														
1.29	<b>FITTINGS</b>	<p>The following standard fittings shall be provided:</p> <ol style="list-style-type: none"> <li>Two earthing terminal pads/ boss with earthing symbol <math>\perp</math> for body earthing on opposite sides with 70sq.mm AL lug and M12 SS bolt and washers.</li> <li>Air Release Device.</li> <li>Thermometer Pocket with cap.</li> <li>1MVA and above with Inspection Cover.</li> <li>Drain cum Sampling Valve &amp; filter valve (Double Flanged 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.</li> <li>Pressure relief device with auxiliary contacts for all plinth mount DT and explosion vent with double diaphragm &amp; oil gauge for pole mounted DT up to 500kVA.</li> </ol>																														

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		<ol style="list-style-type: none"> <li>7. Welded fixed type Radiators.</li> <li>8. HV cable box for plinth mount DT and LV cable box for all DT.</li> <li>9. HV and LV Porcelain Bushings for up to 630kVA DT.</li> <li>10. For HV bare bushing DT- bird guard on bushings terminals connectors</li> <li>11. 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 630kVA DT.</li> <li>12. HV and LV two-part Gland plates (Non-Magnetic and with Single compression Brass glands).</li> <li>13. Conservator with Dehydrating Breather on LV side.</li> <li>14. Prismatic Oil level Gauge and magnetic float switch (&gt;160KVA rating) in conservator.</li> <li>15. Lifting lugs (enclosed type) for the top cover, complete transformer and core and winding assembly.</li> <li>16. Pulling Lugs.</li> <li>17. Jacking Pads</li> <li>18. Stiffener Angle.</li> <li>19. 2 Base channels all DT</li> <li>20. Marking Plates as asked in clause 6.1</li> <li>21. Oil Temperature indicator with alarm &amp; trip contact (&gt;160KVA rating) and Dial type OTI for up to 160kVA rating.</li> <li>22. Magnetic float switch for 250kVA &amp; 500 kVA DT on conservator tank.</li> <li>23. 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.</li> </ol>															
1.30	<b>WINDING TEMPERATURE INDICATOR (WTI)</b>	<ol style="list-style-type: none"> <li>1. WTI shall be provided in one winding of each phase.</li> <li>2. WTI shall be <b>indicating type</b>, responsive to the combination of top oil temperature and winding current, calibrated to follow the hottest spot temperature of the transformer winding.</li> <li>3. WTI shall operate a remote alarm and trip in the event of attaining the predefined temperature.</li> </ol>															
1.31	<b>BUCHHOLZ RELAY</b>	NOT Applicable															
1.32	<b>MARSHALLING BOX AND PROTECTION</b>	NOT Applicable															
1.33	<b>MAKE OF MAJOR COMPONENTS &amp; RAW MATERIALS</b>	<p>The BA shall procure the following constituent items from the designated vendors as follows:</p> <table border="1"> <thead> <tr> <th>S.no</th> <th>RAW MATERIAL/EQUIPMENT</th> <th>MAKE</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>Copper</td> <td>M/S Sterlite, M/S Hindustan Copper, M/S Hindalco.</td> </tr> <tr> <td>b</td> <td>Core</td> <td>M/S AK Steels, POSCO, Kawasaki/JFE, Nippon Steel.</td> </tr> <tr> <td>c</td> <td>Insulation paper and Pressboards</td> <td>ITC paper, ABB, Raman Boards-Mysore, Senapathy Whiteley – Bangalore</td> </tr> <tr> <td>d</td> <td>Transformer Oil</td> <td>Savita, Apar, Gandhar</td> </tr> </tbody> </table>	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	Savita, Apar, Gandhar
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		<table border="1"> <tr> <td></td> <td>(Mineral oil)</td> <td></td> </tr> <tr> <td>e</td> <td>Gaskets &amp; Corks</td> <td>Nu Cork, Anchor Corks</td> </tr> <tr> <td>f</td> <td>Steel For Tank</td> <td>M/s, TATA Steel, M/s SAIL, M/s. JSW Steel, M/s. IISCO, M/s. RINL/Vizag Steel, M/s. Jindal Steel,</td> </tr> <tr> <td>g</td> <td>Dehydrating Breather</td> <td>Yogya, Anushree, Electrical engineers</td> </tr> </table> <p>Also, Bidder has to provide all test certificates from original manufacturers &amp; relevant sourcing documents. BA shall also have shot blasting facility.</p>		(Mineral oil)		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
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2.	<b>NAME PLATE AND MARKING</b>													
2.1	<b>MARKING PLATES</b>	<ol style="list-style-type: none"> <li><b><u>Name Plate (Rating) Plate:</u></b> SS material A rating plate shall be fitted to each transformer in a visible position and shall carry all the information as <b>specified in clause no. 2.2</b></li> <li><b><u>Terminal Marking Plate: on same name plate also accepted</u></b> <ul style="list-style-type: none"> <li>The terminal marking plate shall be provided which shall be strictly in accordance with <b>figure 4 of IS 1180-Part 1: 2014</b>. This plate may be combined with the rating plate or can be provided separately.</li> <li>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.</li> </ul> </li> <li><b><u>Details Plate:</u></b> MS sheet of 2.5mm with punched details and welded on tank. A separate plate of <b>size 125 mm x 125 mm</b> shall be provided having following details: <ul style="list-style-type: none"> <li>Name of the firm.</li> <li>Serial No.</li> <li>Rating of transformer.</li> <li>Order no. and date.</li> <li>Date of dispatch.</li> </ul> </li> <li><b><u>Guarantee Plate:</u></b> A separate warranty plate made of <b>Stainless Steel</b> with following clause written on it. <b><i>“THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE OF COMMISSIONING OR 60 MONTHS FROM THE DATE OF LAST SUPPLY”</i></b> All the plates described above (clause 1 to 4) should be as followings: <table border="1"> <tr> <td>Material</td> <td>Stainless Steel</td> </tr> <tr> <td>Thickness</td> <td>1 mm</td> </tr> <tr> <td>Engraving</td> <td>The letters on the rating plate shall be engraved black on the white/silver back ground.</td> </tr> <tr> <td>Fixing</td> <td>Fixing screws shall be of stainless steel.</td> </tr> </table> </li> </ol>	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.				
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		<p><b>5. <u>Danger Plate: On all cable boxes</u></b> Danger notice shall have red lettering on a white background on a plate as specified in <b>IS: 2551 – 1982</b>.</p> <p><b>6. <u>BIS Certification Mark: On main name plate</u></b> The Bidder is required to get approval from BIS and display BIS mark on the name plate.</p> <p><b>7. <u>Control Circuit drawing Plates:</u></b></p> <ul style="list-style-type: none"> <li>Engraved drawing for control circuit unit shall be available on Marshalling box.</li> </ul> <p>The design, colour, size and content of label shall be as specified in the schedule annexure IV.</p>
2.2	<b>NAME PLATE DETAILS</b>	<p>The name plate shall be strictly as per <b>IS 1180: 2014 (figure 1)</b>. Additionally, following points shall be displayed:</p> <ol style="list-style-type: none"> <li><b>Actual no load losses of transformer.</b></li> <li><b>Actual total losses of transformer at 50% load and 100% load.</b></li> <li>Standard mark (BIS certification).</li> <li><b>“TPCODL”</b> shall be written in bold letters.</li> <li>PO number with date has to be mentioned.</li> <li>Overall dimensions of the transformer.</li> </ol>
2.3	<b>MARKING</b>	<ol style="list-style-type: none"> <li>All transformers shall have HV phase windings marked in both, the terminal boards inside the tank and outside with capital letter 1U, 1V, 1W.</li> <li>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.</li> <li>The markings shall be done by steel strips in which marks had been engraved in black colour.</li> <li>Colour marking of the bushings shall be done.</li> <li>On the top cover of tank and the core channel, Manufacturer's name and Manufacturer's serial no. shall be engraved.</li> <li>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.</li> <li>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.</li> </ol>


### **TYPE TEST REPORT**

*Bidder shall furnish the type test report for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.*

*Lightning Impulse Test [As per IS 2026 (Part 3) Clause no. 12].*

*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.*

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*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).*

*Pressure Test [As per IS 1180: Part 1 (2014)].*

*Determination of sound levels [IS 2026 (part 10)].*

*No load current at 112.5% voltage*

*BDV and moisture content of oil in transformer (IS 335).*


*Magnetic balance test.*

*Measurement of Zero-phase sequence impedance.*

*Measurement of Harmonics of no-load current.*

*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, and 3 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at NABL accredited labs, accreditation certificates to be submitted, in- house tests accepted if in-house lab is NABL accredited for these tests.*

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## 41.0 LT DISTRIBUTION BOX FOR 25 kVA S/S

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
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	Siemens Grey
4	Dimension of Box (L X W X H)	500 x 500 x 1000mm
5	Thickness Of Box, Door, Support Smc	3 mm
i	Load Bearing Size	3mm (Min.)
ii.	Non-Load Bearing size	3mm (Min.)
iii	Door	Centre Opening Double Door Swing
6	Strip Hinges	Minimum 4 Hinges on each door. Stringes-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) 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	In coming aluminium Bus Bar R, Y, B, N	25X3mm
13	Outgoing Aluminium Riser /Dropper	25x3 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
18	Busbar mounting insulator	SMC mounting Insulator
19	Clearance between busbars.	40 mm Min
20	Clearance between busbar & Box walls.	40 mm Min

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
21	Sealing arrangement	Hole for Wire Sealing
22	Markings	a) Reference to the Standards. b) Manufacturer's name c) Year of manufacture. d) The following shall be embossed on the LTDB," TPCODL." e) Danger Name plates, Supply voltage-440V f) Purchase Order number
23	Degree of protection	IP-55 (Min)
24	Packing	Standard Corrugated box packing
25	Earthing Provision	M8 x 40 mm-2nos,
26	Incoming arrangement	40 Amp MCCB, 40KA TP MCCB -01 Nos
27	Make of MCCB	ABB, Siemens, L&T, EATON, Schneider, Legrand. MCCB Should have integrated OL, SC & E/F Protection
28	Outgoing arrangement	25 Amp HRC Fuse (06 Nos)- L&T, Siemens, EATON
29	Terminal Spreader rating	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	Glands	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	Provision of LT switch & socket	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	Provision of Space for Energy Meter	To be provided by Bidder
33	Provision of Space for CT	To be provided by Bidder
34	Provision of LED Indication on Incoming supply R, Y, B with Fuse protection	To be provided by Bidder
35	Provision of NO & NC Contact for status monitoring of MCCB	To be provided by Bidder


### **GENERAL CONSTRUCTIONS**

Please refer general construction of LTDB 500kVA mentioned below in Item No. 46

### **DRAWINGS**

Please refer sample Drawing of LTDB 500kVA mentioned below in Item No. 46.




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## 42.0 LT DISTRIBUTION BOX FOR 63 kVA S/S

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
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	Siemens Grey
4	Dimension of Box (L X W X H)	1000x500X 1010 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 aluminium Bus Bar R, Y, B, N	25 x 6 mm,
13	Outgoing Aluminium 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
18	Busbar mounting insulator	SMC mounting Insulator
19	Clearance between busbars.	40 mm Min
20	Clearance between busbar & Box walls.	40 mm Min

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
21	Sealing arrangement	Hole for Wire Sealing
22	Markings	a) Reference to the Standards. b) Manufacturer's name c) Year of manufacture. d) The following shall be embossed on the LTDB," TPCODL." e) Danger Name plates, Supply voltage-440V f) Purchase Order number
23	Degree of protection	IP-55 (Min)
24	Packing	Standard Corrugated box packing
25	Earthing Provision	M8 x 40 mm-2nos,
26	Incoming arrangement	100 Amp 40KA TP MCCB- 01 Nos
27	Make of MCCB	ABB, Siemens, L&T, EATON, Schneider, Legrand. MCCB Should have integrated OL , SC & E/F Protection.
28	Outgoing arrangement	100 Amp HRC Fuse (03 Nos), 63 Amp HRC Fuse (03 Nos). L&T, Siemens, eaton.
29	Terminal Spreader rating	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	Glands	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	Provision of LT switch & socket	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	Provision of Space for Energy Meter	To be provided by Bidder
33	Provision of Space for CT	To be provided by Bidder
34	Provision of LED Indication on Incoming supply R,Y, B with Fuse protection	To be provided by Bidder
35	Provision of NO & NC Contact for status monitoring of MCCB	To be provided by Bidder

### **GENERAL CONSTRUCTIONS**

Please refer general construction of LTDB 500kVA mentioned below in Item No. 46

### **DRAWINGS**


Please refer sample Drawing of LTDB 500kVA mentioned below in Item No. 46.

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### 43.0 LT DISTRIBUTION BOX FOR 100 kVA S/S

#### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
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	Siemens Grey
4	Dimension of Box (L X W X H)	1000x500x1010 mm
5	THICKNESS OF BOX	
i	Load Bearing Size	3.0 mm (Min.)
ii.	Non-Load Bearing size	3.0 mm (Min.)
iii	Type of Door	Centre opening double door swing Type
6	Strip Hinges	Minimum 3 Hinges on each door.
7	Panel Type 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 As per drawing
b	Whether for incoming and outgoing cables provisions of glands of suitable size have been made. Please mention its dimension?	For 100 KVA: 2) Incoming cable Hole suitable to 4CX150Sqmm 3) For Outgoing cable 2 Nos. holes suitable to 4CX150Sqmm cable
12	In coming aluminium Bus Bar R, Y, B, N	25 x 8mm,
13	outgoing Aluminium Riser/Dropper	25 x 8mm
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
18	Busbar mounting insulator	SMC mounting Insulator
19	Clearance between busbars.	40 mm Min
20	Clearance between busbar & Box walls.	40 mm Min

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
21	Sealing arrangement	Hole for Wire Sealing
22	Markings	a) Reference to the Standards. b) Manufacturer's name c) Year of manufacture. d) The following shall be embossed on the LTDB," TPCODL." e) Danger Name plates, Supply voltage-440V f) Purchase Order number
23	Degree of protection	IP-55 (Min)
24	Packing	Standard Corrugated box packing
25	Earthing Provision	M6 x 35 mm, 02 Nos
26	Incoming arrangement	For 100 KVA: 160 Amp 40KA TP MCCB -01 No.
27	Make of MCCB	ABB, Siemens, L&T, EATON, Schneider, Legrand. MCCB Should have integrated OL , SC & E/F Protection
28	Outgoing arrangement	For 100 KVA : 160Amp HRC Fuse base (03 Nos) and 100Amp HRC Fuse base (03 Nos). HRC Fuse make- L&T, Siemens, EATON
29	Terminal Spreader rating	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	Glands	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	Provision of LT switch & socket	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	Provision of Space for Energy Meter	To be provided by Bidder
33	Provision of Space for CT	To be provided by Bidder
34	Provision of LED Indication on Incoming supply R, Y, B with Fuse protection	To be provided by Bidder
35	Provision of NO & NC Contact for status monitoring of MCCB	To be provided by Bidder

### **GENERAL CONSTRUCTIONS**

Please refer general construction of LTDB 500kVA mentioned below in Item No. 46

### **DRAWINGS**

Please refer sample Drawing of LTDB 500kVA mentioned below in Item No. 46

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#### 44.0 LT DISTRIBUTION BOX FOR 250 kVA S/S

##### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
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	Siemens Grey
4	Dimension of Box (L X W X H),(CC hole-920mm)	1400x500x1200 mm
5	THICKNESS OF BOX	
i	Load Bearing Size	3.0 mm (Min.)
ii	Non-Load Bearing size	3.0 mm (Min.)
iii	Type of Door	The Door should be centre opening, Double door with Swing Type
6	Strip Hinges	Minimum 4 Hinges on each door.
7	Panel Type 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 As per drawing
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 Single core cable. There will be 8No's Holes. Each single core cable is of 300Sqmm .2) Outgoing Holes will be 3No's Suitable Cable Size will be for 4CX185Sqmm
12	In coming Aluminium Bus Bar R,Y,B,N	For 250 KVA: 50 x 8mm, (R, Y, B, N)
13	Outgoing Aluminium Riser /Dropper	50 x 8mm
16	No. of connections on each bus bar	Each phase bus bar 01 no Incomer and 03 nos outgoing circuit
17	Bus bar arrangement	Step mounting arrangement
18	Busbar mounting insulator	SMC mounting Insulator
19	Clearance between busbars.	40 mm Min
20	Clarence between busbar & Box walls.	40 mm Min

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<b>SL. NO.</b>	<b>TECHNICAL PARTICULARS</b>	<b>DESIRED VALUE</b>
21	Sealing arrangement	Hole for Wire Sealing
22	Markings	a. Reference to the Standards. b. Manufacturer's name c. Year of manufacture. d. The following shall be embossed on the LTDB," TPCODL." e. Danger Name plates, Supply voltage-440V f. Purchase Order number
23	Degree of protection	IP-55(Min)
24	Packing	Standard Corrugated box packing
25	Earthing Provision	M6 x 35 mm, 02 Nos
26	Incoming arrangement	For 250 kVA: 500 Amp 40KA TP MCCB- 01 Nos
27	Make of MCCB	ABB, Siemens, L&T, EATON, Schneider, Legrand. MCCB Should have integrated OL, SC & E/F Protection
28	Outgoing arrangement	For 250 kVA : 200 Amp HRC Fuse (06 Nos) , 160 Amp HRC Fuse (03 Nos) , 100 Amp HRC Fuse (03 Nos).HRC Fuse make- L&T, Siemens, EATON
29	Terminal Spreader rating	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	Glands	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	Provision of LT switch & socket	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	Provision of Space for Energy Meter	To be provided by Bidder
33	Provision of Space for CT	To be provided by Bidder
34	Provision of LED Indication on Incoming supply R,Y, B with Fuse protection	To be provided by Bidder
35	Provision of NO & NC Contact for status monitoring of MCCB	To be provided by Bidder

### **GENERAL CONSTRUCTIONS**

Please refer general construction of LTDB 500kVA mentioned below in Item No. 46

### **DRAWINGS**

Please refer sample Drawing of LTDB 500kVA mentioned below in Item No. 46

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## 45.0 LT DISTRIBUTION BOX FOR 500 kVA S/S

### GENERAL TECHNICAL PARTICULARS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
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	Siemens Grey
4	Dimension of Box (L X W X H) (CC hole-920mm)	1400x500x1200 mm
5	Thickness Of Box	
i	Load Bearing Size	3.0 mm (Min.)
ii	Non-Load Bearing size	3.0 mm (Min.)
iii	Door Type	Centre opening Double Door Swing Type
6	Strip Hinges	Minimum 4 Hinges on each door.Hinges of Stainless Steel
7	Panel Type Lock arrangement	Provided
9	Whether sufficient sealing provided to make dust, water and vermin proof?	Rubber Gasket
10	Provided Louvers For ventilation	As per Drawing
11 a	Whether inlet and outlet arrangement for service cable provided. Please mention dimension of holes?	Bottom Entry As per drawing
b	Whether for incoming and outgoing cables provisions of glands of suitable size have been made. Please mention its dimension?	1) Incoming Cable Holes will be 12 No's Holes. Each hole will be suitable for 1CX300Sqmm. 2) Outgoing 4 No's holes will be required. Each Cable Holes will be suitable for 4CX300Sqmm.
12	In coming aluminium Bus Bar R, Y, B, N	For 500 KVA: 75 x 12mm, (R, Y, B, N)
13	Outgoing Aluminium Riser / Dropper	50 x 6mm
16	No. of connections on each bus bar	Each phase bus bar 01 no Incomer and 04 nos outgoing circuit
17	Bus bar arrangement	As per drawing
18	Bus bar mounting insulator	SMC mounting Insulator
19	Clearance between bus bars.	30 mm Min
20	Clearance between bus bar & Box walls.	30 mm Min


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<b>SL. NO.</b>	<b>TECHNICAL PARTICULARS</b>	<b>DESIRED VALUE</b>
21	Locking arrangement	As per drawing
22	Markings	a. Reference to the Standards. b. Manufacturer's name c. Year of manufacture. d. The following shall be embossed on the LTDB," TPCODL." e. Danger Name plates, Supply voltage-440V f. Purchase Order number
23	Degree of protection	IP-55(Min)
24	Packing	Standard Corrugated box packing
25	Earthing Provision	M8x40mm, 2Nos.
26	Incoming Arrangement	For 500KVA :800 Amp 50KA TP MCCB-01No.
27	Make of MCCB	ABB, Siemens, L&T, EATON, Schneider, Legrand. MCCB Should have integrated OL, SC & E/F Protection
28	Outgoing Arrangement	For 500 KVA: 315 Amp HRC Fuse (12 Nos), 200 Amp HRC Fuse (03 Nos), 160 Amp HRC Fuse (03 Nos). HRC Fuse Make- L&T, Siemens, EATON
29	Terminal Spreader rating	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	Glands	Suitable cable glands of heavy duty, double compression type shall be provided at the bottom of the box.
31	Provision of LT switch & socket	1 set of light, socket & switch is provided for availing power auxiliary single phase supply of 16Amp.
32	Provision of Space for Energy Meter	To be provided by Bidder
33	Provision of Space for CT	To be provided by Bidder
34	Provision of LED Indication on Incoming supply R, Y, B with Fuse protection	To be provided by Bidder
35	Provision of NO & NC Contact for status monitoring of MCCB	To be provided by Bidder

### **GENERAL CONSTRUCTIONS**

Distribution Boxes shall have nos. of 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.



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LTDB for 25KVA, 63KVA, 100KVA will be pole mounted & 250KVA & 500KVA LTDB will be PLINTH mounted. Bidder has to supply SMC frame along with Distribution box for 250KVA & 500KVA LTDB.

#### A. INCOMING CIRCUIT

Each distribution box shall have 1 nos. of triple-pole MCCB rating suitable for 25KVA/63 KVA /100 KVA /250 KVA /500 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 electrical open during fault. The MCCB should be front operated triple pole type.

#### B. OUT GOING CIRCUIT


##### 1. HRC FUSE:

HRC Fuse of suitable capacity shall be provided on outgoing terminal 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 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 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	100A	63A	NA	NA
100KVA	160A	160A	100A	NA	NA
250KVA	500A	200A	200A	160A	100A
500KVA	800A	315A	315A	200A	160A

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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. 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. Meter size 400mm x400mm x 150mm.

### C. 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.**
- 4) **The Incomer Feeder dropper & Bus Bar for 250KVA LTDB will be 50 x 8 mm cross section.**
- 5) **The Incomer Feeder dropper & Bus Bar for 500KVA LTDB will be 75X12 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**

### D. 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.

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

1. **25 KVA Distribution box - 500x500x1000 (LXWXH)**
2. **63 KVA Distribution box - 1000x500x1010 (LXWXH) mm**
3. **100 KVA Distribution Box - 1000x500x1010 (LXWXH) mm**
4. **250 KVA Distribution box- 1400x500x1200(LXWXH)mm**
5. **500 KVA distribution box- 1400x500x1200(LXWXH) mm**

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

The Colour of inside & outside of the SMC distribution box shall be SIEMENS Gray. The Base and doors of enclosure shall be individually in one piece without any welding, 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.

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

#### **E. LOCKING ARRANGEMENT TO THE BOX**

1. 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.
2. Electrolytic grade aluminium neutral busbar will be same rating as phase bus bar with current density 1Amp/sqmm.

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3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. All joints of current carrying parts shall be bolted with 8.8 grade High Tensile MS Nuts & Bolts, Corrugated/spring & Plain Washers. The nuts & bolts should be of hexagonal type. All the nuts, bolts & washers should be properly zinc plated.
9. Each distribution box shall be supplied with proper packing in five ply - corrugated box.
10. 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.
11. Incoming and outgoing circuit should be duly highlighted with paint by stencil printing.
12. Adequate slope on the top of box shall be provided to drain out rainwater from the top.
13. 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 language.

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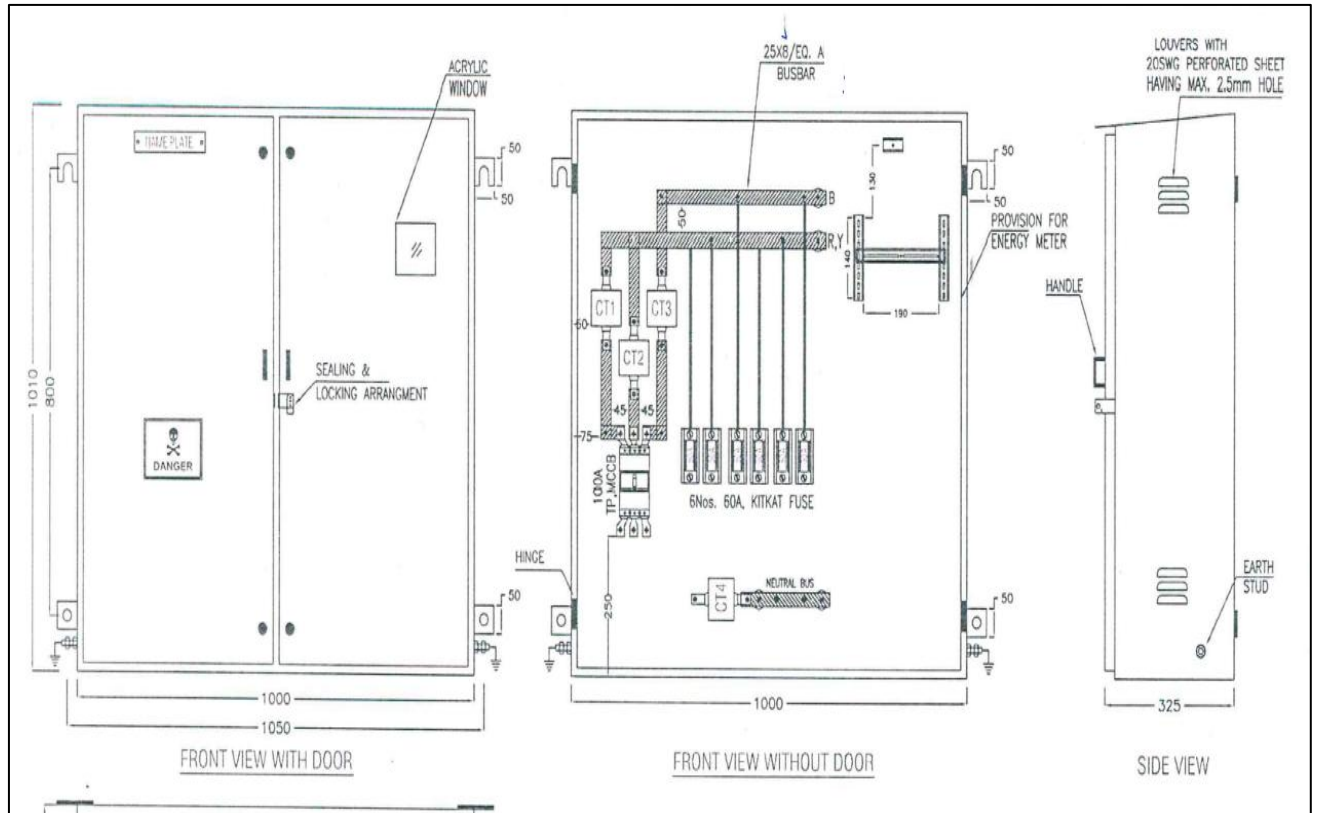
## F. SMC SHEET PROPERTIES

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 IS: 13411: 1992
6.	Izod Impact Strength (Notched), KJ/m2, 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, 10 <sup>3</sup> MPa	12 to 15	Type	IS 8543 (Part 4/Sec1): 1984
10	Surface Resistivity (24H in Water), Ohm, Min	1x10 <sup>13</sup>	Routine	IS3396:1979
11	Volume Resistivity, Ohm-cm, Min	1x10 <sup>14</sup>	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
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)

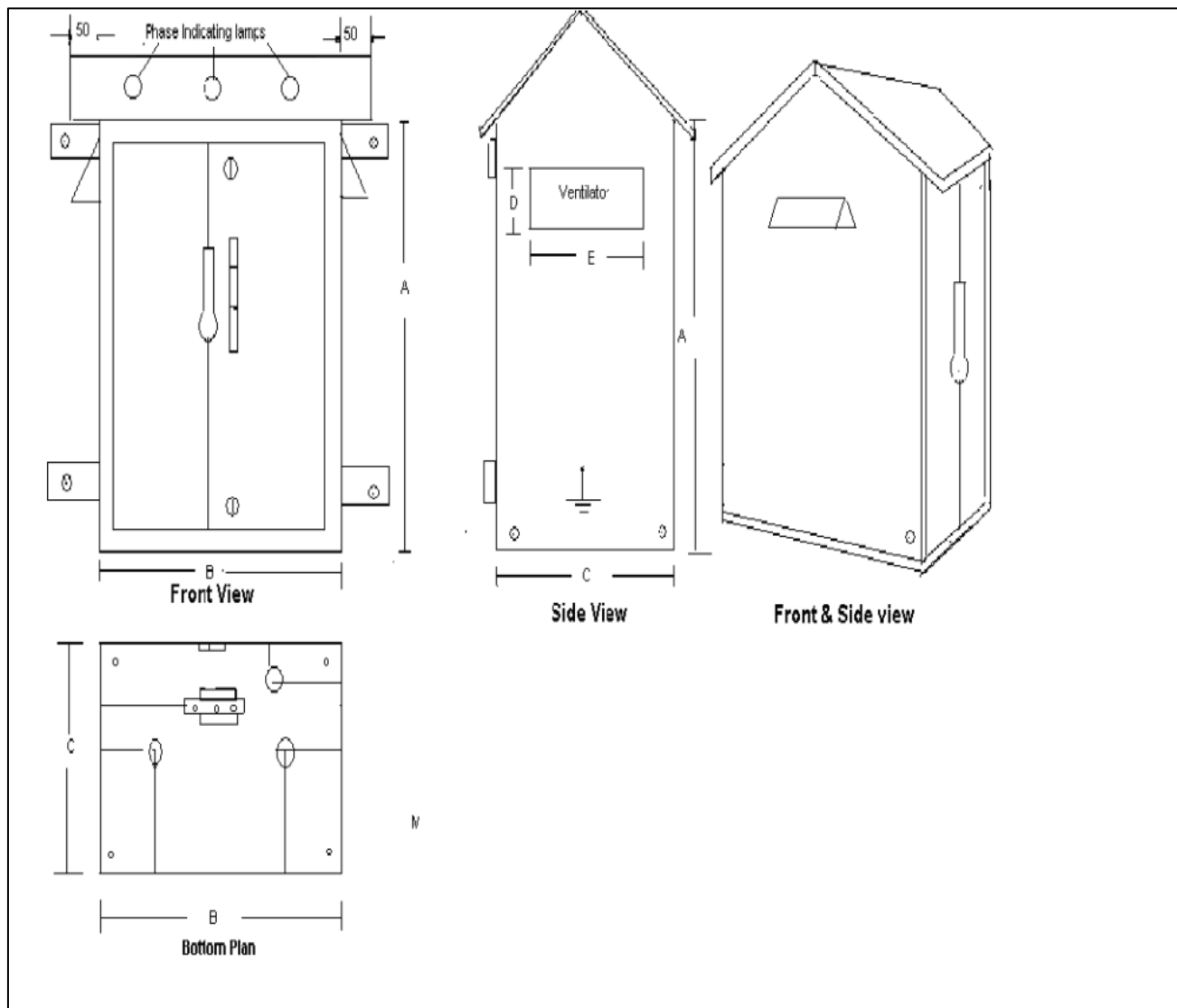
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Sr. no	Test Details	Requirement for S3 electrical Grade	Type of test	Reference standard
19	Glow wire test	-	Type	IEC – 695 –2-1 or IS :11000(Pt 2/sec.1)
20	Ball pressure test	-	Type	IEC : 335
21	Mechanical Strength	-	Type	IS: 14772
22	Marking, Dimensions 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


### SAMPLE DRAWINGS



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**Note: - All Dimensions are in mm unless noted otherwise specified.**

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## **TYPE TEST REPORT**

Bidder shall furnish the type test report for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**

### **1. ON COMPLETE BOX:**

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


### **2. ON HRC fuses base and HRC fuse:**

All 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.

### **3. ON MCCB:**

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




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## 46.0 HDPE PIPE

### GENERAL TECHNICAL PARTICULARS

SL.NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
		160 MM	110 MM
1	Name of Manufacture	To be specified by Bidder	To be specified by Bidder
2	Types of pipes	HDPE	HDPE
	Description	HDPE PIPE, PE-80, PN-8	HDPE PIPE, PE-80, PN-8
3	Standard according to which pipe is manufactured	As per IS: 4984/1995	As per IS: 4984/1995
4	Mean Outside Diameter	160 mm	110 mm
5	Wall Thickness	11.9 (min) - 13.3 (max)	8.2 (min) - 9.3 (max)
6	Ovality	As per IS: 4984/1995	As per IS: 4984/1995
7	Length of Straight Pipe	In straight length of 6 Mtrs	In straight length of 6 Mtrs
8	Hydraulic Characteristics	4.9Mpa induces stress for 48Hrs at 80 degree Centigrade	4.9Mpa induces stress for 48Hrs at 80 degree Centigrade
9	Reversion Test	1.30%	1.30%
10	Density	949 kg/m <sup>3</sup>	949 kg/m <sup>3</sup>
11	Carbon Black Content	2.35%	2.35%
12	Melt Flow Rate	0.2 to 1.1gm/10 mins	0.2 to 1.1gm/10 mins
13	Marking	a. Reference to the Standards. b. Manufacturer's name c. TPCODL d. ISI Mark e. Year of manufacturing. f. TPCODL g. Purchase Order number	


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#### 47.0 11KV STRAIGHT THROUGH 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 specification, ENA TS 09-13, IEC 60502 and IS 13573, part-2 and other relevant standards.
- Cable joint and termination material shall not be adversely affected in any manner even after contact with material used in cable construction and material used as accessories in the construction of cable joints and terminations and there will be no chance of corrosion developing on any metal surface.
- Assembled jointing kit components shall perform without distress in system with parameters (mentioned below):

#### GENERAL TECHNICAL PARTICULARS

SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
1	Max. Withstand System Voltage	12 kV
2	Partial Discharge at 1.73 U <sub>0</sub>	<10 pC
3	Impulse Peak Withstand	75 kV
	Continuous operation withstand Temperature	90 ° C
4	Short Circuit withstand temperature	250 ° C
5	Withstand short circuit current kA/sec	a) 3CX95 Sq.mm Cable: 8.93 kA b) 3CX120 Sq.mm Cable: 11.28 kA c) 3CX300 Sq.mm Cable: 28.2 kA e) 3CX400 sq.mm Cable: 37.7 kA
6	Storage Temperature Range	-10° C to + 45° C
7	Shelf life of kit components excluding mastic and solution	Min. 5 Years
8	Shelf life of mastic and solution	Min. 2 Years
<b>Heat Shrinkable Insulation Tubing/ Sleeves/ Wrap Around Sleeve</b>		
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Density	
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	Electric Strength	10 KV /mm (Minimum)
6	Tensile Strength	10 N/mm <sup>2</sup> (Minimum) and (8 N/mm <sup>2</sup> for anti-tracking)
7	Ultimate Elongation	200% (Minimum)

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SL. No.	TECHNICAL PARTICULARS	DESIRED VALUE
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 200 <sup>0</sup> C Min. (For stress control tube: 30 Minutes at 250 <sup>0</sup> C Min.)
9	Low Temperature Flexibility	No cracking after 4 hrs. at minus -20 <sup>0</sup> C Max.
10	Volume Resistivity	1x 10 <sup>10</sup> Ohm- meter (Minimum) (For stress control tube VR: 1x 10 <sup>7</sup> 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
11	Tracking resistance	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.
<b>Heat Shrinkable moulded components/ Breakouts/Weather sheds</b>		
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other visible defects.
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)
3	Internal 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 <sup>2</sup> (Minimum)
7	Ultimate Elongation	200% (Minimum)
8	Heat Shock	No splitting, cracking, dripping or flowing after 30 minutes at 250 <sup>0</sup> C Min.
9	Low Temperature Flexibility	No cracking after 4 hrs. at minus -20 <sup>0</sup> C Max.
10	Volume Resistivity	1x 10 <sup>10</sup> Ohm- meter (Minimum)
11	Flame Retardant (For anti-tracking moulded components)	After 1 minute burn: Burnt or charred length 250 mm max.

## **GENERAL CONSTRUCTION**

### **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 aluminium conductor, XLPE insulated (in line with TPCODL Specification for underground and AB cable, IS 7098- part 2, and IS 13573 Part 2 &3).

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- Length of 11KV terminations (from bottom of breakout to center of lug hole) shall be:

- |                             |          |
|-----------------------------|----------|
| i) HT ABC                   | - 450mm  |
| ii) 1 core cable I/D & O/D  | - 550 mm |
| iii) 3 core cable I/D & O/D | - 800 mm |


<b>S. No.</b>	<b>Components</b>	<b>Requirement</b>
1	Compression Lugs/ Tinned coated Mechanical Lugs	<p>Compression Lugs:</p> <ul style="list-style-type: none"> <li>- Material: Aluminium</li> <li>- All Aluminium lugs with anti-corrosive paste shall be long barrel type as per IS 8309: 2003.</li> <li>- Dimensions shall be as annexure-I of this specification.</li> <li>- 1000mm<sup>2</sup> Aluminium lugs shall be without palm hole.</li> </ul> <p>Mechanical Lugs:</p> <ul style="list-style-type: none"> <li>- Tinned coated Aluminium</li> <li>- As per IEC 61238(part1): 2003.</li> <li>- Dimensions shall be as annexure-I of this specification.</li> </ul>
2	Lug Seal, Anti-tracking tube, weather sheds, Stress control tube	<ul style="list-style-type: none"> <li>- Heat Shrinkable</li> <li>- Fire resistant and weather resistant as per ENA TS 09-13 – for lug seals, weather sheds and Anti-tracking tubes</li> </ul>
3	Mastic tape	<ul style="list-style-type: none"> <li>- Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant.</li> <li>- Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS 09-13.</li> </ul>
4	Heat Shrink Breakout	<ul style="list-style-type: none"> <li>- Fire resistant and weather resistant as per ENA TS 09-13.</li> <li>- Adhesive coated Breakouts shall be provided on outer sheath of the cable to prevent water ingress.</li> </ul>
5	Tinned coated copper braid	<ul style="list-style-type: none"> <li>- Shall be completely insulated by adhesive coated fire retardant and weather resistant HS tube/sleeve up to copper lug.</li> <li>- Fire resistant and weather resistant as per ENA TS 09-13.</li> <li>- Size and length is as follows: <ul style="list-style-type: none"> <li>- 25 mm<sup>2</sup> x 500 mm x 1 Run for 95, 120 &amp; 150 mm<sup>2</sup> cables.</li> </ul> </li> </ul> <p>Additionally, 1 no. 95 mm<sup>2</sup> Al long barrel lugs with sealing sleeves/ mastic shall be provided for armour back fold earth bonding in Aluminium armoured 150 mm<sup>2</sup> HT ABC.</p> <ul style="list-style-type: none"> <li>- 50 mm<sup>2</sup> X 600 mm X 1 Run for above 150 mm<sup>2</sup> &amp; up to 400 mm<sup>2</sup> cables.</li> <li>- 70 mm<sup>2</sup> X 500 mm X 1 Run for 630 mm<sup>2</sup> &amp; 1000mm<sup>2</sup> cables.</li> </ul>

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		Additionally, 3 nos. X 150mm <sup>2</sup> Al lugs with sealing sleeves/ mastic for armor back fold earth bonding.
6	Tinned coated copper braid as a Leakage Current Collector	<ul style="list-style-type: none"> <li>- Leakage current collector tinned copper braid</li> <li>- 1R X 7 mm<sup>2</sup> X 150 mm per core shall be provided for terminations.</li> </ul>
7	Tinned copper wire mesh	<ul style="list-style-type: none"> <li>- Minimum 2.5mm<sup>2</sup> tinned copper mesh shall be provided on armour circumference beneath the copper braid.</li> <li>- Length of copper wire mesh shall be provided in BOM submission.</li> </ul>
8	Sub-kit components	<ul style="list-style-type: none"> <li>- Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and other necessary items.</li> <li>- Compatible Supporting ring with SS jubilee clips shall be provided to connect tinned copper braids.</li> <li>- Soldering on copper screen is not acceptable.</li> <li>- Roll spring shall be provided for screen connections.</li> <li>- Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring should be used for same.</li> </ul>
9	Submission of BOM and instruction sheet	<ul style="list-style-type: none"> <li>- 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.</li> <li>- *Note: BOM shall be approved by TPCODL authorized official at the time of pre-bid.</li> </ul>

## 2 Components of Straight Through jointing kit:

S. No.	Components	Requirement
1	Heat Shrinkable insulating tube/ Sleeve	<ul style="list-style-type: none"> <li>- Surface of material: shall be smooth and free from protrusion, voids and nicks.</li> <li>- 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.</li> <li>- Wall thickness ratio (before recovery) of all sleeves/ tubes shall not be less than 60% at any two points of measurement.</li> </ul>
2	Ferrules/ Mechanical Connectors	<ul style="list-style-type: none"> <li>- Material: 99% Electrolytic grade Aluminium with Anti-corrosive paste</li> <li>- Shape: As per IS 8308</li> <li>- Dimensions as per <b>Annexure-I</b> of this Specification</li> <li>- Conductivity of ferrules/mechanical connectors shall be as per IS 8309: 2003/ IEC 61238(part1).</li> <li>- Conductivity of Aluminium shall be min. 60% of IACS.</li> </ul>
3	Mastic Tape	<ul style="list-style-type: none"> <li>- Mastic tape shall be electrically insulating, non-tracking and water/humidity resistant.</li> <li>- Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA</li> </ul>

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		TS 09-13.
4	Tinned coated copper braid for GI armour continuity  / Ferrules for Aluminium armour continuity	<p><b>Tinned coated copper braid for GI armour continuity:</b></p> <p>Uniformly tinned coated copper braid shall be provided for armour continuity.</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- Uniformly tinned coated copper braid shall be provided for armor continuity. Length of tinned copper braid shall be as per approved BOM.</li> <li>- Size of tinned copper braid shall be: 50 mm<sup>2</sup> x 1 Run for 150-400 sq.mm. three core cables.</li> </ul> <p><b>Ferrules for Aluminium armour continuity:</b></p> <ul style="list-style-type: none"> <li>- In single core cables, 1CX400, 1CX630 and 1CX1000 sq.mm., Aluminium armor continuity shall be done using 2 nos. long barrel type of size 150 sq.mm. and 185 sq.mm. ferrules respectively.</li> <li>- In Aluminium armored HT ABC, 1CX95 sq.mm. and 1CX150 sq.mm., armor continuity shall be done using 2 nos. 50 sq.mm. ferrules.</li> <li>- For Copper screened HT ABC, continuity of armour shall be through 2.5 sq.mm. copper wire mesh.</li> </ul>
5	Tinned copper wire mesh	<ul style="list-style-type: none"> <li>- Uniformly tinned coated copper mesh shall be provided for screen continuity.</li> <li>- Minimum 2.5mm<sup>2</sup> tinned copper mesh shall be provided on both sides of armour circumference beneath the copper braid.</li> <li>- Length of copper wire mesh shall be provided in BOM submission.</li> </ul>
6	GI wire mesh/ Copper wire mesh	<ul style="list-style-type: none"> <li>- Mechanical protection shall be provided in GI armoured cables by means of heavily zinc coated GI mesh as per IS 4826.</li> <li>- In 1C Aluminium armoured cables, for mechanical protection, copper wire mesh shall be provided.</li> </ul>
7	Breakouts	<ul style="list-style-type: none"> <li>- Adhesive coated Breakouts shall be provided on outer sheath at both sides on the cable to prevent water ingress.</li> </ul>
8	Wrap around insulating tube/Sleeve as outer most tube	<ul style="list-style-type: none"> <li>- Material: cross-linked polyolefin (Heat Shrinkable) as a waterproof seal.</li> <li>- 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).</li> <li>- Stainless steel channel shall be provided along the wrap around to close the sleeve during installation.</li> <li>- Excellent mechanical and corrosion protection, and atmospheric sealing.</li> </ul>

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		<ul style="list-style-type: none"> <li>- High split resistance.</li> <li>- *Note: Overlapping of wrap around sleeve is not acceptable.</li> <li>- Additionally, adhesive coated sleeve approx. 300 mm length shall be provided at ferrule joint area beneath the wrap around sleeve.</li> </ul>
9	Sub-kit Components	<ul style="list-style-type: none"> <li>- Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and other necessary items.</li> <li>- Compatible support rings (Aluminium for single core and GI for three core cables) with four nos. SS jubli clips shall be provided to connect tinned copper braid.</li> <li>- For copper screen bonding, roll spring shall be provided.</li> <li>- Plumb earthing on PILCA side is unacceptable. Constant pressure roll spring shall be provided for earthing continuity.</li> </ul>
10	Submission of BOM and instruction sheet	<ul style="list-style-type: none"> <li>- 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.</li> <li>- *Note: BOM shall be approved by TPCODL authorized official at the time of pre-bid.</li> </ul>

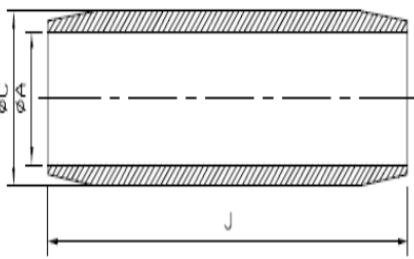
## DRAWINGS

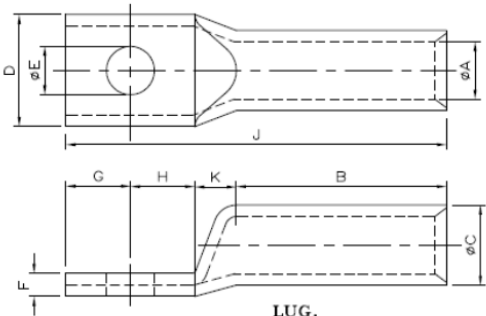
Annexure- Dimensions Ferrules & Lugs HT			
Dimensional details of Aluminum ferrules for HT AL circular stranded compacted XLPE cables			
Cable Size in MM <sup>2</sup>	φA (mm) +0.3mm	φC (mm) +0.3 mm	J (mm) ±3mm
95	12	16.9	108
150	15.1	21.2	116
300	21.8	30.2	150
400	25	34.8	150
630	31.7	44.4	200
1000	41	56	250

Dimensional details of Aluminum Lugs for HT circular stranded compacted XLPE cables							
Cable Size in MM <sup>2</sup>	φE (mm) ±0.1mm in centre of palm	φA (mm) +0.5mm	φC (mm) +0.5 mm	D (mm) ±1.5mm	F (mm) ±0.5mm	B±3.0mm	J (mm) ±5mm
95	13	12	16.9	23.5	4.9	73	109
150	13	15.1	21.2	29.5	6	83	128
300	17	21.8	30.2	42	8.4	89	157
400	17	25	34.8	48	9.8	113	187
630	17	31.7	44.4	61	12.7	140	225
1000	-	41	56	77.5	15	160	280





**LUG.**

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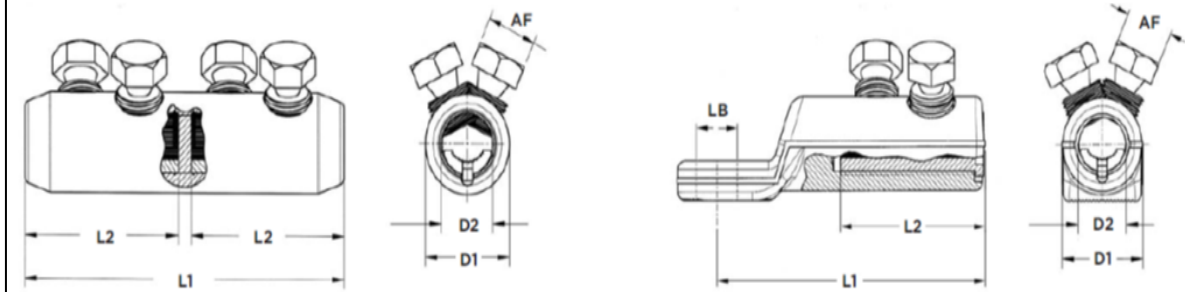
### Annexure- Dimensions Mechanical connectors & Mechanical Lugs

Aluminium Mechanical connectors


Cable Size in MM <sup>2</sup>	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 <sup>2</sup>	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






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## 48.0 11kV RING MAIN UNIT

### GENERAL TECHNICAL PARTICULARS


SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
1.0	RMU Category -Motorized	3Way - 1CB or 2 CB or LBS 4Way - 2 CB or 3 CB or LBS 5 Way - 3CB
2.0	RMU application	Indoor or Outdoor as mentioned in tender
3.0	Offered Model nos. and OEM type	a. 3Way (E/NE, I/D or O/D) b. 4Way (E/NE, I/D or O/D) c. 5 Way (E/NE, I/D or O/D)
4.0	Dielectric medium	SF6
5.0	Interrupting medium	Vacuum- for CB SF6 for LBS and earth switch
6.0	System Frequency	50 Hz
7.0	Rated Voltage	12 KV
8.0	Service Voltage	11 KV
9.0	Rated current -Line Switches	630 A
10.0	Rated Current-CB and LBS	630 A for all type
11.0	Rated Short time current withstand (3 sec)	21 KA
12.0	Rated Short time Making capacity	50 KA
13.0	Rated cable charging interrupting current of incomer load break switch	10 A
14.0	Rated load interrupting line current	630 A
15.0	Rated cable charging breaking current of breaker	25 A
16.0	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
17.0	Opening time of breaker (max.) Without relay time	2.5 cycle
18.0	Closing time of breaker (max.)	3 cycle
19.0	Breaker Duty Cycle	O – 3min - CO - 3min – CO
20.0	i. Mechanical endurance for Isolator & Earth Switch	Min 1000 Operations
	ii. Mechanical endurance for Circuit Breaker	Min 2000 Operations
21.0	Electrical operations of at rated current a. LBS/Disconnecter b. Earth Switch	To be provided by bidder
22.0	Temp rise above ambient of 50 deg.	50 Deg C. (Type Tested as per IEC and complying to requirements)
23.0	Min Gas pressure in bar	To be provided by bidder based on type tested design

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
24.0	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.
25.0	Enclosure	The RMU metal parts shall be greater than 2mm thickness high tensile steel/CRCA. The overall paint thickness shall be not less than 70 microns.
26.0	Guaranteed SF6 leakage per annum	Less than 0.1% from main tank
27.0	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
28.0	Internal Arc rating	IAC AFL or better
29.0	Internal Arc test	20kA for 1 Sec.
30.0	Lightning Impulse withstand Voltage	75 kVp
31.0	Power Frequency withstand voltage	28 kVrms.
32.0	SF6 Tank design	Hermetically/robotically sealed unpainted stainless-steel enclosure with SF6 Gas. Sealed pressure system by Laser 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.
33.0	Earth bus bars	In enclosure to prevent tampering.
34.0	Material & size of earth bus bar	To be provided by the bidder
35.0	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. Moving contacts of earthing switch shall be visible in closed position thru transparent covers AND closing shall be possible only when Isolator is open	To be provided by bidder
36.0	Incomer Load Break switch: Shall be SF6 insulated with least	To be provided by bidder

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
	<p>maintenance. Shall have at least 3 positions, Open, Close &amp; earth with natural interlocks. Fitting of motor at site shall be possible &amp; shall have mechanical interlock. The electrical interlock of cable charge with earth switch is preferred.</p>	
37.0	<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 &amp; Close, Manual operation &amp; 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>	<p>To be provided by bidder as per specs.</p>
38.0	<p>Protection Relay-Without auxiliary power &amp; shall include , electronic relay, low energy release &amp; fast on test receptacle for protection testing</p>	
39.0	<p>Make of self-powered Relay &amp; offered model</p>	<p>a. For TPCODL, ODISHA – ABB, Ashida, Schneider, Siemens</p>
40.0	<p>Flag indication for CB Trip on fault in relay/ mechanical</p>	<p>To be provided by bidder</p>
41.0	<p>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</p>	<p>To be confirmed. If separate test bushing are provided, it shall be covered with suitable antitheft covers with anti-vandal screws</p>

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
42.0	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.
43.0	Doors	Hinged Main doors shall be provided for outdoor type RMU. The hinges for the doors need to be riveted and shall not have any access from outside. Bolted shall not be acceptable.
44.0	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
45.0	Cable cleats (full circle)	HDPE/Nylon (Fire Retardant)
46.0	Cable termination and bushing suitability	Heat/ Cold shrink terminations
46.A	Cable Termination boot /Cable boot	Bidder should provide Cable Termination protector /cable boot for each cable compartment, 12KV Class Cable size 3x400sqmm.Approved make -3M/Raychem
46.0	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.
47.0	The cable compartment	All cable compartment shall be bottom entry and front opening type only
48.0	Size of bimetallic washer in all compartments	Must be suitable for M16 for TPCODL, ODISHA) bolt and bushing sizes with min. 2mm thick.
49.0	Height of bushing terminal from base plate	Minimum 800mm for proper termination space.
50.0	Fault passage indicator	FPI on each LBS as a part of each RMU with specified default setting.
51.0	Operating handle	To be provided by bidder as a part of RMU with each RMU and to be placed on front or on door
52.0	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-ODISHA As per annexure-2
53.0	Main Bus bar Material	Copper
53.1	Bus bar Cross Section	To be specified by bidder as per current

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
		density
54.0	Opening & Closing times with relay	125 ms maximum
55.0	Current Transformer for CB compartment	<p>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 co-axial position with base plat holes and bushing terminal bolts.</p> <p>a. For TPCODL, ODISHA The CT settings shall be adjustable between 60 - 400/1 Amp at terminal block. CT ratio is 60-400/1A, Burden is 2.5 VA, Class -5P10.</p>
56.0	Future motorization and SCADA Compatibility	To be provided
57.0	Guarantee	As per specification
58.0	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder
59.0	Total weight	To be provided by bidder
60.0	Paint	Light Gray shade RAL 7032
61.0	Type test of product	To be provided by bidder as per specification
62.0	Availability of spares	Assurance by bidder for 25 years, list of spares as mentioned in specification to be provide along with RMU lot.
63.0	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.
63.1	VPIS	In all compartments
64.0	Breaker operation counter	To be provided by bidder
65.0	LBS operation counter	To be provided by bidder
66.0	Moisture absorption material in SF6 tank	Bidder should provide the detail of the moisture absorption material.
67.0	Direction of operation (As offered) (Close - clock wise Open- counter clock wise)	<p>a. LBS – ON/off</p> <p>b. ES- Open/ close</p> <p>c. CB disconnecter- ON/off</p> <p>d. CB earth switch-Open/ close</p>
68.0	Making of earthing operations	a. For TPCODL, ODISHA All earth operation to be marked with Yellow back ground and permanent in nature.
69.0	Auxiliary contacts (total numbers)	LBS Earth Switch

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
	and spare numbers)	CB CB Disconnecter - CB earth switch-
70.0	Control cable entry provision	To be provided
71.0	Shunt trip coil 24V DC	For TPCODL, ODISHA 24V DC shunt trip coil to be provided and specify DC voltage rating and charger rating  Trip coils to be wired up on TB.
72.0	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	To be provided
74.0	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	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
75	Type test reports	Bidders to provide detailed list of tests conducted at lab name, conducted dates, report number along with full reports.
76	SCADA Compatibility-Remote operation of RMU shall be possible by using motors fitted to operating mechanism of isolators & CB etc.	To be provided
77	Harting Plug arrangement for individual isolator as well as breaker motor connections, which will be fitted on RMU body itself.	To be provided
78	Details of I/O	As per Annexure-IO list of this specs

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
79	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
80	<b>Technical Details of motors</b>	
a	Operating Voltage	24 V DC
b	Max. power rating	240 Watts
c	Max current drawn	9 Amp ( $\pm 10\%$ )
d	Operating time	4-8 seconds
e	Power Supply	There shall be provision of 230 V AC (maximum 5 Amp current) & 24 V DC
81	Name Plate & Marking	<p>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, ODISHA' &amp; "CODE NUMBER" along with the following information. A Danger plate of appropriate size shall also be provided on the enclosure.</p> <ul style="list-style-type: none"> <li>a) Manufacturer's Name</li> <li>b) Month and year of supply</li> <li>c) PO Number</li> <li>d) Type/Model</li> <li>e) Rated Voltage</li> <li>f) Rated current</li> <li>g) Service voltage</li> <li>h) System Frequency</li> <li>i) Rated Short time withstand current for 1 sec</li> <li>j) Rated Impulse withstand Voltage</li> <li>k) Degree of Protection</li> <li>l) Type Designation or Serial no.</li> <li>m) Year and month of manufacture.</li> <li>n) Applicable Rated values</li> <li>o) Mass of unit</li> <li>p) SF6 gas filling pressure.</li> <li>q) Warranty period</li> </ul> <p>The sr. no. and year of manufacturing shall be painted in black color with yellow background on side.</p>

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## **RMU CONFIGURATION**


Types of Ring Main Units shall be as under:

A) For TPCODL, ODISHA:

- i) **3 Way with 1 CB** (For Indoor and Outdoor application): Both side extensible  
2 Nos. 630A Incomer Load Break Switches + 1 No. 630A Local Feeder/transformer Control Vacuum Circuit Breaker with self-powered O/C + E/F relays+ shunt trip coil (24V DC) + 1 No. Electronic Fault Passage Indicator on left LBS in each RMU
- ii) **3 Way with 2CB Non extension type** (For Indoor and Outdoor application):  
1 Nos. 630A Incomer Load Break Switches + 2 No. 630A Local Feeder/transformer Control Vacuum Circuit Breaker with self-powered O/C + E/F relays+ shunt trip coil (24V DC) +1 No. Electronic Fault Passage Indicator on left LBS in each RMU + LBS with 1Cx 630 sq mm cable provisions.
- iii) **4 Way with 2CB** (For Indoor and Outdoor application): Both side extensible  
2 Nos. 630A Load Break Switches + 2 Nos. 630A Feeder Vacuum Circuit Breakers with self-powered O/C + E/F relays + shunt trip coil (24V DC) + 1 No. Electronic Fault Passage Indicator in left side LBS in each RMU
- iv) **4 Way with 3 CB Non extension type** (For Indoor and Outdoor application):  
1 Nos. 630A Incomer Load Break Switch + 3 Nos. 630A Feeder Vacuum Circuit Breakers with self-powered O/C + E/F relays + Shunt trip coil (24V DC) + 1 No. Electronic Fault Passage Indicator in left side LBS in each RMU
- v) **5 Way Non-Extension RMU** (For Indoor and Outdoor application):  
2 Nos. 630A Incomer Load Break Switch With Electronic Fault Passage Indicator in each LBS + 3 Nos. 630A Feeder Vacuum Circuit Breakers with self-powered O/C + E/F relays+ Shunt trip coil (24V DC)
- VI) **4 Way with 4 LBS** (For Indoor and Outdoor application): Non extensible 4Nos. 630A Load Break Switches + 3 No. Electronic Fault Passage Indicator in extreme left & right-side LBS in each RMU
- VII) **3 Way with 3 LBS** (For Indoor and Outdoor application): Non extensible -3 Nos. 630A Load Break Switches + 3 No. Electronic Fault Passage Indicator in extreme left & rightside LBS in each RMU.

Cable Voltage presence Indicators to be provided in each compartment of all type of RMUs in above mentioned combination. All LBS, EW and CB shall be with auxiliary contacts for




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SCADA status indication. All LBS and CB should be given 24V DC motorized RMU while designing RMU having inbuilt Battery & Battery charger.


**Note- All shunt trip coils shall be 24V DC for TPCODL**

### **GENERAL CONSTRUCTION**


1 . 1	<b>MAIN TANK</b>	<p>1.1.1 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 GI high tensile steel/CRCA 2mm thick with thick gland plates as per IS 513.</p> <p>1.1.2 The tank shall have SS sheet of 2.5 mm thickness minimum (or as per type tested design of bidder with undertaking on letter head) 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.</p> <p>1.1.3 The maximum leakage rate of SF6 gas shall be lower than 0.1 % of the total initial mass of SF6 gas per annum from main tank. The filling pressure for the switchgear shall be just above the atmospheric pressure so as to prevent the tendency to leak. SF6 gas used for the filling of the RMU shall be in accordance with IEC 376.</p> <p>1.1.4 It is mandatory 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.</p> <p>1.1.5 The RMU shall be complete with all connection and copper bus bar with continuous current carrying capacity of 630A. The bus bar shall be fully encapsulated by SF6 gas inside the steel tank.</p> <p>1.1.6 The tank shall have an separate SF6 refilling valve and the filling pressure must be mentioned near the valve. And the refilling valve should be marked properly.</p> <p>1.1.7 If same valve is used for pressure indicator or remote communication then the procedure to refill to be mentioned near the NRV from with permanent sticker.</p> <p>1.1.8 The SF6 tank shall be completely enclosed in the enclosure such way that any rodent entry on top or side of tank is deterred.</p> <p>1.1.9 All configurations should be in one tank without any coupling/joint on main Busbar.</p>
1 . 2	<b>GENERAL DETAILS</b>	<p>1.2.1 The mimic board shall be provided with IP2X degree of protection for Indoor RMUs and protection for Outdoor RMUs shall be minimum IP 54(Main door closed). Cable compartment shall be IP54.</p>

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	<p>1.2.2 The RMU shall be suitable for mounting on plinth with trench below and shall have base frame on sides with mounting bolt accessibility from outside of RMU the mounting bolts provision shall be min. M12 bolts on all four sides. The mounting bolts and nuts shall be of hot dip galvanized to avoid rusting. The provision for cabling shall be through base plate from bottom of RMU through trench below. The RMU shall be designed so that the position of the different devices is visible to the operator on the front face plate with permanent type indicators.</p> <p>1.2.3 The RMU shall be identified by an appropriately sized permanent labels which clearly indicates the functional units and their operation directions etc. The ON or OFF shall be marked as words and only I/O labelling shall not suffice.</p> <p>1.2.4 The RMU shall be designed to be tamper proof so as to prevent access to all live parts during operation without the use of special tools.</p> <p>1.2.5 The earth bus bar shall be covered if passing through the cable chamber and enclosed in an enclosure housing to prevent theft/tampering. Only extension outside enclosure shall open for access.</p> <p>1.2.6 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 enclosure and cable compartment and tank shall be connected to common earthing.</p> <p>1.2.7 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.</p> <p>1.2.8 The LBS /CB 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 the Load break switch is closed or when cable is charged.</p> <p>1.2.9 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 as mandatory spare/tool.</p> <p>1.2.10 The default design of cable compartment for TPCODL, ODISHA shall be for 3Cx400sq.mm AL cables (91mm external dia.).</p>
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		<p>Cable boots, gland plate, cable cleat, washer, bushings &amp; terminal bolts should be suitable for 3Cx400 sq.mm cables in all RMU compartments except three way with 2 CB</p> <p>1.2.11 Three way with two CB configuration following thing to be complied: The incomer LBS shall be suitable for 1Cx 630 sq.mm cable. Cable boots, gland plate, cable cleat, washer, bushings &amp; terminal bolts should be suitable for 1Cx 630 sq.mm cable in only incomer LBS cable compartment. The other two CB compartment shall be suitable for 3Cx 400 sq.mm cable termination. The terminal bolt used in LBS compartment shall have 15mm extra length than regular bolt to accommodate the mechanical type lug having large thickness. For Incomer LBS shall be provided with nonmagnetic base plate section and suitable cable cleat for 51 mm diameter 3x1C cables.</p> <p>1.2.12 The circuit breakers, Load break switches and earthing switches shall have pad lock provision &amp; can be locked in the open or closed position by 1 to 3 padlocks 6 to 8mm in diameter.</p> <p>1.2.13 For ODISHA the atmosphere is mainly humid, saline across year hence necessary anticorrosive fasteners &amp; components to be provided on switchgear. Anticorrosive painting should be painted for RMU</p>
1 3	<b>INTERNAL ARC TESTING</b>	<p>Any accidental over pressure inside the sealed chamber tank shall be limited by the opening of a pressure limiting device provided at the bottom part of the tank. Gas shall be released to the bottom without affecting cables and termination of the RMU with partition between cable chamber such way that gas releases away from the operator. Bidder shall provide type test report to prove compliance to the 'Internal fault IAC- A FL minimum for indoor and A-FLR for outdoor with bottom release' as per IEC 62271-200 on main tank and cable chambers.</p> <p>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. In case of SF6 gas leakage from gas tank or any kind of repair should be done at site or replacement of complete RMU to be done free of cost within guarantee period.</p>
1 4	<b>Incomer Load Break Switches (LBS)</b>	<p>1.4.1 Load break switches shall be maintenance-free. The position of the power contacts and earthing contacts shall be clearly visible on the front of the RMU. The position indicator shall provide positive contact indication in accordance with IEC 60265-1. In addition, manufacturer shall prove reliability of indication in accordance with the standard. The switches shall be of the "increased operating frequency" in accordance with IEC 60265-</p>

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		<p>1.</p> <p><b>1.4.2 Electrical /Mechanical Interlock should be provided to the Earth switch it should not be Close when cable is back charged.</b></p> <p>1.4.3 The LBS shall have at least 3 positions, open-disconnected, closed, and earth (with making capacity) and shall be constructed in such a way that natural interlocking prevents unauthorized operations.</p> <p>1.4.4 The disconnecter should have the maximum 200micro ohm contact resistance.</p> <p>1.4.5 Earthing of the cable shall be either through a three-position switch of a separate snap action type or Earth Switch having fault making capacity.</p> <p>1.4.6 The switches shall be fully mounted and inspected in the factory. Provision for future motorisation of LBS and CB should be kept in configuration while designing RMU.</p> <p>1.4.7 The load break switch and earthing switch operating mechanism shall have mechanical endurance of at least 1000 operations. The type test reports to be submitted along with Bid.</p> <p>1.4.8 Load break switch shall have mechanical switch operation counter and should be visible on front in horizontal alignment.</p> <p>1.4.9 The Load break switch should have minimum spare (for TPCODL use) 3 NO+ 3 NC auxiliary contacts and 1NO+1NC for earth switch.</p> <p>1.4.10 The load break switch shall be compatible for remote operation without any modification of the operating mechanism and without de-energizing the RMU, The LBS shall be fitted with an electrical operating mechanism and can remotely open-disconnected, closed and earthed from a reserved location.</p>
1 5	<b>Circuit Breaker For Transformer / Local Feeder Control</b>	<p>1.5.1 The circuit breakers/ interrupter shall be of the maintenance free.</p> <p>1.5.2 The position of the power and earthing contacts shall be clearly visible on the front of the RMU.</p> <p>1.5.3 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.</p> <p>1.5.4 For TPCODL where the RMU CB is used for switching operation &amp; protection of feeder (cables) - 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> <p>1.5.5 They shall be fully mounted and inspected in the factory.</p> <p>1.5.6 Breaker contact resistance should be <math>\leq 50</math> micro-ohms. The</p>

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		<p>various circuit contact resistance should comply with provisions in IEC 62271-200.</p> <p>1.5.7 The breaker should have minimum spare (exclusively for TPCODL use) 4 NO+ 4 NC auxiliary contacts.</p> <p>1.5.8 An operating mechanism can be used to manually close and open the circuit breaker with single push on push buttons. It shall be fitted with a local system for manual tripping by an integrated push button. There will be no mechanical automatic re-closing.</p> <p>1.5.9 The operating mechanism shall be compatible for remote/ SCADA operation. The required motor for this operation shall be delivered separately to stores (at a later date) and shall be compatible with older versions of RMUs already working within the TPCODL network.</p> <p>1.5.10 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).</p> <p>1.5.11 CT shall be mounted on cables the mounting arrangement shall be flexible to move to &amp; fro, up and down based on site condition of cable terminations etc. The mounting arrangement shall ensure that the CT should not reach less than 300mm from live part of bushing. The CT mounting shall be fixed at position while dispatch such that the cable entry, the bushing terminal bolt and CT core hole are co-axial.</p> <p>1.5.12 Fixing bracket to be provided for fixing CT on particular position without touching termination cores. Bolting arrangement to be provided for fixing CT on the mounting bracket.</p> <p>1.5.13 In any mounting the CT shall be mounted in such a way that the secondary connection shall be accessible and visible from front side after opening cable compartment door</p> <p>1.5.14 Breaker shall have mechanical endurance of at least 2000 operations. Relevant type test reports to be submitted along with bid.</p> <p>1.5.15 Breaker operation counter should be provided and should be visible on front in horizontal alignment.</p> <p>1.5.16 The circuit breaker shall be compatible for remote operation and can close (ON) and open (OFF) by remote operation in future if automated.</p> <p>1.5.17 In control cabinet the Terminal block shall have AC input wiring provision and MCB provision for incoming of LT AC supply.</p> <p>1.5.18 The relay auxiliary power, communication ports and other required ports should be wired up on the TB.</p>
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		<p>1.5.19 The breaker should have one series trip coil and one shunt trip coil.</p> <p>1.5.20 For TPCODL, ODISHA supply - The shunt trip coil shall be of 24V DC along with charger and complete wiring up to trip coil through DC MCB and socket and switch arrangement for AC charger.</p> <p><b>1.5.21 Electrical /Mechanical Interlock should be provided to the Earth switch it should not be Close when cable is back charged.</b></p> <p>1.5.22 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 between 60 - 400/1 Amp for outgoing feeder and transformer in relay. The pickup current of relay should be adjustable as per relay specification as per the requirement at site.</p> <p>1.5.23 CT shall be resin cast only, CT shall be of Protection class having dual ratio i.e. 400/1A and 60/1A. The ratio selection shall be made available on one TB on control cubicle. The ratio section chart shall be fixed permanently at suitable nearest arrangement available.</p> <p>1.5.24 The class of CT shall be 5P10 for both cores and CT Burden shall be 2.5 VA.</p> <p>1.5.25 The relays shall be self-powered suitable numerical relay with necessary elements. Please refer Specification no. ENG-HV-95 for Self-power relay for RMU feeder protection. The preferable make of relay are ABB, Ashida, Schneider, Siemens make relay.</p> <p>5.27 For TPCODL ODISHA Supply- Following shall be applicable</p> <p>The circuit breaker shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include:</p> <ul style="list-style-type: none"> <li>• Three toroid transformers incorporated in the transformer tee-off bushings,</li> <li>• An electronic relay, (self-powered target latched by battery or capacitive unit)</li> <li>• A low energy release,</li> <li>• A "fast-on" test receptacle for protection testing (with or without CB tripping)</li> <li>• The protection relaying shall have following features:</li> <li>• Phase Protection: With Definite time/ IDMT element having standard characteristics of Standard Inverse, very inverse, Extremely Inverse (as per IEC 255-3) or Fuse Characteristics.</li> </ul>
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		<ul style="list-style-type: none"> <li>• Earth Fault Protection: With Definite time or IDMT element having standard characteristics of Standard Inverse, very inverse, Extremely Inverse as per IEC 255-3 standard.</li> <li>• The CTs of 5P20 Class shall be employed. CT ratio shall be 200/1 (Further CT ratio may finalized during detailed engineering)</li> <li>• The transformer ratings which are to be controlled by the breaker are as follows: 500kVA to 2000kVA.</li> <li>• The terminal protectors to be supplied with the RMU by the vendor along with the cable termination bolt for termination 400 Sq. mm 11kV 3 C for isolator &amp; Breaker compartment.</li> </ul> <p>There should be provision of flag Relay on each outgoing vacuum breaker module for indication of Trip on Fault The preferable make of relay at ODISHA supplies are ABB, Ashida, Schneider, Siemens, C&amp;S, Alstom make relay.</p>
1 . 6	<b>Bushings and Cable terminations</b>	<p>1.6.1 Bushing should be of Epoxy resin. Each cable compartment shall be provided with three bushings of adequate sizes to terminate the incoming and outgoing cables. The termination bolt shall be M16 only for TPCODL ODISHA supplies for all bushings &amp; M12 for TPCODL ODISHA supplies</p> <p>1.6.2 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 &amp; cable shall be held by HDPE (fire retardant) cleat. The Sizes of incoming and outgoing cable shall be as per clause no. 5.2.10 to 15.2.12</p> <p>1.6.3 BA should provide bimetallic washer for connection between copper bushing stud and Aluminium Lug. Necessary spring and flat washers to be provided on each terminal. The bimetallic washer shall be suitable for M16 bolt for ODISHA &amp; M12 bolt for ODISHA supply and 630A rating in all compartments with minimum thickness of 2mm and sufficiently cover the completely copper bushing stud. The bidder can alternately offer tinned copper surface of bushing then bimetallic washer not required.</p> <p>1.6.4 The Terminal bolt shall have arrangement for fixing the cable test rod through cable boot opening. Cable boot should have opening for test rod insertion.</p> <p>1.6.5 The bolt tightening pressure must be written inside each cable chamber with permanent sticker.</p> <p>1.6.6 Cable boot for cable termination should be as per IS 13573-2. Boot should be easy to install.</p>

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		<p>1.6.7 The cable compartment must be without any holes or gaps and properly vermin proofing before inspection.</p> <p>1.6.8 The cable testing provision to be ensured in design. 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 &amp; a cable test rod (to be quoted as spare) which can be fixed on the terminations/ termination bolt through boot hole to facilitate testing. Termination boots as approved by the TPCODL should have a proper opening to facilitate the testing. The opening in boot shall be covered by means of removable protection cap.</p> <p>1.6.9 All cable compartments shall have front door opening. The cable cover door shall be pad lockable and shall be Tamper and Arc proof. The circuit breaker and earth switch shall be lockable in the open or closed positions by 1 to 3 padlocks.</p> <p>1.6.10 In outdoor RMU the door should have pad lock provision and cable door shall have interlock so that it shall not be opened by external forces. Also, it shall not be possible to operate the load break switch / isolator or breaker from outside once door closed. This is required to prevent pilferage.</p> <p>1.6.11 Locking provision of cable compartment door to be provided in case of any switch/CB is at earth position to avoid pilferage.</p> <p>1.6.12 Control cabinet with a terminal block (TB) located at convenient accessible location so as to wire all inputs &amp; outputs (IOs) up to the terminal block (TB). All the cable secondary wiring should be rooted through marshalling box separately for relay, CT etc.</p> <p>1.6.13 The wiring of the relay to be done on the TB for its terminals along with communication terminals.</p> <p>1.6.14 All terminals wires shall have proper identification ferrules and the identification marking provided on TB.</p> <p>1.6.15 Control cabinet shall have control cable entry arrangement on both sides of the RMU top control cabinet with proper grommet such that the opening are sealed in normal installations when not used for our door extension box arrangement to be provided any other arrangement to be explained in drawing during tender.</p> <p>Note: Supply of Cable terminations is not to be part of RMU supply.</p>
<b>1 . 7</b>	<b>Earthing:</b>	<p>1.7.1 The RMU outdoor metal clad switchgear enclosure, load Break Switch, VCB, SF6 tank etc. shall be equipped with a copper earth bus throughout all compartments and securely fixed along the base of the RMU with cover.</p> <p>1.7.2 The extension of this earth bus shall be taken out minimum 50mm outside the enclosure on both sides for fixing of the TPCODLs GI earth flat of 50mm width. The extension coming out of enclosure shall be properly sealed such a way to ensure</p>



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		<p>vermin proofing of the cable compartment.</p> <p>1.7.3 The size of copper earth bus-bar should be Min.105 sq.mm inside the enclosure to withstand short time current carrying capacity as per IEC.</p> <p>1.7.4 Two nos. body earthing bolts of M12X70 mm to be provide on the extended bus-bar.</p> <p>1.7.5 The mother earth needs to be extended up to 250mm periphery of cable entry hole so that the cable termination earthing can be connected easily to the main mother earth with 12mm bolt and washers. This arrangement needs to be provided in each compartment of RMU.</p> <p>1.7.6 The main tank must be connected to mother earth at least two positions with proper contact.</p> <p>1.7.7 In Three-way outdoor type compact design bidders should ensure the earthing from mother earth is provided inside the cable compartment for earthing of the cable terminations. that TPCODL shall provide only two main earthing on switchgear</p> <p>1.7.8 Bidder to ensured that the earth bus shall be single conductor/bus suitable for taking specified fault current and both main earthing are interconnected by earth bus and not through thank or enclosure.</p> <p>1.7.9 If bolt are provided as current carrying path then the bolt material shall be brass and size shall be suitable to carry specified fault current.</p>
1 · 8	<b>Voltage indicator lamps and phase comparat ors</b>	<p>1.8.1 Each compartment of RMU shall be equipped with a fixed type voltage indicator lamps having dip ports for insertion of phase comparators or line tester to check the phase sequence or presence of charge in cable. This is to be fixed on the front face plate to indicate presence of voltage in the cables. The capacitive dividers will supply low voltage power to the indicator lamps. Three inlets can be used to check the synchronization of phases with phase comparator or other device. These devices shall be in compliance with IEC 62271-206:2011 standard. The VPIS without dip ports are not accepted.</p> <p>1.8.2 All the VIPS installed on compartments shall have auxiliary contacts wired up to the terminal block of respective compartment which shall be further used for remote status indication at SCADA. The auxiliary contacts in VPIS shall be there should be electrical interlock of cable presence indicator and operation of earth switch in RMU incomer cable compartment of LBS.</p>
1 · 9	<b>Front Cover</b>	<p>1.9.1 The front cover shall provide a clear mimic diagram that indicates the different functions. This shall be permanent in nature throughout the useful life of the RMU.</p> <p>1.9.2 The position indicators shall give a true reflection of the position</p>

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		<p>of the main contacts. Position Indicators shall be clearly visible to the operator.</p> <p>1.9.3 The lever operating direction shall be clearly indicated in the mimic diagram.</p> <p>1.9.4 The bidder shall provide a operating sequence process on each compartment with permanent type arrangements. So that all data shall be self-explanatory.</p> <p>1.9.5 The mimic shall have clear Words for "CLOSE/OPEN/EARTH" at each desired place.</p> <p>1.9.6 All status indicators shall be marked appropriately with permanent labels as Earth On/OFF, Disconnecter/LBS On/OFF, CB On/OFF.</p> <p>1.9.7 All operating ports shall have marking like spring charging provision, three position disconnecter port and Shutter operator for interlocking, Operation allowed along with arrow indication and labeled as earth operation or disconnecter operation.</p> <p>1.9.8 For better clarity of earthing related operations shutters and ports shall be painted in Yellow background such way that the persons should get clear indication that if operating in Yellow region means he is performing earthing related operation. The details shall be as per annexure-2 of this specification for</p> <p>1.9.9 The Direction of operation shall be clock wise for any close operation and anti-clock wise for any open operation of disconnecter/LBS and earth switch or as per type tested design with undertaking</p> <p>1.9.10 There shall be one label for SF6 gas pressure indicator and a clear message must be fixed near pressure indicator that region of safe operation and Alert message stating 'If GAS pressure not OK. Do not operate any switchgear and report to OEM (name) customer care/engineer in charge' This message should be clearly visible in front with suitable background and shall be with permeant marked.</p> <p>1.9.11 For gas pressure indication a dial type manometer to be provided with will show actual pressure. Gas pressure shall have SCADA compatible contacts and wired up on TB with labeling.</p> <p>1.9.12 All the other accessories and boxes shall be properly labelled with permanent marking/printing such a way that the product is self-explanatory for user.</p>
<b>1</b> <b>.</b> <b>1</b> <b>0</b>	<b>Fault Passage Indicators</b>	<p>1.10.1 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) for O/C. These shall be provided with bright LED s / flag Indicators, which shall be clearly visible in the day time.</p>

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		<p>These shall have the following resetting facilities:</p> <ol style="list-style-type: none"> <li>a. Manual reset</li> <li>b. Resetting after a set time duration</li> <li>c. Electrically reset from remote with at least 2-spare potential free contacts.</li> <li>d. Resetting on restoration of LV</li> </ol> <p>1.10.2 The unit shall have Short Circuit adjustable to different settings with separate Current transformer. They shall be fully field-programmable and shall have at least and 5 settings for Phase fault or over current.</p> <p>1.10.3 The preferred range is – O/C setting range 200-1000A.</p> <p>1.10.4 The default setting shall be and 300A for overcurrent. This shall be ensured before inspection call in each RMU.</p> <p>1.10.5 The Approved Make of FPI are EKL8000, EKL8000NG, Easergy Flair 22D, SICAM and any other makes can be approved subject to TPCODL Approval</p> <p>1.10.6 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.</p> <p>1.10.7 The process of fixing the FPI shall be fixed on the wall of the incomer LBS cable compartment along with pictorial view.</p> <p>1.10.8 FPI connecting wires should be properly dressed and covered in insulated sleeve and tied to the side walls with help of cable ties. If sticking type arrangement is provide then it must be with good quality permanent adhesive from reputed makes like 3M and should not come out with force of 10kN.</p> <p>1.10.9 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  IEC 1000-4: EMC – Testing &amp; Measurement  IEC 1000-6: EMC- Immunity for Residential, Commercial and light industrial environments.</p>
1 . 1 1	<b>Remote Control of the RMU:</b>	<p>1.11.1 For non-motorized RMU: Future provision for motorization to be kept along with the hurting plug arrangement on each feeder of each RMU</p> <p>For future requirement of remote operation of the RMU line switches shall be possible using motors fitted to the operating mechanism for both line switch and circuit-breaker functions as and when required. All the necessary accessories shall be supplied separately to stores based</p>

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	<p>on PO placed on quotation provided in this tender.</p> <p>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.</p> <p>1.11.2 For motorized RMU- The motors to be fitted in LBS sections only. 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.</p> <p>Preferred communication protocol for FRTU shall IEC-60870-5-104.</p> <p>All Close-Open coils / signaling contacts shall be rated for 24 V DC. Following signaling contacts are essential for remote operation of RMU:</p> <p>A) Aux. contact for Line Isolator (Status)  B) Aux. contact for all earthing switch (Status)  C) Aux. contact for Breaker (Status)  D) Aux. contact for FPI indication  E) Aux. contact for Protection trip (Breaker module)  F) Aux. Contact for Low Gas Pressure</p> <p>2 Nos. spare relay tripping NO, NC contacts to be provided. Flag Indications on RMU when tripped should be on shunt trip. A provision for physical disconnection of motor supply (like fuse) of line isolator must be provided in RMU unit itself.</p> <p>(A flag is required for series and shunt coil actuation).</p> <p>There should be harting plug arrangement for individual Isolator as well as breaker motor connections, which will be fitted on the RMU body itself. Also, the PCB of motor should be covered by anti-tracking agent. There should be relay with timer instead of only relay, which is used in the latching circuit.</p> <p>Suitable unlatching system to be provided to prevent mal operation of motor in case of any latched command/ non executed command at RMU (case like fuse failure etc.)</p> <p>The separator between terminals to be provided to avoid any tracking etc.</p> <p>Signal requirement for field RTU (which shall be mounted near RTU) is attached (refer Annexure-1). The bidder shall quote the cost of field RTU (FRTU) separately with all technical details for acquisition of the signal as described in Annexure-1.</p>
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1 1 2	<b>Paint</b>	<p>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.</p> <p>The enclosure of the RMU shall be painted with shade light Grey, i.e., RAL 7032. The RMU 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 &amp; saline weather, Corrosion Protection for RMU entire life cycle(minimum25Years).</p>
1 1 3	<b>SLD and configuration</b>	<p>The SLD and the offered configurations cannot be changed without prior notice and approval from TPCODL.</p> <p>TPCODL reserve the right to accept the change or reject the same. Safety being utmost concern hence same need to be taken care in offered designs.</p>

### **TYPE TEST REPORT**

Bidder shall furnish the type test report for the tests as mentioned below and as per reference standards. Complete set of Type Tests shall be conducted at certified test laboratories, which are CPRI / ERDA only. **Type test should have been conducted in certified test laboratories during the period not exceeding 5 years from the date of Permission.**

1. Lightning Impulse test
2. Power Frequency Voltage Test
3. Temperature Rise Test
4. Measurement of Circuit Resistance
5. Rated Short Time and Peak Current Withstand test for main and Earth Circuit.
6. Breaking and Making Capacity Test for Breaker & Isolating Switches.
7. Operational & Interlock Performance Test
8. Internal Arc Withstand Test.
9. Degree of Protection (IP Code verification tests)
10. Mechanical Endurance Tests for Isolator and Breaker.
11. Pressure withstand test & Leakage test on SF-6 Gas chamber
12. Dimensional and Visual Checks.
13. Salt Spray Test for 1000Hours

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## 49.0 TECHNICAL SPECIFICATIONS FOR 11kV 1000, 750 and 630kVA CRT PACKAGE SUBSTATION

### GENERAL TECHNICAL PARTICULARS

#### 1. Scope:

This specification covers technical requirement of design, engineering, manufacture, testing at manufacturing work, painting, packing, forwarding, supply and performance of Package type substation comprising an enclosure containing high voltage switchgear, transformer, low voltage switch gear. The transformer shall be of 1000, 750 and 630kVA Cast resin, the HV compartment shall comprise of RMU and the LV compartment shall include ACB along with MCCBs and auxiliary equipment's with interconnection inside the enclosure for efficient and trouble-free operation of the distribution network for TATA POWER CENTRAL ODISHA DISTRIBUTION LIMITED, ODISHA.

#### 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 standards / IEC and shall confirm to the regulations of local statutory authorities.

IEC 62271-202 : HV switchgear and control gear- HV/LV Pre-fabricated substation.

IEC 62271-200 : HV switchgear and control gear-AC metal enclosed switchgear and control gear for voltages above 1kV and up to and including 52kV

IEC 60694 : 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 60265-1 : High voltage switches – Part 1: Switches for rated voltages above 1kV and less than 52kV

IEC 60529 : Degrees of protection provided by enclosures (IP code)

IEC 62262 : Degree of protection provided by enclosures for electrical equipment against mechanical impacts (IP 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 60076 / IS 2026 : Power Transformer

IEC 60255-3 : Electrical Relays – Part 3: Single input energizing quantity measuring relays with dependent or independent time

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IEC 60044-1 / IS 2705 : Current transformers

IEC 60044-2 / IS 3156 : Voltage transformers

IEC 60376 : Specification of technical grade sulphur hexafluoride (SF6) for use in electrical equipment

IEC 61958 : High voltage prefabricated switchgear and control gear assemblies – Voltage presence indicating systems

IS 11171 -1985 : Specification for Dry Type Transformer.

IS 2099: 1986 : Specification for Bushings for Alternating Voltages above 1000 Volts

IS 7421: 1988 : Specification for porcelain bushings for alternating voltages up to and including 1000kV.

IS 8603 (Part-1) : 1977 Dimensions for Porcelain Transformer Bushings for Use in Heavily Polluted Atmospheres - Part I: 12 kV and 17.5 kV Bushings.

IS 2629:1985 : Recommended practice for Hot dips Galvanizing of iron & steel. IS 2633:1986 : Test for Uniformity of Zinc Coating


CEA guidelines dt August 2008 for energy efficient distribution transformer.

However in case of conflict between standard and this specification, the specification shall govern.

### 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                           | : 95%                                       |
| e) Minimum humidity                           | : 10%                                       |
| f) Average no. Of thunderstorm days per annum | : 50  |
| g) Average annual rainfall                    | : 2386 mm                                   |
| h) Average no. of rainy days per annum        | : 60  |
| i) Rainy months                               | : June to Oct.                              |
| j) Altitude above MSL not exceeding           | : 300 mtrs.                                 |
| k) Wind pressure                              | : 126kg/sq m up to an elevation of 10 mtrs. |

The atmosphere is generally laden with mild acid and dust suspended during dry months and subjected to fog in cold months. The design of the equipment and accessories shall be withstand seismic forces corresponding to an acceleration of 0.1 g.

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#### 4. GENERAL TECHNICAL REQUIRMENTS:


Description	Requirement
Application	Outdoor
Rated voltage	12kV
Service Voltage	11kV
System Frequency	50 Hz
Rated maximum power of substation	1000KVA, 750KVA and 630kVA Cast Resin (Ventilation Louvers)
Degree of Protection for Enclosure	IP 54
Degree of protection for other compartments	Trf compartment – IP 33, RMU – IP 67 for Tank, IP2X for the front cover / mimic board, IP 54 (Main door closed) for Outdoor RMUs. IP 54 for cable compartment
Internal arc test	IAC-AB as per IEC 62271-202 (20KA for 1sec)
Rated Class of enclosure	Class K10
Temperature rise for any accessible part of the enclosure	Maximum permissible temperature shall not exceed 70 deg C at an ambient temperature not exceeding 40 deg C
<b>HV Insulation Level</b>	
Rated Impulse withstand voltage	75Kvp
Power Frequency Withstand voltage	28kV rms
<b>HV Network and Bus Bar</b>	
RMU	3 way, Non-extensible (2nos isolator + 1no. Breaker)
Rated current of incomer Load break Switch	630 A
Rated Current Of Circuit –Breaker	630 A
Rated Short Time Current Withstand	21kA for 3 Sec
Rated Short Circuit Making Current	52.5kA
<b>LV Network</b>	
Rated LT voltage	433V
LV Incomer ACB	1no., 3 pole 2000A (Microprocessor based protection) & 230V AC shunt Tripping coil & Compensating CT on Neutral busbar
LV Outgoing MCCBs	6 nos., 630A MCCB

#### 5. GENERAL CONSTRUCTION:

Package type substation is designed to compromise the following main component.

- The enclosure with relevant IP.
- The HV compartment consisting of 11kV ring Main unit.
- The Cast Resin transformer.
- The LV compartment consisting of LT ACB and MCCBs with interconnections compartmentalised.
- LT ACB with self -powered relay, 230V AC shunt Tripping coil for remote Tripping and compensating CT on neutral Bus.



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- f) Dedicated one no of MCCB for fire outlet.
- g) There must be three separate sources of supply for protection, Auxiliary & external lighting circuit.
- h) Outgoing 440V circuit 630A MCCB's must be mounted horizontally on LV switchgear panel.
- i) Phase to phase clearance between MCCB RYB phases should not be less than 30mm and not less than 25mm between lugs after connecting cable termination.
- j) There must be a caution plate on both side of Transformer compartment door mentioning "DON'T OPEN Transformer will Trip".
- k) Name plate "Energy Meter" should be given on PSS LT Panel side door for indicating energy meter inside.

**i. INDOOR ENCLOSURE:**


The Enclosure shall be made of minimum 2-3 mm thick GI sheet with a base of 3 mm (min), tropicalised to meet Indian weather condition. The base of the enclosure shall ensure rigidity for easy transport and installation. The Structure of the substation should be provided with additional supporting beams capable of supporting the gross weight of all the equipments. The roof of the substation compartments shall be designed to support adequate loads with a minimum clearance of 300 mm provided up to the top of any component installed inside the substation. There shall be provision of proper ventilation through louver apertures so as to allow circulation of hot air inside enclosure naturally. The complete design shall be compartmentalized.

The HV compartment shall comprise of one no. 3 way, non-extensible, 11kV RMU with 2 nos. incomer and one no. circuit breaker as outgoing. Termination bolts and boots for RMU shall be supplied by bidder as per TPCODL approved Make.

The Transformer shall be 11/0.433kV, 1000, 750 and 630kVA, Cast resin type, copper coil, naturally cooled (AN) construction with Taps on Primary side. The LV compartment shall comprise of one no. 2000 A ACB with 6 nos. (5+1 for fire supply) 630A each MCCBs and other auxiliary components with interconnection required for complete operation of substation.

Degree of protection for over all the enclosure shall be IP 54 with transformer compartment as IP 33 and RMU shall be IP 67 for Tank, IP 2X for the front cover / mimic board, IP 54 (Main door closed) for Outdoor RMUs, IP 54 for cable compartment in accordance with IEC recommendation. There shall be no bolting arrangement on the doors and sides (periphery) so as to avoid access of dust and water inside. This would also ensure that the unit is well protected from outside nuisance owing to its being located in crowded and outdoor areas.

HV and LV compartment shall be accessible on the side of substation through double doors with equipment with key lock and nitrile rubber seal. The doors shall be pad locked and/or lock protected to ensure theft prone locking arrangement. Heavy duty hinges shall be provided for each door such that they are not visible from outside and hence not removable. The outgoing of the distribution transformer shall be connected directly to incomer of LV distribution

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through busbar s. Transformer shall be accessible from both sides of enclosure. HV, LV and transformer compartment should be isolated from each other internally.

There shall be an arrangement for internal lighting activated by associated switch on door for HV, Transformer and LV compartment separately. Space heater with thermostat shall be provided in both cable compartment. Suitable for lifting package type substation should be provided.

Ventilation aperture shall be as per class K10 & substation shall be type tested for internal Arc withstand test as per IEC. The bidder shall provide provision for remote monitoring of status of RMU, fault passage indicator, LT ACB & MCCBs.


ii. EARTHING:

All metallic components of substation shall be earthed to a common earth conductor of size 50X6 tinned Cu or 65x10 mm GI strip running all long the periphery of package substation. Four nos. earthing/studs shall be provided on the enclosure at each corner position which shall be internally connected to the common earth conductor /strips provided for entire substation. The diameter of stud shall be at least 12mm and shall be able to connect and terminate the external earth conductor. The connecting point shall be marked with protective earth symbol as per IEC, separate earthing conductor /strips shall be provided for transformer neutral and the same shall be insulated from the body earth and suitably brought out from the enclosure for connecting to external system earth.

iii. PAINT:

All paint shall be applied on clean, dry surfaces under suitable atmosphere condition by seven tank process and powder coating. The paint shall not be scale off or crinkle or be removed by abrasion during normal handling. The enclosure for the substation shall be painted with shade **TPCODL** blue i.e.

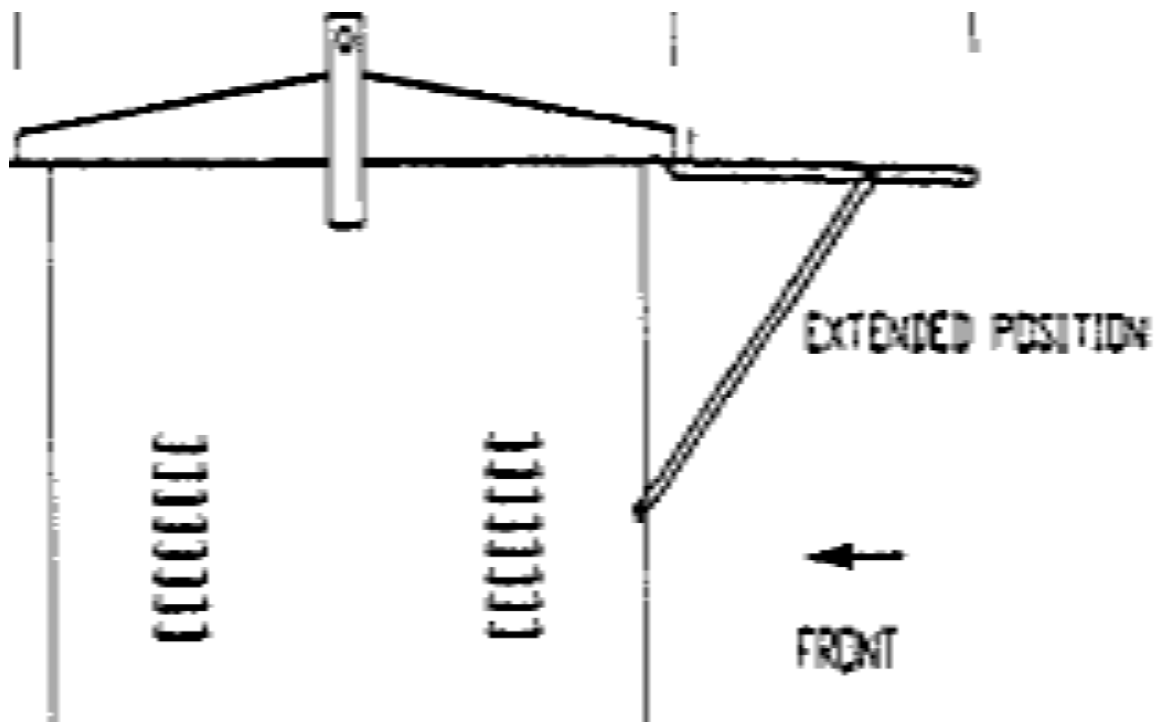
PENTON E2727C. Sufficient quantity to touch-up paint shall be furnished for application at site.


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iv. GALVANIZING :

- a) The 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 have galvanic bath, which could have a determine effect on the durability of the zinc coating.
- b) After galvanizing no drilling or welding shall be performed on the galvanized parts of equipment except that nuts may be threaded after galvanizing.
- 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 dip galvanization. The galvanized steel shall be subjected to test as per IS-2633/BS 729 amended to date.

- v. Extensible canopy to be provided on both sides of the PSS. As per safety norms the arc suit of the person operating the system should not get wet during rainy season. Sample drawing is as shown below.



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vi. HV COMPARTMENT :


**11kV RING MAIN UNIT**

The switch gears and busbar shall be contained in a stainless steel tank filled with SF6 Gas and the outerbody shall be made of GI sheet steel, minimum 2-3mm thick with 2-3mm thick AL gland plates. The tank should be meet the sealed pressure system criterion in accordance with the IEC 62271-200. This is the system for which no handling /refilling of gas shall be required throughout the expected operating life, i.e. 30 years. Sealed pressure system are completely assembled, filled and tested in the factory. The maximum leakage rate of SF6 gas shall be lower 0.1% of total initial mass of SF6 gas per annum. The filling pressure for the switchgear should be just above the atmospheric pressure so as to reduce the tendency to leak. SF6 gas used for the filling of RMU shall be in accordance with IEC 376.

The RMU shall have be IP 67 for Tank, IP2X for the front cover / mimic board, IP 54 (Main door closed) for Outdoor RMUs, IP 54 for cable compartment degree of protection. The RMU shall be suitable for mounting inside the HV compartment of package substation with provision for cabling through gland plate in the base and trench below. The RMU shall be designed so that so that position of the different devices is visible to the operator on the front of RMU and operations are visible as well. The RMU shall be identified by an appropriate sized label which clearly indicates the functional units and their electrical characteristics. The RMU shall be designed to be temper proof so as to prevent access to all live parts during operation without the use of tools.

The RMU shall be complete with all connection and copper bus bar with continuous current carrying capacity of 630A. The bus bar shall be fully encapsulated by SF6 gas inside the steel tank. There shall be continuity between the metallic parts of 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 should be preferably enclosed in an enclosure to prevent theft/ tampering and further connected to the common earth conductor provided for the entire substation. The RMU body shall be earthed with 25 x 6 sq mm tinned copper strips.

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. The earth switch can only be operated when the main load breaker switch/circuit breaker is open. The earth switch shall be fitted with its own operating mechanism and manual closing shall be visible in the closed position through transparent covers. Mechanical interlocking system shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when the load break switch is closed or when cable is charged.

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vii. INCOMER LOAD BREAK SWITCHES (LBS) :

Load break switched shall be maintenance free. The position of the power contacts and earthing contacts shall be clearly visible on the front of RMU. The position indicator shall provide positive contact indication in accordance with IEC 60265-1. In addition manufacturer shall prove reliability of indication in accordance with standard. The switches shall be of the increased operating frequency in accordance with IEC 60265-1. They shall be at least 3 positions, open- disconnected, closed, and earthed, and will be constructed in such a way that natural interlocking prevents unauthorized operations. Earth of the cable shall be either through a three-position switch of a separate snap action type or earth switch having fault making capacity. The mechanism shall be constructed in such a way that natural interlocking prevents unauthorized operation.


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. Earth switch can be fitted with electrical operating mechanisms and without de-energizing the RMU. The switch and earthing operating mechanisms and without de-energizing the RMU. The switch and earthing switch operating mechanism shall have mechanical endurance of at least of at least 5000 operations.

viii. CIRCUIT BREAKER FOR TRANSFORMER CONTROL:

The circuit breakers shall be of maintenance free. The position of power and earthing contacts shall be clearly visible on the front of the RMU. The circuit breakers shall have at least 2 position Open- disconnected and closed and shall be constructed in such way that natural interlocks prevent all unauthorized operation. They shall be fully mounted and inspected in factory.

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 reclosing. The circuit breaker shall be associated with an integrated protection until that will operate without any auxiliary power supply and shall include three toroid transformers incorporated in the transformer tee-off bushing, an electronics self- powered relay, flow energy releases, and a "fast -on" test receptacles for protection testing (with or without CB tripping).

The protection system (Micro- processor based) shall ensure circuit breaker tripping as of minimum operating current which is in rated current of the underground network to be protected. The settings shall be adjustable between 0 to 75 AMP. The circuit breaker shall be provided with phase protection of definite time/ IDMT element having standard characteristics of standard inverse, very inverse, extremely inverse as per IEC 255-3 standard. The "time multiplier" with minimum set point of 0.05 TMS should be available. The earth fault protection

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shall be provided of definite time/IDMT element having standard characteristics of standard inverse, very inverse, extremely inverse as per IEC 255-3 standard. The “Time multiplier” with minimum set point of 0.05 TMS should be available. The breaker shall have the provision of flag relay for indication of trip on fault . The relay shall be SEG-WIP, Schneider – VIP300 or as per

**TPCODL** approved make. RMU Protection CTs installed in Breaker compartment of RMU should be of Cast resin Type or as per **TPCODL** approved Make. The CTs need to be mounted on bushing or externally mounted over the insulated plate . The ID of CT should be suitable to 1C X 185 sqmm 11KV cable

There should 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 interlock such that doors can be opened only with earth switch in closed position & a cable test rod has to be provided which can be fixed on the terminations to facilitate testing. Termination boots as approved by **TPCODL** should have a proper opening to facilitate the testing. The opening should be covered by means of removable protection cap.


In case of front door opened, it should not be possible to operate the load switches / isolators or breaker. All panel covers shall be provided with anti-vandal screw bolts so that opening of panel covers is only possible with special tools, to be lockable and should be Tamper and arc proof. There should be provision of hinged doors in the RMU. The circuit breaker and earth switch shall be lockable in the open or closed position by 1 to 3 padlocks.

ix. **BUSHING AND CABLE TERMINATION :**

**RMU** : For HT side termination, tinned Copper busbar shall be provided with Al Lugs suitable for connecting to 11 kV 3C x 400 sq.mm to Isolator and 3Cx300 sq mm AL XLPE cable to Breaker compartment.

x. **VOLTAGE INDICATOR LAMP AND PHASE COMPARATORS :**

Each function shall be equipped with a fixed type voltage indicator box on the device to indicate whether or not these are 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.

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xi. SAFETY OF PEOPLE :

Any accidental over pressure inside the sealed chamber shall be limited by the opening of a pressure limiting device in the rear part of the tank. Gas will be released to the rear of the RMU away from the operator. Manufacturer shall provide type test report compliance to the "" Internal fault IAC – AB as per IEC 62271-202.

xii. OPERATING LEVER :

An anti – reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing the switch or earth switch. All manual operations shall be carried out on the front of the RMU.

xiii. FRONT PLATE :

The front plate includes a clear mimic diagram that indicates the different functions. The position indicators shall give true reflection of the position of the main contacts .They shall be clearly visible to the operator. The lever operating direction shall be indicated in the mimic diagram. The manufacture’s plate shall include the RMUs main electrical characteristics.

xiv. PAINT :


All paint shall be applied on clean, dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The paint shall not be scale off or crinkle or be removed by abrasion during normal handling. The RMU body shall be painted with shade RAL 7032 or 631 as per IS-5. Sufficient quantity of touch –up paint shall be furnished for application at site.

xv. FAULT PASSAGE INDICATORS:

Fault passage indicators shall be installed on the ring main unit. These devices shall be electronics devices with their own energy source and connected to single 3 phase split core CTs (CBCT).they shall

be provided with bright LEDs /flags indicators, which shall be clearly visible in the day time. They shall have the following resetting facilities:

Manual reset and Resetting after a set time duration and Resetting on restoring of LV

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The Unit shall have short circuit and earth fault adjustable to different setting with separate current transformer. They shall be fully field –programmable and shall have at least 16 settings for phase –phase

.It shall be possible to Test these indicators at site thru “Test” push button. The fault passage indicators should also be provided with SCADA output contact. They should confirm to the following standard:

IEC 68-2-6, IEC 68-2-9: Environmental testing - for vibration, Solar radiations.

IEC 950: Information technology equipment – safety

IEC 1000-2: Electromagnetic compatibility for low frequency conducted disturbances and signaling in public low power supply system.

IEC 1000-4: EMC – testing & management

IEC 1000-6: EMC immunity for residential, commercial and light industrial environment.

## **DISTRIBUTION TRANSFORMER:**

### **GENERAL CONSTRUCTION:**


The transformers shall be Cast resin type, copper coil, naturally cooled (AN), 11/0.433 KV, 1000, 750 and 630 kVA, 50 Hz,. The transformer shall be suitable for service with fluctuations in supply voltage upto plus 12.5% to minus 12.5%. The transformer and accessories shall be designed to facilitate operation, inspection, maintenance and repairs. The design shall incorporate every precaution and provision for the safety of equipment as well as staff engaged in operation and maintenance of equipment.

#### i. **CORE:**

The core shall be stack type of high grade cold rolled, non-ageing, grain oriented, annealed silicon steel lamination (CRGO), having low loss & good grain properties, coated with hot oil proof insulation, bolted together to the frames firmly to prevent vibration or noise. Scrap CRGO material shall not be used for transformers. The grade of core shall be M3 or better. The core shall be stress relieved by annealing under inert atmosphere if required. All core clamping bolts (If any) shall be effectively insulated. Only one grade and one thickness of core shall be accepted and no mixing of different grades shall be allowed.

The complete design of the core must ensure permanency of the core losses with continuous working of the transformers. The value of the maximum flux density allowed in the design & grade of laminations used shall be clearly stated in the offer. The successful bidder is required to submit the following documents with regard to the procurement of core material



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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
- f) Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of the material.

The bidder shall offer the core for inspection and approval of the Purchaser during manufacturing stage. **TPCODL** shall impose heavy penalty or black list the bidders using seconds/defective CRGO sheets. The transformer shall be suitable for continuous service without damage under conditions of over fluxing' (due to combined effect of voltage and frequency) 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 getsaturated.


The bidder shall furnish necessary design data in support of this situation. No load current shall not exceed 2% of full load current and shall be measured by energising the transformer at 433V, 50 Hz on the secondary. For increase in voltage at 433V by 12.5%, the no load current shall not increase beyond 5% of the full load current.

ii. **LOSSES:**

The bidder shall guarantee the total loss at 50% and 100% load condition (at rated voltage and frequency and at 75°C) and these should be within the limits of maximum total losses declared by **TPCODL** for both 50% and 100% loading values (as per ECBC+ buildings).

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.

1. 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 the values given in specifications.
2. 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 reject the transformer and shall have the right to reject the complete lot
3. During testing at Bidder's works, if the temperature rise exceeds the specified values, the entire lot shall be rejected by **TPCODL**
4. During testing at Bidder's works, if the impedance values differ from the guaranteed values including tolerance, the transformer shall be rejected by **TPCODL**.

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The fixed (iron) and running (copper) losses shall be as low as is consistent with reliability and economical use of materials. The bidder shall guarantee individually the no-load and load loss without any positive tolerance. No positive tolerance shall be allowed on the guaranteed losses and the bids with higher losses than those specified by the Purchaser would be treated as non-responsive.

**However, the bidder can offer losses less than the specified and those offers would be evaluated on Total Owning cost as per the formula given below.**

$$TOC = IC + (A \times W_i) + (B \times W_c)$$

Where,

TOC = Total owning cost

**IC = Initial cost (including taxes) of transformer as quoted by the manufacturer**  
**A factor = Cost of no-load losses (in Rs/Watt)**

B factor = Cost of load losses (in Rs/watt)

**W<sub>i</sub> = No load losses quoted by the manufacturer (in watt)**

W<sub>c</sub> = Load losses quoted by the manufacturer at 100% loading (in watt)


**For the purpose of calculating Total Owning Cost, A factor shall be considered as Rs 459.50 per Watt and B factor shall be considered as Rs 225.20 per Watt. The value of "A" & "B" may change periodically.**

Any changes in the figures assigned for the transformer losses shall not be permitted after opening the bids and bid evaluation shall be carried out on the basis of information made available at the time of bid opening.

**The successful bidder shall guarantee the quoted losses for at-least five years. Penalty shall be imposed as per above, if losses increase during this period.**

iii. PENALTY FOR NON PERFORMANCE:

- a) During testing at bidder's works, if it is found that the actual measured losses are more than the values quoted by the Bidder, the purchaser shall reject the transformer and shall have the right to reject the complete lot.
- b) The Purchaser shall reject the entire lot during test at bidder's works, if the temperature rise exceeds the specified values.
- c) The Purchaser shall reject any transformer during the test at bidder's works, if the impedance values differ from the guaranteed values including tolerance.

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iv. WINDINGS:

Primary and secondary windings shall be constructed from high- conductivity, Double Paper Covered (DPC) copper conductor. The winding shall be designed for better voltage regulation and mechanical strength. LV winding shall be such that neutral formation will be at top. The coil shall be circular in shape and their construction shall be such that there is no possibility of any distortion under likely conditions of service.

Inter layer insulation both for HV and LV windings shall be Epoxy dotted Kraft/Kraft paper and pressboard of standard make or any other superior material subject to approval of Purchaser shall be used. All spacers, axial wedges/runners used in windings shall be made of pre-compressed solid press board. 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.


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. The dimensional tolerances for windings shall be within limits and as specified in the GTP. 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 shortcircuit conditions. 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.

The current density for HV and LV winding should not be more than 2.6 Ampere per sq.mm. The insulation between core and bolts and core and clamps shall withstand 2.5kV for one minute. The bidder shall submit characteristics of insulation paper with the offer.

The tolerance for the winding resistance measurement for different phases but at same taps shall be limited to 2.5%.

v. ENCLOSURE:

The epoxy cast resin transformer shall be housed in an enclosure constructed of heavy gauge sheet steel of minimum thickness 2-3mm with the load bearing member should be of 3mm thick. The enclosure shall provide a minimum degree of protection of IP33. The housing shall have ventilation louvers / opening provided with wire mesh screens and shall be provided with a door, which shall be inter locked such that it should be possible to open the door only when power supply to the transformer is switched off. A suitable danger plate should also be provided.

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The enclosure shall be provided with a minimum of two welded heavy duty closed lifting lugs and necessary hardware for mounting on the floor. The lifting lugs shall be capable of withstanding the total weight of the transformer.

The base of the enclosure shall be furnished with ground pads located on opposite diagonal corners. The base shall have jacking pads and shall be constructed of heavy steel members to permit skidding or rolling in any direction. The core shall be visibly grounded to the enclosure frame by means of a flexible grounding strap. The enclosure shall be powder coated. The wire mesh if any provided shall be fixed with nut bolt & lock nut on it. All doors shall have facility for putting pad locks (LOTO Locks). Caution boards shall be provided on all sides. Vendor to ensure proper locking arrangement and smooth opening closing operation of door.

vi. PAIN:

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects. All primers shall be well marked into the surface, particularly in areas where painting is evident and the first priming coat shall be applied as soon as possible after cleaning. The paint shall be applied by spray or seven tank powder coating process, as applicable to the various parts of the transformer and enclosure. The transformer shall be painted with shade of 631 as per IS: 5 and RAL 7032 as applicable. The paint shall not scale off or crinkle or be removed by abrasion during normal handling. The Sufficient quantity of touch-up paint shall be furnished for application at site. Vendor to ensure proper finishing of the paint.


vii. TERMINAL ARRANGEMENT FOR INCOMING & OUTGOING :

RMU : For HT side termination, tinned Copper busbar shall be provided with Al Lugs suitable for connecting to 11 kV 3C x 300 sq.mm for isolator or 1Cx185 sq mm AL XLPE cable for Breaker.

LT ACB: For LT side termination, AL bus bar of 2000A capacity having provision for connecting 4CX300sq mm AL XLPE cable. Colour sleeves to be provided on busbars for easy identification. All control cables shall be provided with identification tags.

viii. TERMINAL CONNECTOR:

HV bushing stems shall be provided with suitable adequate Cu bus bar between RMU and transformer. Similarly adequate rating of LT Cu bus bar provision shall be made between transformer and LT chambers. Provision of disconnecting facility with suitable flexible copper jumper in between Transformer LV Bushing & LT ACB bus bar to be considered. Suitable colour coding sleeves shall be considered for HV as well as LV connections. Terminal connectors shall be type tested as per IS 5561.

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LT /HT busbar Nut Bolts for cable connection to be provided by OEM. The terminal connector Drawings shall be provided by the bidder and shall be submitted for Purchaser's approval.

ix. TAP:

The tapping's shall be provided on the high voltage winding for variation in HV voltage in 1000, 750 and 630kVA transformers. The tapplings shall be within range of (+) 10% to (-) 10% in steps of 2.5%. Tap changing shall be carried out by means of tinned Brass link and when the transformer is in de-energized condition, switch position no. 1 shall correspond to the maximum plus tapping. Each tap change shall result in variation of 2.5% in the voltage. Suitable plate shall be fixed for tap changing switch to know the position number of tap. Tap links should be robust in construction. Tap numbers. punching to be provided

x. EARTHING CONNECTION:

The provision for earthing connection shall be provided for 50X6 Cu or 65x10 mm GI strip. 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. (Neutral CT to be mounted before neutral bifurcation. If bifurcation is inside the transformer NCT will have to be mounted inside the transformer) Transformer top cover shall be connected at two diagonal places with the tank by tinned copper earthing strip. All plates which have insulating gaskets in between shall be provided with tinned copper earthing strips.


A dedicated core earthing shall be provided with testing facility. Earthing should be extended from main earth grid with 50X6 Cu or 65x10 mm GI strip

xi. 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.

xii. TERMINAL MARKING:

All transformers shall have the primary and secondary terminal markings plainly and indelibly marked on the transformer adjacent to the relevant terminal. (Vendor to specify the type of marking in the GTP. It should be such that if it comes out should not cause reduction in

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clearances). High voltage phase windings shall be marked both in the terminal boards inside the tank and on the outside with capital letter 1U, 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. Sequence of marking should be 1U, 1V, 1W and 2n, 2u, 2v, 2w). Colour codes to be marked in addition to 1U,1V, 1W & 2u, 2v, 2w and 2n.

R , Y, B identification marking shall be provided on RMU Cable compartment & similarly R,Y, B, N marking to be done on Outgoing MCCB cable compartment.


xiii. TEMPERATURE INDICATORS:

Winding Temperature Indicator (WTI) for measuring the hot spot temperature of the winding shall be provided. It shall be suitable for control room as well as marshalling box installation and is built for long and trouble free operation under extreme conditions of service associated with the Cast resin Dry type transformers. It shall comprise of the following devices/features:

- a) RTD sensors shall be suitable to allow the user to monitor maximum six Critical Temperature parameters on the Transformer. Routing of sensing cables shall be done through cable turf with necessary tying through nylon tie belts.
- b) It shall be programmable to display, store and note maximum temperature such that the same can be recalled even after the power for the device is interrupted.
- c) It shall be compatible for communication with Computer / SCADA (IEC 61850).
- d) It shall be provided with settable set-points -
  - i) To warn the user of high temperature
  - ii) To trip the transformer in case of excessive heating.
- e) The temperature indication range shall be -25 to 300 deg C.
- f) The display shall be seven segment LED type for displaying temperature and channel number.
- g) The enclosure shall be of M.S. sheet box, powder coated, with acrylic viewing window and minimum degree of protection shall be IP52.
- h) It shall be operated by the supply voltage of 240 V AC.
- i) It shall not consume power more than 5 VA during operation.
- j) It shall be suitable for operation under max. Ambient temperature conditions.
- k) Sensors should be long RTD's.

xiv. MARSHALLING BOX:

All transformers shall have standard marshaling box. The Links in these should be of disconnecting type and should have facility to hold ring type of lugs. All links shall be droppable type ASEA links. Marshaling Box shall be suitably located not to obstruct the doors & power cables. Sufficient extra links to be provided for control wiring. Knock outs to be provided in marshaling box for control cabling. Heaters shall be provided in the marshaling Box and shall be fitted in proper location without creating any obstruction to other equipment in MB.

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xv. CURRENT TRANSFORMER:

The Neutral CTs window type, resin cast of protection class for ultimate E/F shall be provided for transformers of rating 1000, 750 and 630 kVA and above on the LT side. All the Metering LT CTs shall be cast resin type. The Current transformer shall be mounted with suitable clamping arrangement and should be C- shaped of sliding, soft material, non -screw type. The current transformer shall comply with IS 2705. The terminals shall have shorting facility. The CT should not get saturated up to 200% of rated current. The CTs shall have following parameters. CT terminal box for secondary of CT shall be provided of suitable size on the side of transformer. Box shall have droppable terminal blocks with shorting link. Secondary of CTs shall be stud type with lock nut. Colour coded wires shall be used for control and CT wiring.

Parameter	Neutral CT
Type	Cast Resin
Accuracy class	5P20
Burden	15 VA
Application	Protection Ultimate E/F
ISF	<=5
CT ratio for 1000, 750 and 630 KVA Transformer	2000/5 for 1000KVA, 1500/5 for 750KVA and 1000/5 for 630 KVA


Parameter	LT Metering CT
Type	Cast Resin
Accuracy class	0.5
Burden	15 VA
Application	Metering purpose
ISF	<=5
CT ratio for 1000, 750 and 630 KVA Transformer	2000/5 for 1000KVA, 1500/5 for 750KVA and 1000/5 for 630 KVA

xvi. OVERLOAD CAPACITY:

The transformer shall be suitable for loading as per IS 6600.

xvii. FASTENERS:

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. All nuts and pins shall be adequately locked. Wherever possible bolts shall be fitted in such a manner that in the event of failure of locking resulting in the nuts working loose and falling off, the bolt will remain in position. All

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ferrous bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanizing, except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals. 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. Taper washers shall be provided where necessary. Protective washers of suitable material shall be provided on front and back of the securing screws.

xviii. **FITTINGS:**

The following standard fittings shall be provided

- Winding temperature indicator complete with thermostat and annunciator (Alarmand trip
- Diagram, rating plate, terminal marking plate should be non-detachable. Separate plate for guarantee period & date of dispatch.
- Two earthing terminals with lugs at the centre of the bottom channels supporting the transformer.
- Lifting lugs for main tank & top cover.
- HV bushings – 3 Nos.
- LV bushings – 4 Nos.
- Stiffener angle
- HV connection with adequate CU bus bar.
- LV side connection with adequate Cu bus bar suitable to connect 1.1KV XLPE cables 4CX 300 Sq.mm cables for further distribution.
- Marshalling box with WTI on HT side.
- HV and LV cable terminal box should be at 180° and shall be properly supported.
- Separate neutral bushing with earth bar supported on insulation. Neutral Bushing CT : 2000/5 for 1000, 750 and 630 KVA.
- Inspection Cover & sufficient ventilation from bottom side also.



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## **LV COMPARTMENT:**

The complete arrangement of ACB & MCCBs shall be provided on frame work of channel with adequate strength to support the weight of ACB & MCCBs. Each outgoing shall be compartmentalised with MS sheet with adequate space/clearance. The frame work shall be covered from the front with GI sheet of thickness not less than 2mm. such that no live part is accessible at any time during the operation or testing period. All mechanism shall be made of such material as to prevent corrosion due to sticking of dust. Cast iron shall be used for any part of equipment which may be subjected to mechanical stresses.

All connections and contacts shall be of ample section and surfaces for carrying continuously the specified current without undue heating and shall be secured rigidly & locked in position.


All apparatus shall be so designed and constructed as to obviate the risks or short circuit of the live parts by lizards/rodents. Corresponding parts of similar apparatus shall be mutually interchangeable. All apparatus to minimize risks of fire and any damage which might cause in the event of fire.

### **i) ACB & MCCBS WITH BUSBAR:**

The bus bar shall be of electrolytic grade aluminium, duly sleeved with shrinkable coloured sleeves and maximum current density of 1.0A/sq mm. The bus bar from transformer secondary shall enter the LV compartment and suitably terminated at incoming of the 3 pole LT ACB. The ACB shall be mounted at a height to accommodate mounting of 6 nos. MCCBs (3 pole, 630A each) directly below the ACB with sufficient space for cable termination. Phase barriers shall be provided suitably at the terminals.

The outgoing from the ACB should be connected to bus bar which in turn are connected to the incoming bus bar of MCCBs. All LV bus bar shall be supported on the LV compartment frame with suitable bus support insulators of 1.1KV class. The minimum clearance between phase to phase shall be 25.4mm and between phase to earth 20mm. The neutral bus bar shall be same size as phase bus bar. Separate neutral bus bar has to be located suitably to terminate the neutral core of LT cable in 3 phase 4 wire system. The neutral bus bar shall be suitable to carry 2000 A. The neutral bus bar shall be insulated from the frame using 1.1KV class support insulators. The transformer neutral shall be terminated on the neutral bus bar in the LV compartment. The entire mechanism of breakers along with frame work shall be suitably earthed 25 x 6 sq mm tinned copper or equivalent Aluminium earth conductor at two distinct points and further connected to the common earth conductor provided for the entire sub-station.

Each MCCB should have ON & OFF indication lamp. LOTO lock arrangement to be done for LT ACB ON & OFF push button switch & Spring charging Handle.

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Note: The LT ACB should have self- powered release for O/C & E/F protection.LT ACB should have additional 230V AC Shunt Tripping coil for tripping of LT ACB through Remote. Additional compensating CT be installed on Neutral bus Bar to avoid tripping of LT ACB during unbalanced load. Pls refer the SLD.

## ii) PAINT:

All paint shall be applied on clean, dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The paint shall not be scale off or crinkle or be removed by abrasion during normal handling. The RMU body shall be painted with shade RAL 7032 or 631 as per IS-5. Sufficient quantity of touch –up paint shall be furnished for application at site.

## NAME PLATE & MARKING


All the components and operating devices of the RMU shall be provided durable and legible nameplates containing all technical parameters. Name plates shall be suitably embossed with “PO no. with date” “PROPERTY OF TPCODL” & “CODE NUMBER” along with the following information. A Danger plate of appropriate fixe shall also be provided on the enclosure.

### ENCLOSURE:

- i. Manufacture’s Name
- ii. Rated Voltage
- iii. System Frequency
- iv. Rated Short time withstand current for 1 Sec
- v. Rated Impulse withstand Voltage
- vi. Degree of Protection
- vii. Rated class of enclosure.
- viii. **“Don’t open the Door Transformer will Trip”** Name plate to be pasted on the PSS Transformer compartment Door.
- ix. **“Transformer Check Meter “** Name plate to be pasted on the PSS LV Compartment Door.

### RMU:

1. Manufacture’s Name
2. Type Designation or serial no.
3. Year of manufacture
4. Application Rated values
5. Mass of unit
6. SF6 gas filling pressure

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#### TRANSFORMER:

A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each transformer 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 back ground. Fixing screws for outdoor use shall be of stainless steel or any other corrosion resistant metals. Danger notice shall have red lettering on a white background or they may be pictorial as approved by the Purchaser. The name plate shall contain following information:


1. Type of transformer
2. Relevant standard.
3. Manufacturer's Name
4. Manufacturer's Serial No.
5. Year of Manufacture
6. No. of phases
7. Rated kVA
8. Rated frequency
9. Rated Voltage
10. Rated current
11. Connection symbol
12. Percentage impedance voltage at rated current
13. Type of cooling
14. Total mass
15. BIL

In addition to the above information the rating plate shall also contain the following:

1. Guaranteed values of no load losses and full load losses at 50% & 100 % load
2. Temperature rise
3. Table giving the tapping voltage, tapping current and tapping power of each tap.
4. Indication of winding which is fitted with tapping's
5. Value of short circuit impedance on extreme tapping and on principal tapping and Indication of winding to which impedance is related.
6. Actual losses of transformer
7. Overall dimensions

LV ACB AND MCCBs: (From Reputed OEM)

1. Manufacturer name
2. Type Designation or serial no.
3. No of the relevant standard
4. Utilization category
5. Rated voltage
6. Rated Current
7. Rated Frequency
8. Rated service Short breaking capacity (Ics)
9. Rated Ultimate short circuit breaking capacity (Icu)
10. Line and load terminals
11. Neutral pole terminal
12. Protective earth terminal
13. Indication of open and closed position

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14. Terminal marking on O/G MCCB
15. LOTO lock arrangement to be done for ACB ON & OFF Push button
16. LOTO lock arrangement for LT ACB Spring charging handle.
17. Indication lamp for MCCB ON / OFF

## **TESTS**


Routine & acceptance Tests shall be conducted on the Ring Main Units in accordance with the latest versions of IS/IEC. All the 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 are 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.

1. Dimensional and visual check
2. Mechanical operation test and checking of interlocks
3. Dielectric test on main and control circuits
4. Temperature rise test
5. Internal Arc withstand test
6. Degree of protection test
7. Test to check the capability of main and earthing circuits subjected to rated peak and short time withstand current

### Transformer Type test report

- i. Lightning Impulse Test with chopped wave [As per IS 2026 (Part 3)]. BIL for 11 kV shall be 75 kV peak on all the three phases.
- ii. Temperature Rise Test [As per IS 2026 (Part 2)]. The ambient temperature and time of test should be stated in the test certificate.
- iii. Note-This may also be done during acceptance test with No-load cycle+ Load cycles as per IEC60076-11
- iv. Short Circuit Withstand test [As per IS 2026 (Part 5)].-Thermal and dynamic ability.
- v. NOTE: Routine tests before and after short circuit test shall be conducted as per IS2026(Part-1)
- vi. Determination of Noise levels [IS 2026 (part 10)].
- vii. No load current at 112.5% voltage.
- viii. Measurement of Zero-phase sequence impedance.
- ix. Measurement of Harmonics of no-load current.
- x. Environmental Test, Climatic test and fire behaviour test ratings for E2/C2/F1 test certification as per IEC60076-11

**Note: -Out of the above mention type test, the tests under sl. No. i, ii, iii & iv shall be conducted at CPRI/ERDA labs for each ratings and the balance shall be acceptable as in-house tests.**

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### TYPE TEST CERTIFICATE

Bidder shall furnish the type test certificates of the 11kV RMU & Transformer for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA as per relevant standards. The 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 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**.

### 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 is liable to rejection. Supplier shall grant free access to the paces of manufacture to **TPCODL** representatives at all times when the work is in progress.

Inspection by the **TPCODL** or its authorized representatives shall not relieve the supplier of this obligation of furnishing equipments 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:

- i. Test reports
- ii. MDCC issued by **TPCODL**
- iii. Invoice in duplicate
- iv. Packing list
- v. Drawings & catalogue
- vi. Guarantee / Warrantee card
- vii. Delivery Challan
- viii. Other Documents (as applicable)

### INSPECTION AFTER RECEIPT AT STORE

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.

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### 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 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 supplied 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 replace / rectifier at bidder's risks and costs and recover all such expenses plus the purchaser's own charges 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.

### PACKING

Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport and be packed in such a manner as to protect it from damage in transit.

### TENDER SAMPLE


Not applicable.

### 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 in the material of construction, components during manufacture and after finishing, bought out items and fully assembled component and equipment including drives. As a 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 manufacture / sub supplier's works to carry out inspections.

### TESTING FACILITIES

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant IS/IEC.

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### 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 be submitted within 15 days from the release of the order.

### SPARES, ACCESSORIES & SPECIAL TOOLS/GAUGES

Bidder shall provide a list of recommended spares with quantity and unit price for 5 year of operation after commissioning. The purchaser may order all of 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 rate stated in the contract document.

The bidder shall provide one SF6 gas leak indicator & one no. phase comparator. A list of complete set special tools and gauges required for erection & maintenance and installation procedure shall be submitted.


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 year minimum. However the purchaser shall give a minimum of 12 month notice in the event that the bidder or any sub vendor plans to discontinue manufacture of any component use in this equipment.

Any spare apparatuses, parts or tools shall be subjected 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 identifications.

### Drawing / documents to be submitted after the award of the contract are as under:

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

1. Completely filled in technical Particulars
2. General description of the equipment and all components including brochures
3. General arrangement for RMU
4. Power flow diagram
5. Foundation plan
6. Bill of material
7. Experience List
8. Type test certificates

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Drawings/ Documents to be submitted after the award of contract are as under :


<b>Sr. No</b>	<b>Descriptions</b>	<b>For Approval</b>	<b>For Review/ Information</b>	<b>Final submission</b>
1	Technical particulars	√		√
2	General Arrangement drawings	√		√
3	Power Flow Diagram	√		√
4	HV and LV compartment layout	√		√
5	Schematic Diagram	√		√
6	Earthing Plan	√		√
7	Bill of Materials	√		√
8	Foundation Plan & loading Details		√	√
9	Installation instructions		√	√
10	Instruction for Use & maintenance		√	√
11	Transport/Shipping Dimension Drawing		√	√
12	QA & QC Plan	√	√	√
13	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** approval.

Instruction Manuals: Bidder shall furnish two softcopies (CD) and (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.



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### GENERAL TECHNICAL REQUIREMENTS:

<b><u>A. ENCLOSURE FOR PSS</u></b>				
Sr. No	Descriptions	Unit	As Specified By TPCODL	As Furnished By Bidder
1	Application		Outdoor	
2	Rated voltage	KV	12	
3	Service Voltage	KV	11	
4	System Frequency	Hz	50	
5	Rated impulse withstand voltage	KVP	75	
6	Rated power frequency withstand voltage	KV rms	28	
7	Rated LT voltage	V	433	
8	Degree Protection for Enclosure		IP 54	
9	Internal Arc Test		IAC-AB as per IEC 62271-202	
10	Max. Permissible Temperature for accessible part of the enclosure.	C	Maximum permissible temperature shall not exceed 70 deg C at an ambient temperature not exceeding 40 deg C	
11	Dimension of Enclosure (LxWxH)	mm x mm x mm	To be provided by bidder	
12	Thickness of sheet for enclosure – For base		2-3mm (min) GI sheet steel 3mm (min) GI sheet steel	
13	Control wiring	Colour code	To be provided by bidder	
	a) Type of insulation		PVC	
	b) Voltage grade	KV (Max)	1.1	
	c) Conductor Material with PVC colour coded sleeves.		Copper	
	d) Conductor Size & insulation wiring	Sq. mm	1.5 & 2.5	
	e) CT wiring & PT wiring	Sq. mm	4	
	f) Wiring identification mark & Accessories as per specification		To be provided by bidder	
14	Ventilation aperture		Class k10	
15	Locking arrangement		The doors shall be padlocked as well as protected.	
16	Earthing to be provided -PSS -RMU -Trf body and neutral -LV ACB & MCCB		To be provided by bidder	
17	Accessories like Heater, Lamps, hooter, door switch, etc.		To be provided by bidder	
18	Paint		PENTON E2727C	

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19	No of Accessories furnished		
	a) Earthing equipment		To be provided bidder
	b) Test Plug		To be provided by bidder
20	Guarantee-from date of takingover by <b>TPCODL</b>		36 Months from the date of commissioning or 48 months from the date of last supplies made under the contract whichever is later
21	Availability of spares		Assurance by bidder for 25 years
22	Dimension	mm x mm x mm	To be provided by bidder
23	Total weight	Kg	To be provided by bidder
24	HT and LT connection between Trf ,RMU & LT ACB	CU with colour coded sleeves	To be provided by bidder

#### B. 11kV RMU


S.N.	Description	As specified by TPCODL	As furnished by Bidder
1.0	RMU Category	3Way - 1CB & 2LBS - (LBS Motorized)	
2.0	RMU application	Indoor	
3.0	Offered Model nos. and OEM type	3Way	
4.0	Dielectric medium	SF6	
5.0	Interrupting medium	Vacuum- for CB SF6 for LBS and earth switch	
6.0	System Frequency	50 Hz	
7.0	Rated Voltage	12 KV	
8.0	Service Voltage	11 KV	
9.0	Rated current -Line Switches	630 A	
10.0	Rated Current-CB and LBS	630 A for all type	
11.0	Rated Short time current withstand (3 sec )	21 KA	
12.0	Rated Short time Making capacity	50 KA	
13.0	Rated cable charging interrupting current of incomer load break switch	10 A	
14.0	Rated load interrupting line current	630 A	
15.0	Rated cable charging breaking current of breaker	25 A	
16.0	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	
17.0	Opening time of breaker (max.) Without relay time	2.5 cycle	
18.0	Closing time of breaker (max.)	3 cycle	
19.0	Breaker Duty Cycle	O – 3min - CO - 3min – CO	
	i. Mechanical endurance for Isolator & Earth Switch	Min 1000 Operations	

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20.0	ii. Mechanical endurance for Circuit Breaker	Min 2000 Operations	
21.0	Electrical operations of at rated current a. LBS/Disconnecter b. Earth Switch	To be provided by bidder	
22.0	Temp rise above ambient of 50 deg.	50 Deg C. (Type Tested as per IEC and complying to requirements)	
23.0	Min Gas pressure in bar	To be provided by bidder based on type tested design	
24.0	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.	
25.0	Enclosure	The RMU metal parts shall be greater than 2mm thickness high tensile steel/CRCA. The overall paint thickness shall be not less than 70 microns.	
26.0	Guaranteed SF6 leakage per annum	Less than 0.1% from main tank	
27.0	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	
28.0	Internal Arc rating	IAC AFL or better	
29.0	Internal Arc test	20kA for 1 Sec.	
30.0	Lightning Impulse withstand Voltage	75 kVp	
31.0	Power Frequency withstand voltage	28 kVrms.	
32.0	SF6 Tank design	Hermetically/robotically sealed unpainted stainless steel enclosure with SF6 Gas. Sealed pressure system by Laser 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.	
33.0	Earth bus bars	In enclosure to prevent tampering.	
34.0	Material & size of earth bus bar	To be provided by the bidder	

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35.0	Earthing of main CCT Cables shall be earthed with earth switch with S/C making capacity as per IEC 129. Moving contacts of earthing switch shall be visible in closed position thru transparent covers AND closing shall be possible only when Isolator is open	To be provided by bidder	
36.0	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.	To be provided by bidder	
37.0	<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 &amp; Close, Manual operation &amp; 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>	To be provided by bidder as per specs.	
38.0	Protection Relay-Without auxiliary power & shall include , electronic relay, low energy release & fast on test receptacle for protection testing	To be provided by bidder	
39.0	Make of self-powered Relay & offered model	ABB-REJ603,,Ashida, Schneider, Siemens, C&S,	
40.0	Flag indication for CB Trip on fault in relay/ mechanical	To be provided by bidder	

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41.0	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	
42.0	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.	
43.0	Doors	Hinged Main doors shall be provided for outdoor type RMU. The hinges for the doors need to be riveted and shall not have any access from outside. Bolted shall not be acceptable.	
44.0	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	
45.0	Cable cleats (full circle)	HDPE/Nylon (Fire Retardant)	
46.0	Cable termination and bushing suitability	Heat/ Cold shrink terminations	
46.0	Cable compartment suitability shall be	Suitable for cable sizes In the isolators compartment 11kV, 3C X 300 sq. mm and in breaker compartment 11kV, 1CX185 sq. mm / 3C X 300 Sq. mm	
47.0	The cable compartment	All cable compartment shall be bottom entry and front opening type only	
48.0	Size of bimetallic washer in all compartments	Must be suitable for M12 bolt and bushing sizes with min. 2mm thick.	
49.0	Height of bushing terminal from base plate	Minimum 800mm for proper termination space.	
50.0	Fault passage indicator	One per RMU in Incomer left LBS as a part of each RMU with specified default setting. The five way RMU shall have FPI in both LBS.	
51.0	Operating handle	To be provided by bidder as a part of RMU with each RMU and to be placed on front or on door	
52.0	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 Green for TPC.	
53.0	Main Bus bar Material	Copper	
53.1	Bus bar Cross Section	To be specified by bidder as per	

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		current density	
54.0	Opening & Closing times with relay	125 ms maximum	
55.0	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 co-axial position with base plat holes and bushing terminal bolts. CTR-200/1 (further finalization in detailed engineering), 5P20	
56.0	Future motorization and SCADA Compatibility	To be provided	
57.0	Guarantee	As per specification	
58.0	Dimension (LxWxH) (mm x mm x mm)	To be provided by bidder	
59.0	Total weight	To be provided by bidder	
60.0	Paint	Light Gray shade RAL 7032	
61.0	Type test of product	To be provided by bidder as per Specification	
62.0	Availability of spares	Assurance by bidder for 25 years, list of spares as mentioned in specification to be provide along with RMU lot.	
63.0	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.	
63.1	VPIS	In all compartments	
64.0	Breaker operation counter	To be provided by bidder	
65.0	LBS operation counter	To be provided by bidder	
66.0	Moisture absorption material in SF6 tank	Bidder should provide the detail of the moisture absorption material.	
67.0	Direction of operation (As offered)  (Close - clock wise Open- counter clock wise)	a. LBS – ON/off b. ES- Open/ close c. CB disconnecter- ON/off d. CB earth switch-Open/ close	
68.0	Making of earthing operations	All earth operation to be marked with green back ground and permanent in nature.	
69.0	Auxiliary contacts (total numbers and spare numbers)	LBS Earth Switch CB CB Disconnecter - CB earth switch-	

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70.0	Control cable entry provision	To be provided	
71.0	Shunt trip coil 24V DC/ 230V AC	230V AC shunt trip coil to be provided. Trip coils to be wired up on TB.	
72.0	MCB for LT AC incomer and TB connection of all CT, Aux switches and relay wiring	To be provided	
74.0	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	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	
75	Type test reports	Bidders to provide detailed list of tests conducted at lab name, conducted dates, report number along with full reports.	
<b>For motorized RMU</b>			
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	<b>Technical Details of motors</b>		
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	

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e	Power Supply	There shall be provision of 230 V AC (maximum 5 Amp current ) & 24 V DC
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<b>C. DISTRIBUTION TRANSFORMER</b>							
Sr.No	Descriptions	Unit	As Specified By TPCODL			As Furnished By Bidder	Remarks
1	Continuous Rating	KVA	1000KVA	750KVA	630KVA		
2	Voltage ratio	KV	11/0.433	11/0.433	11/0.433		
3	HV current	A	52A	39A	33A		
4	LV current	A	1320A	1000A	840A		
5	Frequency	Hz	50+/-3%	50+/-3%	50+/-3%		
6	No. Of Phases		3	3	3		
7	HV connection		Delta	Delta	Delta		
8	LV connection		Star (Neutral brought out)	Star (Neutral brought out)	Star (Neutral brought out)		
9	Vector group		Dyn11	Dyn11	Dyn11		
10	Tap changer (off load)		+10% to -10% in steps of 2.5%	+10% to -10% in steps of 2.5%	+10% to -10% in steps of 2.5%		
11	Type of Transformer		Dry Type	Dry Type	Dry Type		
12	Type of construction		Cast resin type	Cast resin type	Cast resin type		
13	Type of cooling		AN	AN	AN		
14	Class of Insulation		Class H	Class H	Class H		
15	Winding Material		Copper	Copper	Copper		
16	Noise level at rated voltage and frequency	Db	64	64	62		
17	Permissible temperature rise over ambient						
a)	Temp rise of winding(measured by resistance)	Deg C	40 at an ambient of 50deg C	40 at an ambient of 50deg C	40 at an ambient of 50deg C		




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18	No load losses at 75degC	W	1250Watt	1250Watt				
19	Load losses at 50% and 100% loading at 75degree Temp							
a)	Total Max losses at 50% Loading	W	2790Watt					
b)	Total max Losses (Cu only) losses at 100%	W	7700Watt		5300 Watt			
c)	Total Losses at 100%(18+19b)	W	8950 Watt					
20	Impedance (with IS tolerance)	%	5%	4.5%	4.5%			
21	Weight of core	Kg	To be provided by bidder					
22	Weight of winding	Kg						
23	Total weight (Approx)	Kg						
24	Regulation at UPF	%						
25	Regulation at .8 PF	%						
26	Efficiency at 100 % Load & UPF	%						
27	Efficiency at 75 % Load & UPF	%						
28	Efficiency at 100 % Load & 0.8 PF	%						
29	Efficiency at 75 % Load & 0.8 PF	%						
30	Maximum flux density rated Voltage	Wb/ sq mm					1.6 (Max)	1.6 (Max)
31	Max current density	A/Sq mm	2.6	2.6	2.6			
32	Test voltage power frequency	KV rms	28	28	28			
33	Impulse Voltage	KV p	75	75	75			
34	Magnetising (no load) current at 100% voltage	%	2%	2%	2%			


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35	Magnetising (no load) current at 112.5% voltage	%	5%	5%	5%		
36	Minimum HV clearance phase to phase / phase to earth in cable Box	Mm	130/90	130/90	130/90		
37	Minimum LV clearance phase to phase / phase to earth in cable Box	Mm	45/20	45/20	45/20		
38	Induced over voltage test at double frequency	KV rms	As per IS	As per IS	As per IS		
39	Grade of core		M3 or better	M3 or better	M3 or better		
40	Terminal on LV side		Bus bar with insulated sleeve	Bus bar with insulated sleeve	Bus bar with insulated sleeve		
41	Terminal on HV cable		Push on /heat shrink	Push on /heat shrink	Push on /heat shrink		
42	Dimension (Lx W x H)		To be provided by bidder	To be provided by bidder	To be provided by bidder		
43	Neutral Cast resin CT Ratio & Knee point voltage		2000/5 & 80V	2000/5 & 80V	2000/5 & 80V		
44	Reference standards		IS 11171 : 1985	IS 11171 : 1985	IS 11171 : 1985		

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D. LV Compartment				
Sr. No	Descriptions	Unit	As Specified By TPCODL	As Furnished By Bidder
1	Thickness of sheet for the frame	Mm	2-3mm (min) GI	
2	Max. Current Density of bus bar	A/sq mm	1.0	
3	Max, permissible temperature		80 deg C at terminal with an amb. Temp not exceeding 40 deg C	
4	Min. clearance between phases	Mm	25.4	
5	Min. clearance between phase to earth	Mm	20	
6	<b>ACB</b>			
7	Application		Indoor	
8	Rated voltage	V	433	
9	Rated current	A	2000A	
10	Type of release		CT operated thermal overload & magnetic short ckt. Release (Micro processor based protection)	
11	CT ratio of Neutral Compensating CT			
11	Rated insulation with colour coded sleeves.	V	1100	
12	Rated impulse-Withstand voltage	kV	8	
13	No of poles		3	
14	Rated Ultimate short ckt breaking capacity ICU	kA (rms)	50	
15	Rated service short ckt breaking capacity Ics	kA (rms)	100% of ICU	
16	Rated short time withstand capacity Icw	KA p	50kA	
17	Rated Making capacity	KA p	105 KAp for 1 sec	
18	CT operated thermal overload relay with setting range	%	50-100%	
19	Typical operating time	m sec	< 40	
20	Typical closing time	m sec	To be provided by bidder	

MCCBs				
Sr. No	Descriptions	Unit	As Specified By TPCODL	As Furnished By Bidder
1	Application		Indoor	
2	Rated voltage	V	433	
3	Rated current	A	630	
4	No of MCCBs		6 nos. 630A, (5 +1 For fire supply)3P with thermal magnetic release	
5	No of poles		3	
6	Rated insulation voltage	V	1100	
7	Impulse-Withstand voltage	kV	8	
8	Rated operation voltage	V	1100	

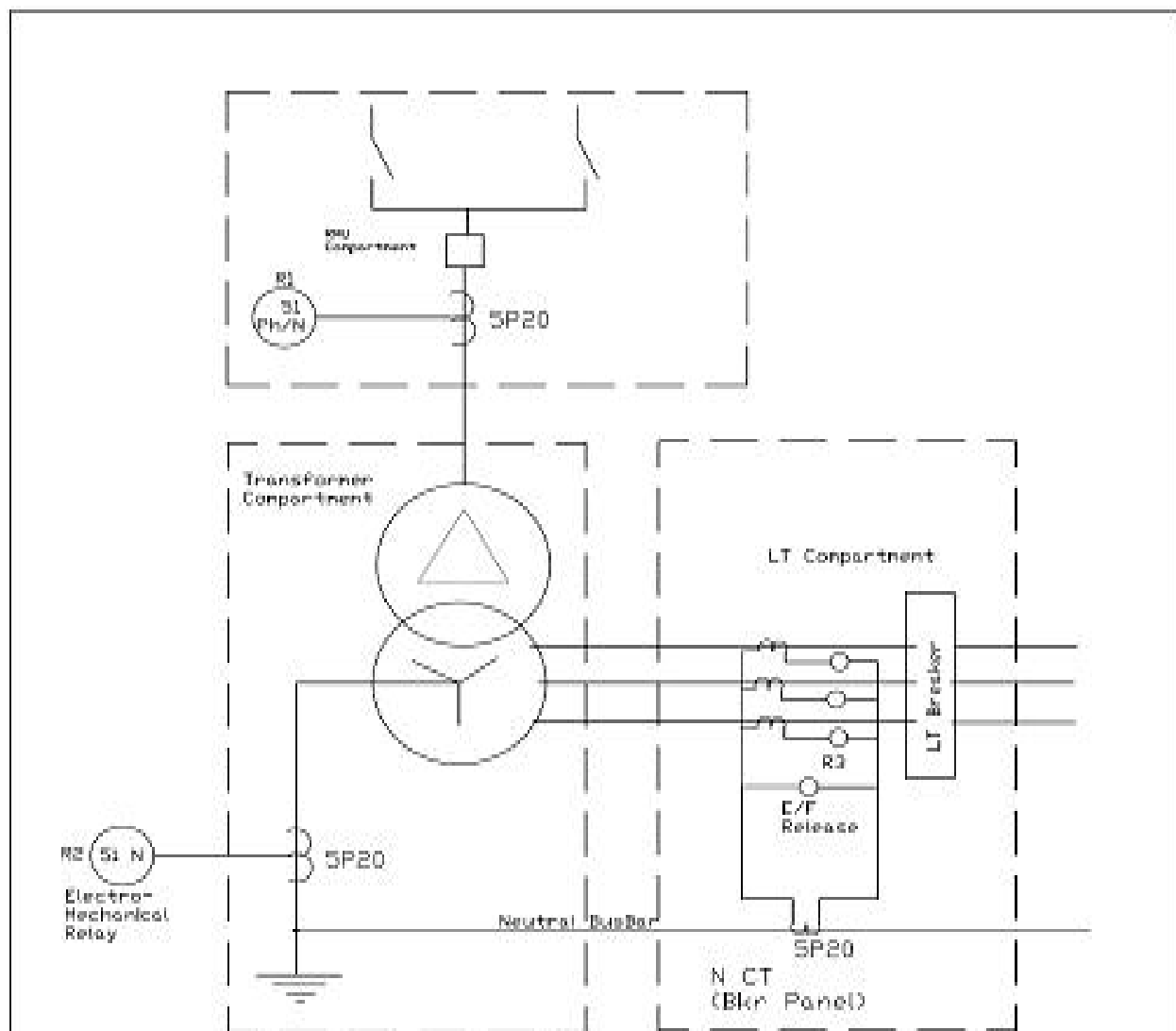
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9	Rated ultimate short circuit breaking capacity Icu	kA (rms)	Min 50kA	
10	Rated service short circuit breaking capacity Ics % of Icu	kA (rms)	100%	
11	Overload release setting		50-100%	
12	Typical opening time	m sec	As per IEC 60947/ IS 13947	
13	Typical closing time	m sec	As per IEC 60947/ IS 13947	
14	Electrical and mechanical life (No of operating cycles)		As per IEC 60947-2	
15	Thermal shrouds		To be provided	
16	Phase barriers		To be provided	

Specific requirements of control & Protection circuits:


1. HT Breaker of RMU shall be wired to trip on followings:
  - A) WTI
  - B) Transformer LT Neutral E/F relay
  - C) Door switch of transformer compartment

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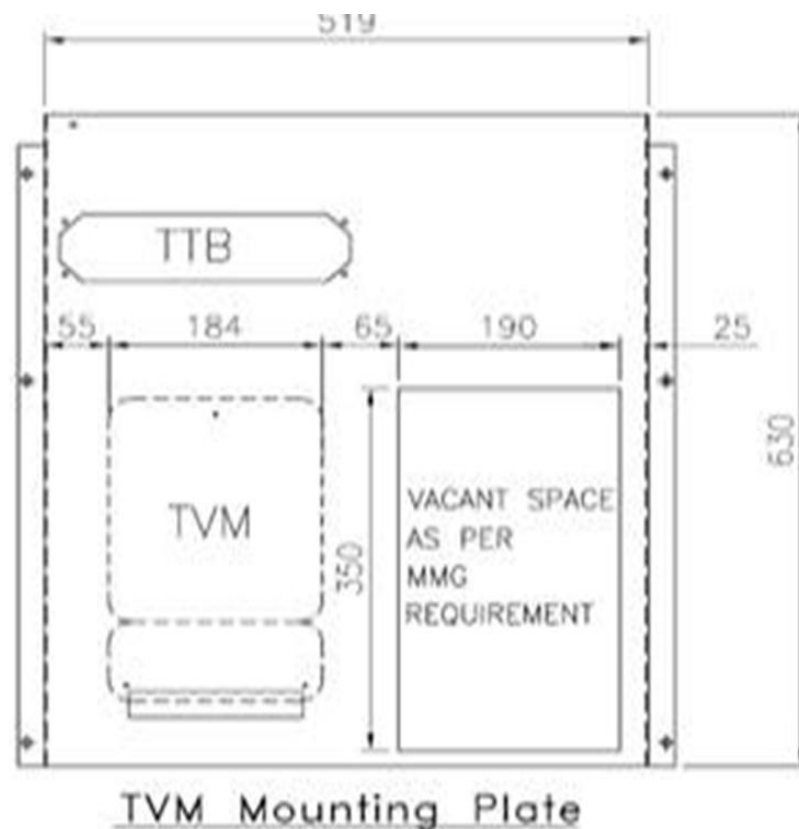


Trip Relay	RMU Breaker	LT Breaker
R1 (RMU)	X	
R2 (Neutral E/F)	X	X
R3 (LT Bkr)		X
DTI (Transformer)	X	
Transformer Door	X	

<b>TATA POWER COMPANY LIMITED</b> PROJECT:-	Protection scheme for Package s/s	DESIGNED BY: Potchode	Appr: BSK	R-CEB-356	26-07-07	Rev R0
		STATUS: Released	Scale: N.T.S			

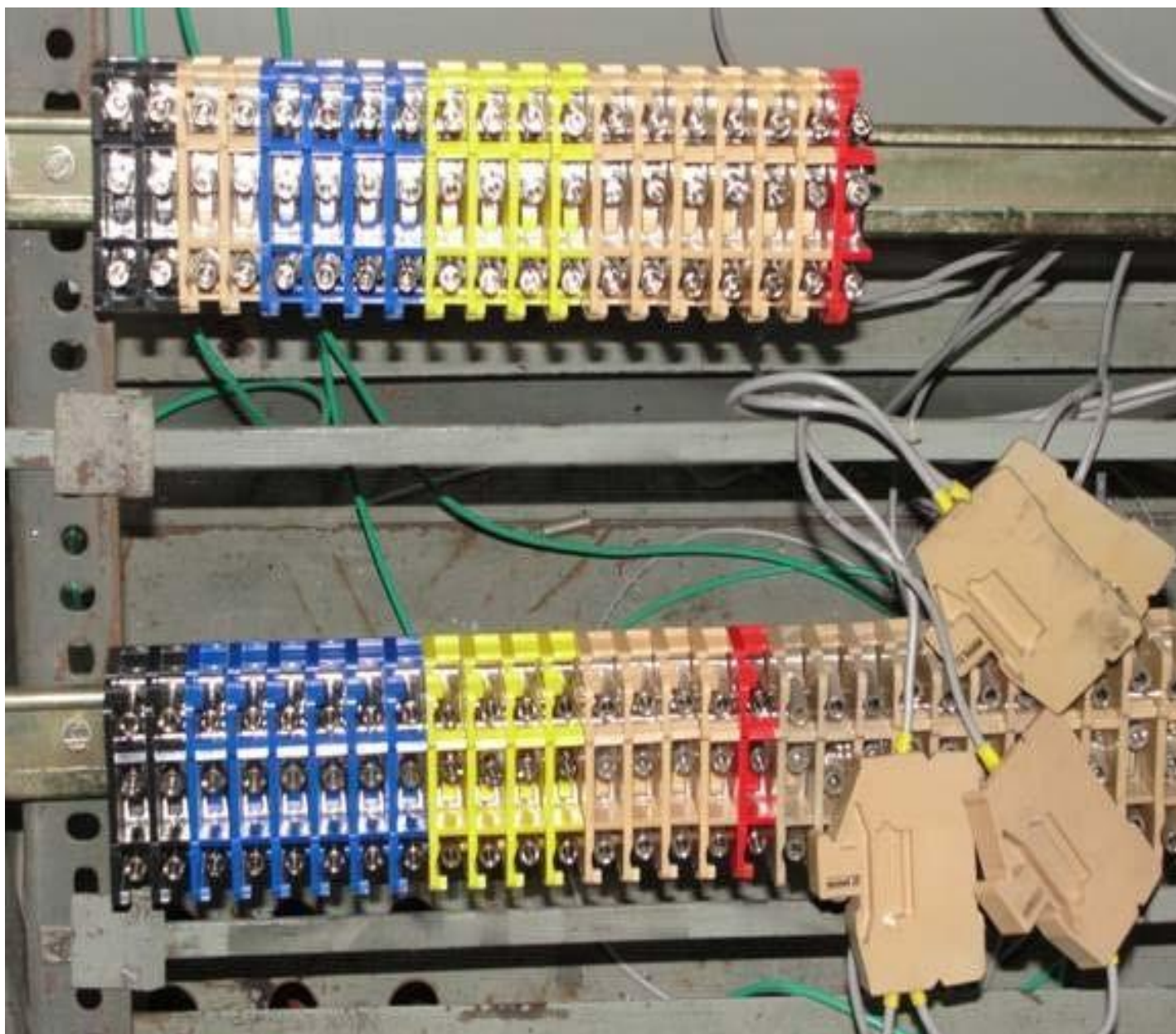
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2. The wiring of Trip circuits for above shall be independent of any other control / illumination circuits. (240V AC supply to Space Heaters, & PSS internal illumination & auxiliary supply through R phase, 240V AC supply for External illumination through Y phase and Tripping circuit dedicatedly though B Phase). All three supply should be taken
3. directly through ACDB outgoing Bus and through individual fuse links.
4. There must be separate supply from any one ACDB outgoing phase busbar tapping for auxiliary supply to one5/15A sockets and this is to be marked with name plate.
5. Fuses shall be employed on all the control circuits.
6. Provide the SLD with separate neutral earth fault relay.
7. Provision for spare relay to be made.
8. The LT breaker relay testing kit to be provided with each PSS.
9. The separate cut out to be made in the PSS in addition to the meter provided.
10. ON /OFF Indicating Lamp to be provided on each outgoing MCCB .
11. ON /OFF Indicating Lamp to be provided for LT ACB
12. TTB Should be DAV Make , 50Amp and Front end connection.
13. **“Don’t open the Door Transformer will Trip”** Name plate to be pasted on the PSS Transformer compartmentDoor. **“Transformer Check Meter “** Name plate to be pasted on the PSS LV Compartment Door.



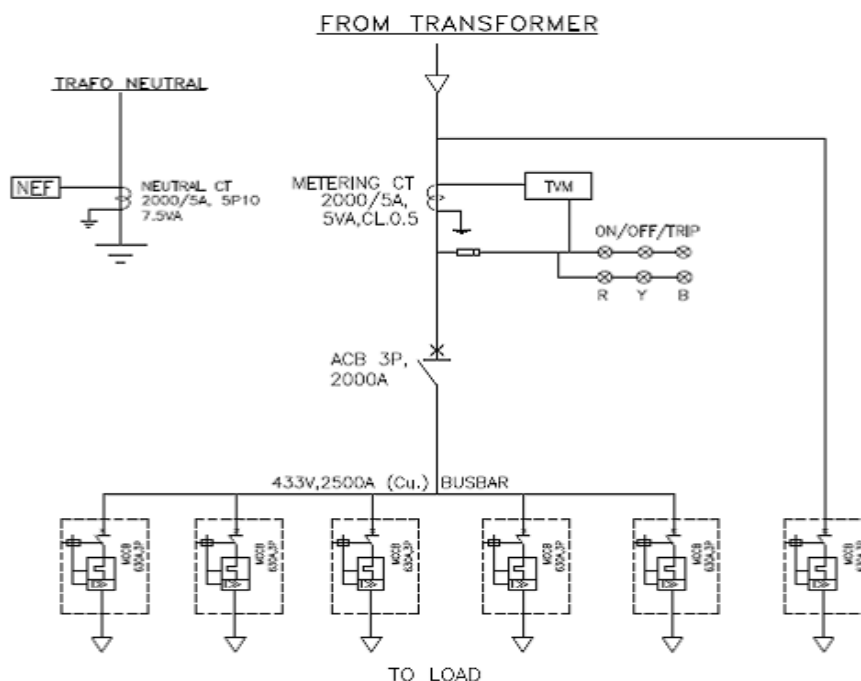
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14. Colour coded links to be provided.



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15. The SLD for fire pump to be provided as shown below:




## 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:

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



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## 50.0 TECHNICAL SPECIFICATION FOR DISTRIBUTION PILLAR BOX WITH MCCB

### GENERAL TECHNICAL PARTICULARS

#### 1.0 SCOPE:

- a) This Technical Specification covers design, manufacture, assembly, inspection and testing at works and supply of LT Feeder Pillar Box Complete with accessories and other miscellaneous equipments specified in this specification.

#### 2.0 STANDARDS:

- 2.1 The equipment should conform in all respects to the relevant latest editions of the Bureau of Indian Standards or other equivalent National or International Standards.
- 2.2 If the specifications other than those mentioned below are applicable, the fact should be made clear in the bid and one copy of such standard specifications in the English language shall be enclosed with the bid.
- 2.3 The equipment shall also comply with the latest revision of the IE ACT & Indian Electricity Rules and any other applicable statutory provision, rules and regulations applicable in the location where these are to be installed.


#### 2.4 THE APPLICABLE STANDARDS ARE LISTED HERE BELOW:

IS: 5-1994: : Colour of ready mixed paints and enamels.

IS: 6875/1973 : Control switches, push buttons and related Part I & II control switches.

IS: 13607/1992: Ready mixed paint, Finishing, General purpose, Synthetic.

IS: 13947/1993: Specification for Low-voltage Switchgear and Control gear.

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### 3.0 CLIMATIC CONDITION:

The Feeder Pillar Boxes offered shall be suitable for being used in the ODISHA, where cyclonic storm effect is heavily experienced along with following weather conditions.

- |    |  |                     |
|----|--|---------------------|
| a) | Minimum temperature of air in shade    | - 5 <sup>0</sup> C  |
| b) | Maximum temperature of air in shade    | - 50 <sup>0</sup> C |
| c) | Relative Humidity                      | - 85% - 100%        |
| d) | Average No. of rainy days per annum    | - 90 days           |
| e) | Rain fall                              | - 750-3000mm        |
| f) | Altitude above means sea level maximum | - up to 10 Mtrs.    |

### 4.0 PRINCIPAL PARAMETERS:

The Feeder Pillar Box shall conform to the specific Technical requirement specified hereunder.

- |    |                           |                                    |
|----|---------------------------|------------------------------------|
| 1. | Rated Voltage             | - 433 V $\pm$ 10%                  |
| 2. | Rated Frequency           | - 50 HZ                            |
| 3. | Continuous Current Rating | - 1000 Amps                        |
| 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 | - 50KA.                            |


#### 4.1 FEEDER PILLAR BOX DESCRIPTION:

4.1.1 Feeder Pillar Box shall be suitable for the purpose for which they are intended to be used.

4.1.2 Each box shall be complete with following accessories:

- a) 630 Amps MCCBs for incoming & out going L.T. UG cable
- b) 1-ph-32 Amps MCBs for single phase consumers.
- c) 3-Ph ,63 Amps MCBs for 3-Ph consumers,
- d) Electronic TV Energy meters (2 nos) along with C.T, suitable for recording energy .
- e) Lock & key.
- f) Interlocking arrangement with MCCB between two incomers supply.
- g) Suitable size of heater should be provided with thermostat.

4.1.3 Feeder Pillar Box shall have access for sufficient ventilation and heat dissipation.

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4.1.4 The cable entry and exit shall be from the bottom of the box. The design of the box must be such as to facilitate easy removal of the cable during erection and repair by suitable bolting the box cover and sliding the bottom plates. The entry of the cable at the extended box shall be through 100mm PVC pipe and projecting 50mm inside the box through suitable glands. The extended box shall be provided with suitable gland and clamps for fixing the cable rigidly. The feeder pillar box shall be suitable for 1.1kV 4 core 400/300/240 sq.mm armored UG cable through 100mm PVC pipe and clearance inside the box must be such as to offer fair working facilities during erection and maintenance.

4.1.5 The inside surface of the box shall be insulated by fiber sheet to with stand 1.1 kV insulation to prevent flash over.

4.1.6 The box shall be vermin proof and dust proof.

4.1.7 Louvers of suitable size shall be provided in the front for ventilation and wire nets shall be provided on the back of the louvers to prevent the entry of dust and insect.

4.1.8 The box shall have double door (self-closing type) fitted with internal type door lock with common key for all the boxes and shall given maximum protection to the interior of the box.

4.1.9 The feeder pillar boxes shall be made of Galvanized steel sheet of 3.5 mm thickness to with stand in the weather of Odisha costal city

4.1.10 The Feeder Pillar Box shall be suitable to mount on brick concrete foundation. Necessary provision for foundation bolt in the pillar shall be made for GI foundation bolts of size 12mm. Nuts, Bolts and 2 Nos. of Washers

4.1.11 The box shall be provided with suitable rain shed and all bolt and washers used shall be galvanized mild steel.

4.1.12 A danger board as shown in the sketch shall be provided in the front of the box.

## 4.2 EARTHING:

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.


## 4.3 NAME PLATE AND CIRCUIT BOARD:

4.3.1 The Feeder Pillar Box shall be provided with transparent label or card of removable type and the following information are to be recorded.

(1) Title

(2) Cable Size

(3) Current Rating of I/C Cable

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(4) Current Rating of O/G Cable

(5) Current Rating of MCBs.

(6) No. of Outgoing service mains with their code numbers

4.3.2 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.

4.3.3 The Circuit plate with following engraved information has to be riveted to the inside of the door of the feeder pillar box in an accessible position for easy reading.

Incoming Line from :

Incoming Line to :

Outgoing Line \_\_\_ Amps to : (24 nos.) 1-Ph, and (8 nos.) 3-Ph.

## 5.0 FABRICATION:

5.1 The feeder Pillar-Box shall be in conformity with relevant I.S

5.2 The feeder pillar-Box shall comprise of the following accessories.

(1) Feeder Pillar box Metal Body/completely galvanized

(2) Aluminum bus bar provided with 1.1 kV insulating PVC sleeves.

(3) Removable links.


(4) MCCB 630 Amps for 2 No's incoming cables

(5) MCBs of suitable capacity for service mains -

(Outgoing Line \_\_\_ Amps to : (24 nos.) 1-Ph, and (8 nos.) 3-Ph)

## 5.3 FEEDER PILLAR BOX METAL BODY:

5.3.1 Feeder pillar box metal body shall be made out of high grade galvanized MS sheet confirming to IS1079, with 3 mm thick for the body and doors.

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#### 5.4 BUS BARS:

- 5.4.1 Feeder pillar 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.
- 5.4.2 The insulated sleeves shall be of high grade to with stand 1.1 kV with Red, Yellow and Blue colour for three phases and black for neutral.
- 5.4.3 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.
- 5.4.4 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.

#### 5.5 MCBs

The feeder pillar box shall be provided with MCBs of reputed make.

#### 5.6 MCCBs


MCCBs shall be suitable to work on 433 V, 630 Amps, four 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 and able to withstand breaking stresses with quick and reliable spring loaded operating handle.

The location of operating handle shall be so as to facilitate convenient operation. The position of ON & OFF must be clearly indicated. The utilization category of the switch shall be Ac-23.

MCBs/MCCBs	
1-ph, 32 A	24 nos
3-ph, 63 A	8 nos.

#### 6.0 TEST & TEST CERTIFICATES AND INSPECTION:

- 6.1 The following routine tests shall be carried out on the panels at the factory:
- Checking of overall dimension, thickness of box sheet and paint film.
  - Checking correctness of continuity of circuits.
  - One minute HV withstand test – All equipments on panel and internal wiring shall be tested to withstand a test voltage of 2KV to earth for one minute.

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- d) Insulation resistance of the complete circuit by circuit with all equipments mounted on the panel using insulation Tester/Megger.
- e) Verification of degree of protection as per IS: 13947 (part-I).

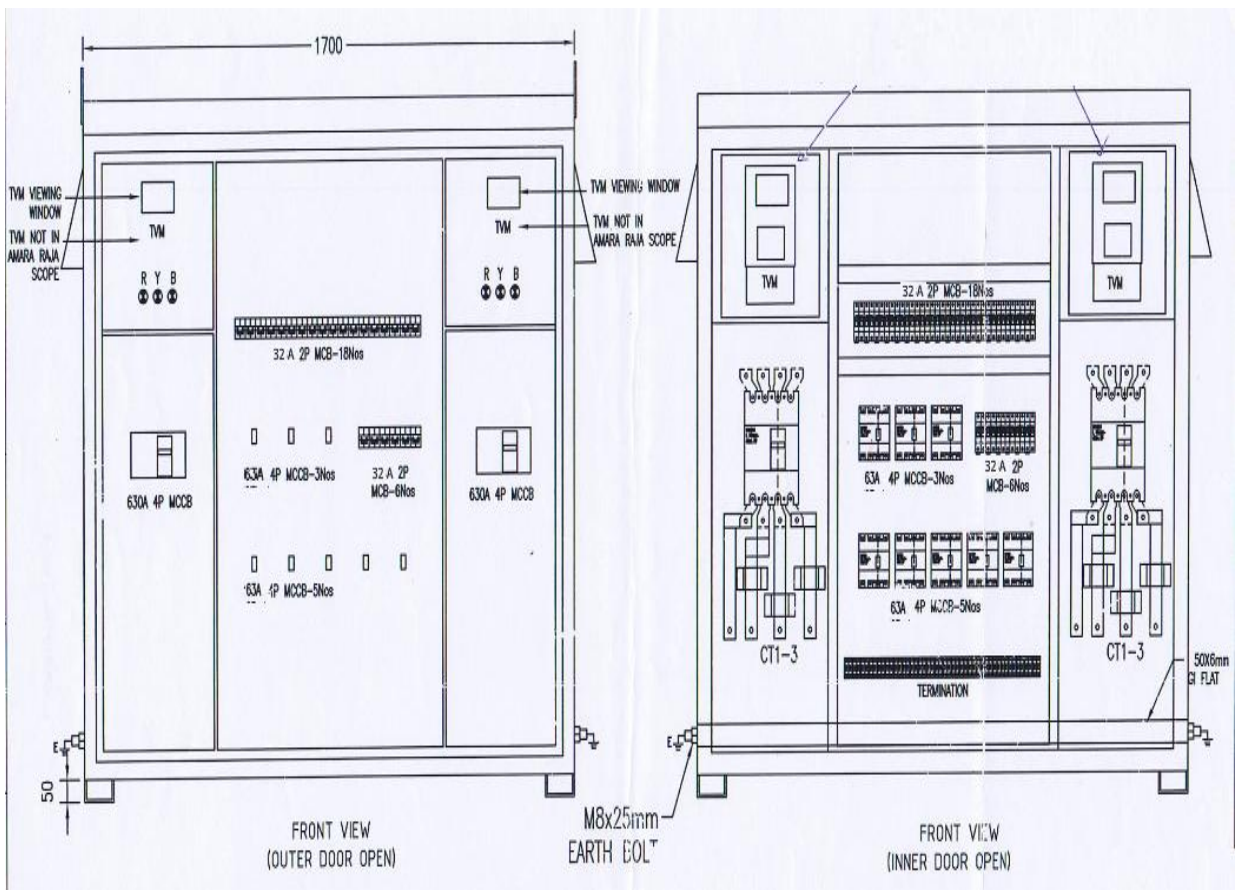
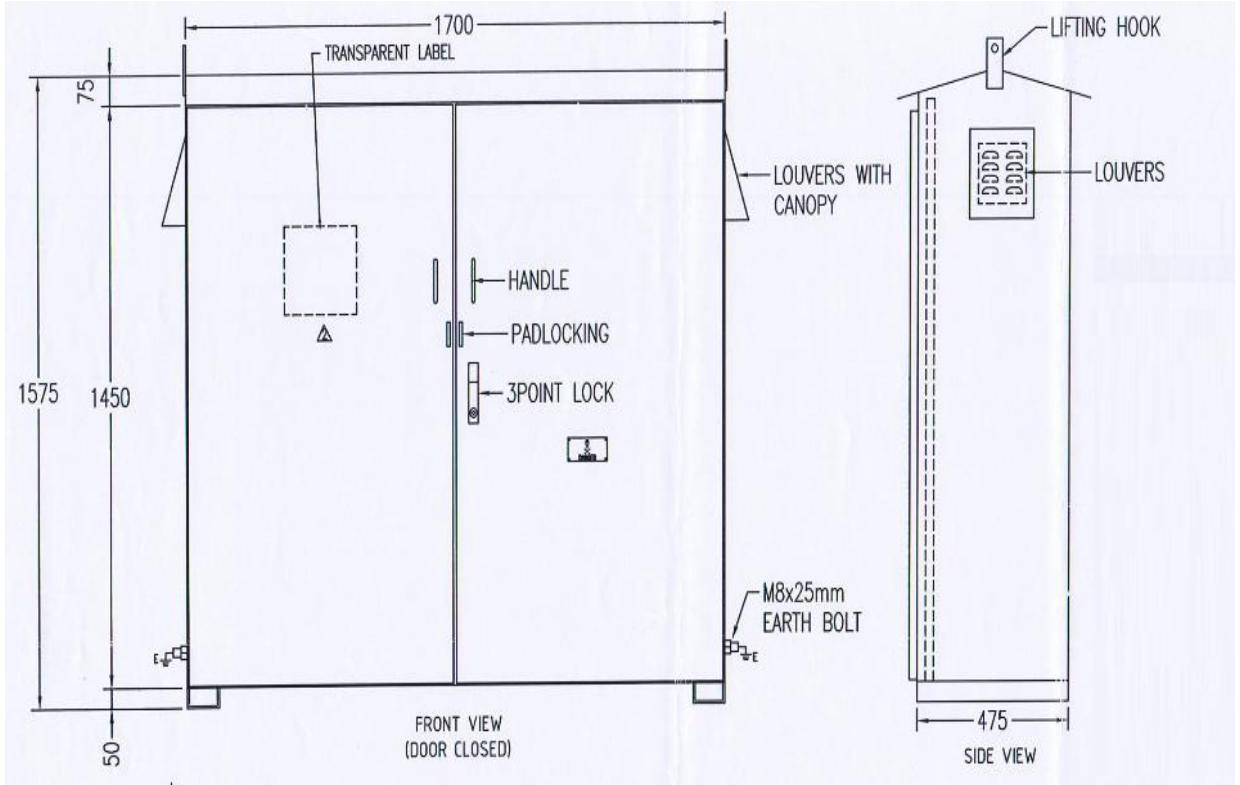
**6.2** The main components used in feeder pillar box shall be subjected to type test and conform.


**6.3** All routine and acceptance tests shall be conducted in presence of the owner's representative. No material shall be dispatched unless the owner communicated his written approval to these test certificates.

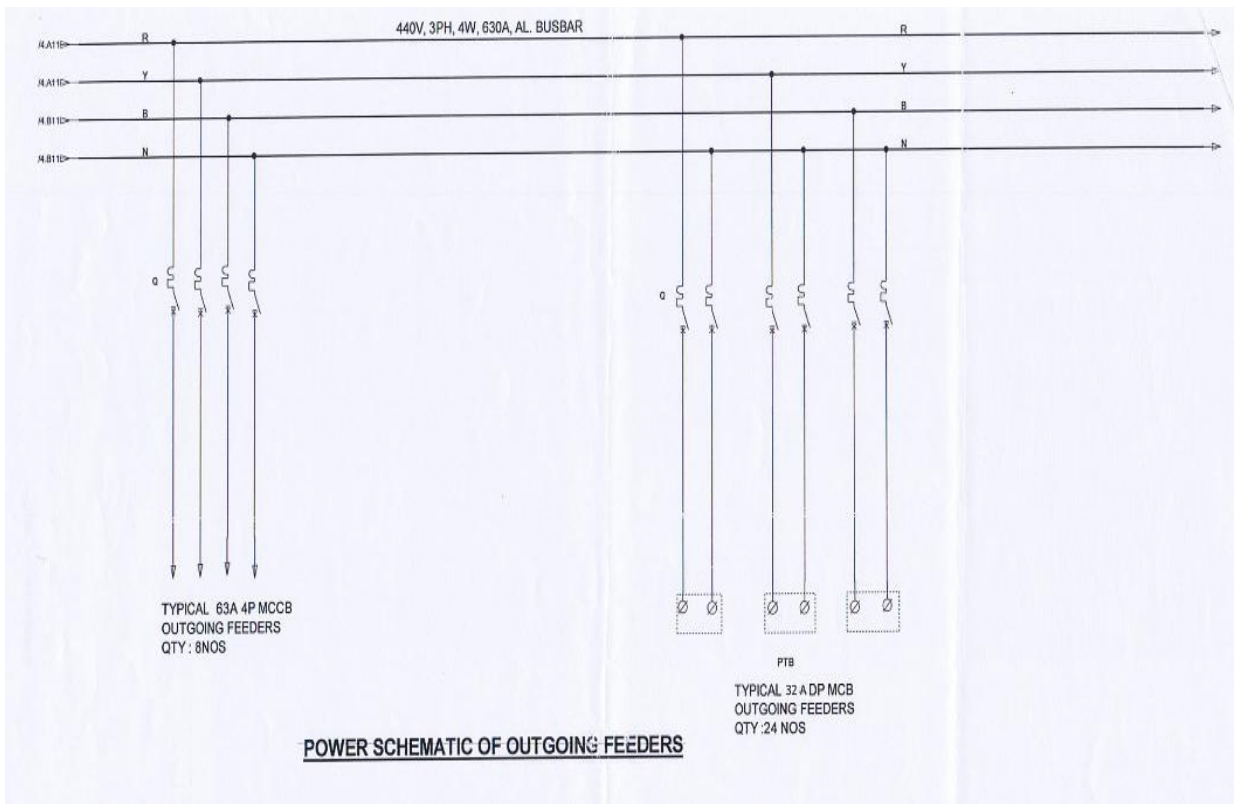
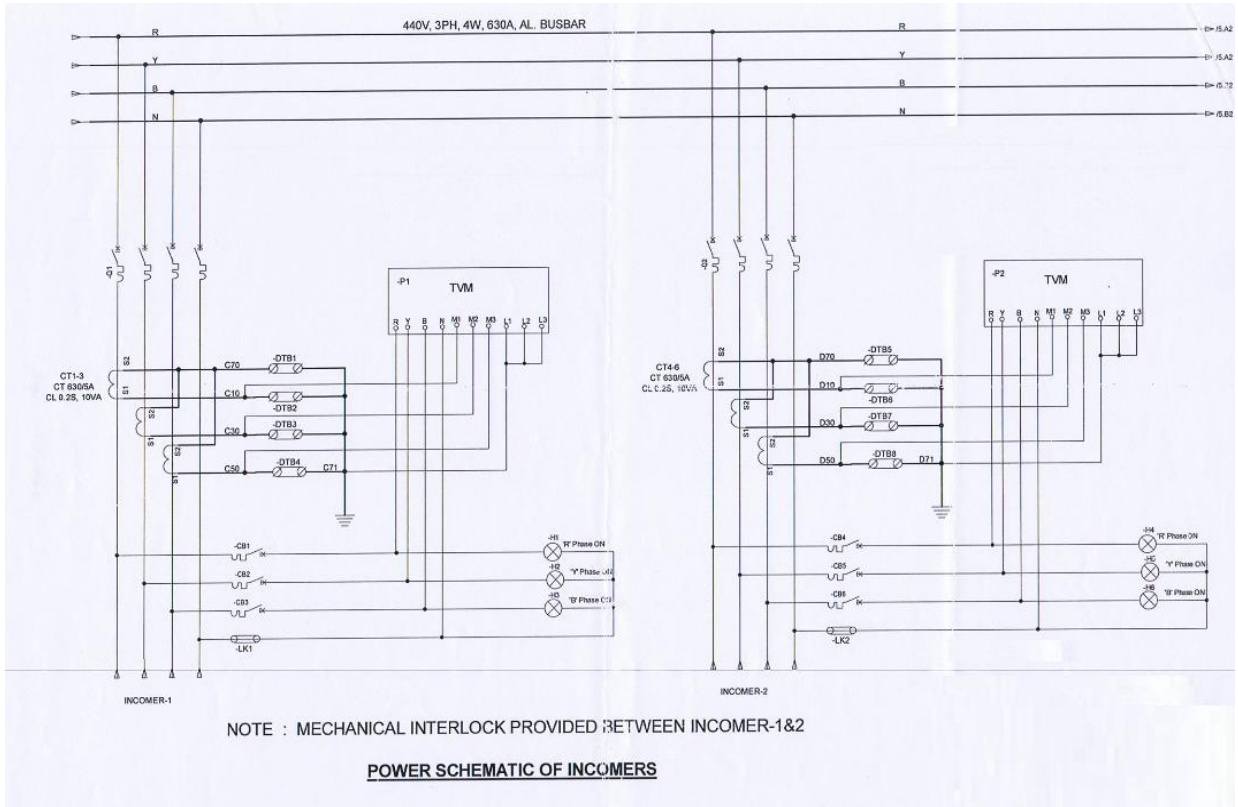
Copies of the type and routine test certificates for all the components used in the manufacture of the box from a recognized test house (to prove the conformity of the components to the relevant standards) shall be submitted along with the tender.

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**Drawing (Indicative Purpose Only)**



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### GENERAL TECHNICAL PARTICULARS

GENERAL TECHNICAL PARTICULARS OF FEEDER PILLAR		
SL.NO	DESCRIPTION	
<b>ENCLOSURE DETAILS</b>		
1	Overall dimension	1700mm(W)X1575mm(H)X475mm(D)
2	Sheet Thickness	3.5mm(Body & Base) 2.0mm(Internal Doors,Mounting Brackets/Channel) Made out of Hot dlp galavinsed MS Sheet/GI Sheet with RAL-7032 Paint Shade.
3	Degree of Protection	IP-55 Outdoor type with Canopy
<b>MCCB (Incoming)</b>		
1	Current Rating(A)	630A
2	Breaking Capacity(kA)	ICS=100% ICU,50kA at 415VAC
3	IP Protection	IP 40
4	Pole(Nos)	4
5	Impulse Withstand Voltage(KV)	8
6	Rated Operational Voltage	690
7	Rated Insulation Voltage(V)	750
8	Confrim to Standard	IEC-60947-2
9	Utilization Category	A
10	Operating Frequency(Hz)	50
11	Ambient Temperature	-5 to 55 deg
12	Storage Temperature	-35 to 70 deg
13	Release	Thermal magnetic (Adjustable)
<b>MCCB (Outgoing)</b>		
1	Current Rating(A)	63A
2	Breaking Capacity(kA)	ICS=50% ICU,10kA at 415VAC
3	IP Protection	IP 40
4	Pole(Nos)	4
5	Impulse Withstand Voltage(KV)	8
6	Rated Operational Voltage	415
7	Rated Insulation Voltage(V)	690
8	Confrim to Standard	IEC-60947-2
9	Utilization Category	A
10	Operating Frequency(Hz)	50
11	Release	Thermal magnetic (Fixed Type)
<b>MCB</b>		
1	Rating(A)	32 A
2	Pole(Nos)	2
3	Tripping Characteristics	C
4	Breaking Capacity(kA)	10kA
5	Voltage Rating(V)	415
6	Confrim to IS Standard	IS/IEC 60898-1
7	Mechanical Life time(Cycles)	100000
8	Electrical Life time(Cycles)	10000
9	Rated Frequency (Hz)	50
10	Degree of Protection (IP)	IP 20
11	Module Width	17.5+/- 1 mm
12	Terminal Size	35 Sq.mm
13	Mounting	Horizontal/Vertical
14	Contact of MCB Material	Silver Plated
15	No.of Arc chute/Splitters	13

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Current Transformer		
1	Applicable Standards	IS 2705-1992 (Manufacturer test certificate shall be Provided)
2	CT Ratio(Amp)	630/5A
3	Accuracy Class	0.2S
4	Burden(VA)	10
5	System Voltage(V)	415
6	Insulation Level in (KV)	3KV for 1 minute
7	Frequency (Hz)	50 Hz (-6 to 5%)
8	Rated Continuous Thermal Current	1.2 Times Rated Current
9	Insulation Class	E
10	CT Type	Resin Cast
11	Internal Diameter(ID)(mm)	70 mm Tolerance : +/- 20mm
12	Outer Dimension(OD)(mm)	140 mm Tolerance : +/- 20mm
<b>Busbar</b>		
1	Bus bar Material	Aluminium
2	Grade	EC Grade
3	Size (mm)	2RX40X10-Ph 1RX40X10-N
4	Earthing Bolt	M8X25 mm

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## 51.0 Technical Specifications For Feeder Remote Terminal Unit (FRTU)

**\* Applicable for both category (Standard and Extended) FRTU**

**Standard FRTU – 4 way FRTU**

**Extended FRTU – 6 Way FRTU**

### GENERAL TECHNICAL PARTICULARS

#### 1.0 Overview of the monitoring and control enclosure

The MV/LV station remote control interface shall include all the functions required to monitor and control MV cubicles in the MV/LV and MV/MV stations to be remote controlled.

Since, requirement is for Motorized RMU and looking onto complicity, we require same vendor for supply of FRTU and RMU, in order to avoid teething technical issues of integration while execution.

#### 2.0 Functions of the monitoring and control enclosure

2.1 The monitoring and control enclosure shall meet following main requirements:

2.1.1 Monitoring and control of medium voltage cubicles.

2.1.2 Detection of amperometric faults, adjustable for each feeder.

2.1.3 Load current measurement on the line fitted with a fault detector.

2.1.4 Data transmission to the remote control centre.

2.1.5 Chronological time-stamped event recording.

2.1.6 Energy supply and storage with 9-hour autonomy in the event of mains failure for:


2.1.6.1 24 VDC motor drives.

2.1.6.2 Transmission equipment.

2.1.6.3 Control unit.

2.2 It shall be possible to view the most important information locally on the front panel of the enclosure and remotely from the control centres.

2.2.1 It shall be possible to view LBS/breaker status from the front mimic of FRTU with the help of green/red led indication.

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2.2.2 It shall be possible to issue control command from the front panel of the FRTU with security button.

2.2.3 It shall be possible to retrieve and display on a laptop PC the time-stamped events recorded at the enclosure. It shall also be possible to retrieve this information from the remote control centre.

2.2.4 The minimum storage capacity shall be 50000 events.

2.2.5 The FRTU shall have remote or local control mode switch on its front panel.

2.3 In remote control mode, the enclosure shall ensure:

2.3.1 Transmission of remote measurements and time-stamped events.

2.3.2 Possibility of electrical remote control.

2.3.3 Inhibition of local electrical control push buttons.

2.4 In local mode, the enclosure shall ensure:

2.4.1 Transmission of remote measurements and time-stamped events.

2.4.2 Possibility of local electrical control of opening and closing operations by simultaneously pressing a pushbutton to select the unit to be operated and a validation push button.

2.4.3 Inhibition of opening/closing remote control.


### 3.0 Energy workshop

Power from the energy workshop shall be sufficient to supply 24 V to at least all the switch cubicles, the radio and the electronics in the enclosure. It shall be possible to configure the 24 V DC motor drive supply voltage (on site).

The 12 V transmission output shall be able to supply a conventional radio without a battery ( $I_{trans} = 8 \text{ A}$ ) to inform the remote control centre of a battery failure.

The standby energy shall be provided by a 12 V 24 Ah battery (which will be placed in RMU) with a minimum autonomy of at least 9 hours for 10 opening and closing cycles.

The batteries shall be checked at regular intervals by the slave station and an alarm shall be generated and transmitted to the remote control centre in the event of a fault.

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The workshop shall be protected against overvoltages and overcurrents. The dielectric characteristics of the supply voltage input in accordance with IEC 60 25564 shall be as follows:

- Insulation (50 Hz/1 min): 10 kV
- Impulse wave (1.2/50): 20 kV

The voltage available in the station is single-phase 220 V AC.

#### 4.0 Time-tagged data archiving

All the archived data shall be retrieved locally and remotely by means of the configuration and operating software supplied with the control unit.

The data shall also be downloaded locally or remotely to a PC as a .CSV file.

Event and measurement time-stamping shall be accurate to one millisecond and the discrimination between two events shall be 10 ms.

#### 4.1 Time-stamped event archiving

Any change of information status shall generate a stored time-stamped event.


The minimum storage capacity of the events to be transmitted to the remote control centre shall be 200 events.

#### 4.2 Measurement archiving

Each measurement can be configured to be archived if required. A measurement declared archived can be stored:

- 4.2.1 At regular intervals (the interval can be configured): mean or sampled value.
- 4.2.2 When the high and low thresholds are exceeded (the thresholds can be configured).
- 4.2.3 On deadband (X% customisable).
- 4.2.4 Daily: min. and max. daily values (the storage period can be configured: 24 h, 7 d, 14 d).

The measurement storage conditions (configured individually) can be combined. The minimum storage capacity shall be 20000 measurements.

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5.0 Communication with the remote control centre

### 5.1 Communication protocol

The control unit shall have following communication protocols:

5.1.1 IEC 870-5-101 / 104 protocol to transfer information to control center SCADA.

5.1.2 Modbus protocol to communicate with field MFM (Multi Functional Meters) on RS485.

### 6.0 Events transmission

It shall be possible to configure each time-stamped event to correspond to the appearance or disappearance of an "alarming event" or an "alarming" closure failure. A time-stamped event declared to be "alarming" establishes communication with the remote control centre.

#### 6.1 Measurement transmission

It shall be possible to configure each measurement to be transmitted spontaneously to the remote control centre when:

6.1.1 The deadband is exceeded: X% variation of the value measured; X% can be configured.

6.1.2 The high or low threshold is exceeded: the threshold can be configured in Amps.

#### 6.2 Communication ports

6.2.1 The control unit shall have following communication ports:

6.2.1.1 One Ethernet port for interfacing with the IP compatible communication equipment.

6.2.1.2 One RS232 Console port.


6.2.1.3 One RS485 port to connect field IED's / Energy Meters on RS485.

6.2.1.4 One RS232 port for connecting external modem.

#### 6.3 Operation of channel

6.3.1 Operation of each channel shall be defined by configuration. The channels shall be used as follows:

6.3.1.1 Out of service: when the channel is not used, not present or temporarily out of use

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6.3.1.2 Normal: corresponds to the main communication channel.

6.3.1.3 Main : corresponds to the 1st channel (normal) used during normal / standby operation.

6.3.1.4 Standby : corresponds to the 2nd channel used during normal / standby operation.

6.3.1.5 Symmetric: corresponds to the 2 channels used during normal / standby operation, without operating priority on either of the channels. The channel in service remains active so long as communication is present on that channel. If communication disappears from that channel, changeover to the other channel takes place provided that communication is present on the other channel.

6.3.1.6 Store & Forward: the messages received on the main channel that are intended for another FRTU that cannot be accessed directly from Scada are re-sent over the same channel in order to send to that other FRTU the message intended for him.

6.3.1.7 Test: this link is used to send certain information to other FRTUs nearby at a fixed carrier frequency so as to be able to perform maintenance operations (adjustment of antenna position, etc.).

## 7.0 Local communication networks

The control unit shall have an Modbus RS485 port for communication with the station equipment:

- Power monitoring unit
- Protection relay


The Modbus protocol shall be open; it shall be programmed by the control unit configurator. Information from this slave equipment can be stored and dated when the status changes (can be configured for each event).

## 8.0 Remote configuration and operating tool

8.1 Data shall be configured using a PC connected to the control unit via an Ethernet and/or USB port.

Configuration shall mainly be effected by downloading a file prepared in the workshop. It shall therefore be possible to:

- prepare the configurations off-line and save them on a PC,
- restore a control unit configuration using a PC,
- save a control unit configuration to a PC.

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It shall also be possible to configure data remotely using the operating and maintenance software supplied with the equipment in the case of GMS, GPRS and Ethernet networks.

This software shall not require a special licence and can be used and copied freely.

Login and access to the various functions shall be protected by a user name and password. Several access levels can be configured.

## 8.2 Diagnosis

The diagnosis pages shall be used to retrieve station, switch and system data:

- Measurement and status display: this page is used to view in real time the TSS, TSD and TM status for each switch controlled by FRTU.
- Archived event retrieval.
- Each status log has its own specific page.
- Users can acknowledge statuses locally.
- Maintenance.
- Information about the unit (name of the unit, date of the last backup).
- Information about the software used.
- Protocol analyser. This analyser is used to observe the frames exchanged with the remote control centre to facilitate maintenance operations.


## 8.3 Data loading

- Loading a configuration from a file saved on a PC.
- Loading a new version of the communication card or protocol software with protected switching and the possibility of reverting to the original version.

## 8.4 Saving parameters and archived data:

- Unit configuration.
- Events and measurements archived as a Word or Excel file.



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## 8.5 Parameter and alarm configuration

- Control module parameters
- Substation name
- Delayed no-voltage alarm
- Fault detector parameters
- Automation parameters
- Communication module parameter
- General parameters (type of protocol, use of ports, type of modem, etc.).
- Protocol parameters: interoperability table, alarm
- Communication parameters
- Optional port parameters
- Equipment time change
- Access rights

## 9.0 Switch connection

Orders and information shall be transmitted from the switchgear interface to the switch control unit via a single cable connected to the enclosure by a rack-out connector mounted on the lower part of the enclosure.

Each connector has a fail-safe device to prevent reversal between the various electrical controls.

The socket can be "plugged" for simulation and test purposes.

## 10.0 Capacity


The Standard FRTU shall be capable to monitor and control 3 Way / 4 ways RMU.

For monitoring and control of 5 Way /6 Way RMU, the FRTU must be extended to control up to 8 Way RMU, considering future aspects.

## 11.0 List of information to be provided

The slave stations shall process at least the following information for remote indication and/or local display purposes:

- open/closed position of each MV switch,

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- earthing status of each MV direction,
- absence of AC voltage,
- local/remote control operating mode,
- detection of phase-to-phase or earth fault current flow,
- load current measurement
- charger fault
- battery fault
- motor drive 24 V supply fault
- internal fault
- detailed diagnosis of the status of the uninterruptible power supply (charger, batteries).

## 12.0 FRTU should Support following Future Provisions

The FRTU must be capable to support PLC programming, in order to incorporate self healing grid logic for faster restoration of supply in absence of control centre SCADA.

Self healing grid requires multiple communication support from FRTU (Simultaneous communication of FRTU with SCADA along with FRTU Peer to Peer communication). Hence, FRTU must support this configuration of communication to achieve SHG feature.

Demonstration of self healing grid capability must be shown during bid evaluation for qualification.

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## 52.0 TECHNICAL SPECIFICATION FOR GI Chain Link Fencing

### GENERAL TECHNICAL PARTICULARS

#### 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 Fencing (11KV & 33KV).

#### 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: 2721	Requirements for galvanized Steel Chain Link fence fabric
IS:1161/IS 806	Diameter of tubes used in posts
IS:209	Purity of zinc


#### 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.

#### 4. GENERAL TECHNICAL REQUIREMENTS

Requirement for Fencing			
Sl.No.	Description	Units	Requirement
1.	Material		Galvanized Steel Chain
a.	Size of Mesh	mm	75
b.	Size of coated wire	mm	3.15
c.	Width of chain link	mm	2000
d.	Class of zinc coating	g/m <sup>2</sup>	615
e.	Posts(M S Tube)	mm	50 / Yst-22 (Kg / sq. mm)
f.	M S flat 50x6	mm	Depending upon the size of fence
g.	Cleats	Nos	As per site requirement
h.	M S base plate	mm	160x160x6

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## 5. GENERAL CONSTRUCTIONS

### 5.1 CHAIN LINK FENCE FABRIC

Chain Link fence fabric in accordance to IS: 2721, and shall also meet the following requirements.

- Size of mesh
- Size of coated wire
- Width of chain
- Class of zinc coating

### 5.2 POSTS

The posts shall be of medium M.S tube of 50 mm diameter confirming to Yst-22 (Kg / sq. mm ).The tubes shall be also confirm to IS:1161/IS 806.The length of the tubular post shall be 3200mm.

### 5.3 MS BASE PLATE

- An M.S base plate of size 160X160X6mm thick shall be welded with the tubular post.
- The post shall be provided on the top with M.S plate. The tubular post shall be welded with 8 numbers of M.S flat of size 50X6mm –75 mm long.
- Two numbers of 13.5 mm dia holes on each cleats shall be provided to bolt the fence fabric panel.

### 5.4 CLEATS

The cleats shall be welded at equal spacing in such a way that 4 no's of cleats are on the opposite side and remaining 4 no's cleats are on the opposite side of the post. The cleats on the corner posts shall be welded in such a way that it suits the site requirement.


### 5.5 HOT-DIP GALVANISATION

The whole assembly of tubular post shall be hot dip galvanized. The zinc coating shall be minimum 615 gram per sq mm. The purity of the zinc shall be 99.95% as per IS:209..

## 6. MARKING

The Fencing 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 Fence ,” PROPERTY OF TPCODL.”

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## 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 HT Stay Set in additions to others specified in the IS/IEC Standards.

### TYPE TESTS

- 1) Tensile Strength.
- 2) Galvanization (Coating thickness, Mass of Zinc, Uniformity & Adhesion) test.

### ACCEPTANCE TESTS

- 1) Visual examination, Verification of dimension and physical condition of material.
- 2) Tensile Strength.
- 3) Galvanization (Coating thickness, Mass of Zinc, Uniformity & Adhesion) test.

### ROUTINE TESTS


- 1) Visual examination, Verification of dimension and physical condition of material.
- 2) Tensile Strength.
- 3) Galvanization (Coating thickness, Mass of Zinc, Uniformity & Adhesion) test.

## 8. TYPE TEST CERTIFICATES

The bidder shall furnish the type test certificates of the Fencing for the tests as mentioned as above as per the corresponding standards. All the tests shall be conducted by CPRI/ERDA/Other NABL accredited Laboratory 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.

## 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.

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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 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

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).

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#### 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


Not applicable.

#### 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.

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.

 <b>TPCODL</b> <small>TP CENTRAL ODISHA DISTRIBUTION LIMITED</small>		<b>TATA POWER CENTRAL ODISHA LIMITED, BHUBANESWAR</b>	
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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.		√	√
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.

## 19. GUARANTEED TECHNICAL PARTICULARS

<b>Requirement for Fencing (To be furnished by bidder)</b>			
SI.No.	Description	Units	Requirement
<b>1.</b>	<b>Material</b>		
a.	Size of Mesh	mm	
b.	Size of coated wire	mm	
c.	Width of chain link	mm	
d.	Class of zinc coating	g/m <sup>2</sup>	
e.	Posts(M S Tube)	mm	
f.	M S flat 50x6	mm	
g.	Cleats	Nos	
h.	M S base plate	mm	



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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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### 53.0 TECHNICAL SPECIFICATION FOR Heat Shrinkable Straight Through Joint and Termination 1.1 kV Power Cable

#### GENERAL TECHNICAL PARTICULARS


<b>1.0</b>	<b>Scope</b>	<p>Technical Specification – covering requirements wrt Design, Manufacturing, Material, Testing at manufacturer's work/CPRI/ERDA lab, Packaging, Supply and Delivery, Unloading at site/store of 1.1 kV Heat Shrink Cable Straight through Joints and Terminations with all accessories for contributing to trouble free and efficient network operation.</p> <p>The equipment shall conform in all respects to high standards of Engineering, Design and Workmanship and be capable of performance in continuous operation.</p>																																													
<b>2.0</b>	<b>Applicable Standards</b>	<p>The equipment covered in the Specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International standards / IEC and shall conform to the regulations of the local authorities.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">S. No.</th> <th style="text-align: center;">Standards</th> <th style="text-align: center;">Title</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">IS-13573: 2011(Part-1)</td> <td style="text-align: center;">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</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">IS 7098-2003</td> <td style="text-align: center;">Cross linked polyethylene insulated PVC sheathed cables up to and including 1.1 kV Cable.</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">IS 14255</td> <td style="text-align: center;">LT Aerial Bundled cable working up to 1.1 kV</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">ENA TS 09-13</td> <td style="text-align: center;">High voltage heat shrinkable material components for use up to and including</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">IEC 61238-1: 2003</td> <td style="text-align: center;">Compression and Mechanical Connectors for Power Cables</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">IS 8308 : 2003</td> <td style="text-align: center;">Compression type tubular inline connector for Aluminium conductors of insulated cables</td> </tr> <tr> <td style="text-align: center;">7</td> <td style="text-align: center;">IS 8309 : 2003</td> <td style="text-align: center;">Compression type tubular terminal ends for Aluminium conductors of insulated cables</td> </tr> <tr> <td style="text-align: center;">8</td> <td style="text-align: center;">IS 2633</td> <td style="text-align: center;">Methods for testing uniformity of coating of zinc coated articles</td> </tr> <tr> <td style="text-align: center;">9</td> <td style="text-align: center;">IS 4826</td> <td style="text-align: center;">Hot dipped galvanized coatings on round steel wires</td> </tr> <tr> <td style="text-align: center;">10</td> <td style="text-align: center;">IS 12444</td> <td style="text-align: center;">Continuous Cast and Rolled electrolytic copper wire rods for electrical conductors</td> </tr> <tr> <td style="text-align: center;">11</td> <td style="text-align: center;">IS 191</td> <td style="text-align: center;">Copper Specification</td> </tr> <tr> <td style="text-align: center;">12</td> <td style="text-align: center;">IS 10810</td> <td style="text-align: center;">Methods of test for cables</td> </tr> <tr> <td style="text-align: center;">13</td> <td style="text-align: center;">EN 50393</td> <td style="text-align: center;">European Cable Jointing Standard</td> </tr> <tr> <td style="text-align: center;">14</td> <td style="text-align: center;">ASTM D-2303</td> <td style="text-align: center;">Standard Test Methods for Liquid-Contaminant, Inclined-Plane Tracking and Erosion of Insulating Materials</td> </tr> </tbody> </table>	S. No.	Standards	Title	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	Cross linked polyethylene insulated PVC sheathed cables up to and including 1.1 kV Cable.	3	IS 14255	LT Aerial Bundled cable working up to 1.1 kV	4	ENA TS 09-13	High voltage heat shrinkable material components for use up to and including	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	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
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3.0	<b>Climate conditions of the installation</b>	<p>a The service conditions shall be as follows:</p> <ol style="list-style-type: none"> <li>1. Maximum altitude above sea level 1,000m</li> <li>2. Maximum ambient air temperature 50°C</li> <li>3. Maximum daily average ambient air temperature 35°C</li> <li>4. Minimum ambient air temperature 0°C</li> <li>5. Maximum relative humidity 95%</li> <li>6. Average number of thunderstorm days per annum (isokeraunic level) 70</li> <li>7. Average number of rainy days per annum 120</li> <li>8. Average annual rainfall 150cm</li> <li>9. Earthquakes of an intensity in horizontal direction-equivalent to seismic acceleration of 0.3g</li> <li>10. Earthquakes of an intensity in vertical direction-equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)</li> <li>11 .Wind velocity: 300 km/hr, 200 km/hr and 160 km/hr.</li> </ol> <p>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.</p>
4.0	<b>General Technical Requirements</b>	<p>4.1 General design and sizes of 1.1 kV XLPE insulated cables with Aluminium conductor operated in TPCODL network are as mentioned below:</p> <p>A. Four Core Cables, 1.1KV A2XWY (Aluminium conductor stranded sector shaped, XLPE insulation, PVC inner sheath, GI round wire armour, PVC outer sheath) &amp; A2XFY</p> <ol style="list-style-type: none"> <li>a) 4CX400 sq.mm.</li> <li>b) 4C X 300 sq.mm.</li> <li>c) 4CX240 sq.mm.</li> <li>d) 4C X 150 sq.mm.</li> <li>e) 4C X 95 sq.mm.</li> <li>f) 4C X 50 sq.mm.</li> <li>g) 4C X 35 sq.mm.</li> <li>h) 4C X 25 sq.mm.</li> </ol> <p>B. Two Core Cables, 1.1KV A2XWY (Aluminium conductor stranded sector shaped, XLPE insulation, PVC inner sheath, GI round wire armour, PVC outer sheath)</p> <ol style="list-style-type: none"> <li>a) 2C X 50 sq. mm. b) 2C X 25 sq. mm. c) 2C X 16 sq. mm. d) 2C X 10 sq. mm.</li> </ol> <p>C. LT ABC, 1.1 kV, A2X Aluminium Conductor, Stranded Circular Compacted, XLPE insulation 1C X 150 sq.mm.</p> <p>4.2 According to standard sizes of cables, following types of cable joints and terminations shall be required:</p> <p>4.3 General requirement for Heat Shrinkable Jointing and Termination kit:</p> <ul style="list-style-type: none"> <li>• The jointing kit containing heat shrinkable tubing, mastics and other accessories for making a complete joint and termination shall be designed to meet TPCODL specification ENG-LV-08, ENA TS 09-13 and IS 13573 and other relevant standards.</li> <li>• 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.</li> <li>• Assembled jointing kit components shall perform without distress in system with parameters(mentioned below):</li> </ul>

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S. No.	Parameter	Unit	Requirement
1	Rated	k	1
2	Continuous operation withstand Temperature	°	9
		°	2
3	Short circuit current rating of conductor	kA for 1 sec	As per TPCODL specification for 1.1 kV
			Power Cable ENG-LV-08 400 sq.mm. – 37.6 kA 300 sq.mm. – 28.2 kA 240 sq.mm. – 22.56 kA 150 sq.mm. – 14.1 kA 95 sq.mm. – 8.93 kA 50 sq.mm.- 4.7 kA
4	Storage Temperature Range	°	-10°C to + 45°C
5	Shelf life of kit components excluding mastic and solution	Year	Minimum 5 Years
6	Shelf life of mastic and solution	Years	Minimum 2 Years
<b>4.4 General Technical Particulars for Heat Shrinkable Insulation Tubing/ Sleeves/ Wrap Around Sleeve:</b>			
S. No.	Parameter	Specified limit	
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other visible defects	
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of measurements)	
3	Internal dia of tube after full recovery	Shall not be higher than as specified in approved BOM / GTP	
4	Longitudinal change	10% Max.	
5	Dielectric Strength	10 KV /mm (Minimum)	
6	Tensile Strength	10 N/mm <sup>2</sup> (Minimum)	
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	
9	Low Temperature Flexibility	No cracking after 4 Hrs. at minus 20° C Max.	
10	Volume Resistivity	1x 10 <sup>10</sup> Ohm- meter (Minimum) (For stress control tube VR: 1x 10 <sup>7</sup> Ohm-meter Min.)	
11	Flame Retardant (Applicable only for Anti tracking Tubes/ sleeves)	After 1 minute burn: Burnt or charred length 250 mm Max.	
<b>4.5 General Technical Particulars for Heat Shrinkable moulded components/ Breakouts:</b>			
S.No.	Param	Specifi	
1	Visual Examination	Free from protrusions, pin holes, cracks, nicks and other	
2	Wall thickness Ratio	0.6 or 60% (Minimum at any two points of	
3	Internal dia of tube after full recovery	Shall not be higher than as specified in approved	
4	Longitudinal change	25	

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		5	Dielectric Strength	10 KV /mm (Minimum)																											
		6	Tensile Strength	8 N/mm <sup>2</sup> (Minimum)																											
		7	Ultimate Elongation	200% (Minimum)																											
		8	Heat Shock	No splitting, cracking, dripping or flowing after																											
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		11	Flame Retardant (For anti-tracking moulded)	After 1 minute burn: Burnt or charred length																											
		<b>4.6. Service Support</b> - 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																													
		<b>5.1. Components of Indoor/ Outdoor Termination Kit:</b>																													
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		<b>TATA POWER CENTRAL ODISHA LIMITED, BHUBANESWAR</b>	
		<b>TECHNICAL BOOKLET</b>	
<b>Document Title</b>		<b>GENERAL TECHNICAL PARTICULARS AND DRAWINGS</b>	
<b>Document No.</b>		TPCODL-ENGG. -001	<b>Issue Date: 05.07.2021</b>
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		<b>Issued By:</b> Praveen Verma	


S. No.	Components	Requirement
1	Heat Shrinkable insulating tube/ Sleeve	<ul style="list-style-type: none"> <li>Surface of material: shall be smooth and free from protrusion, voids and nicks.</li> <li>Recovered thickness: Recovered thickness of insulation tubes over ferrule circumference shall not be less than 2.5 mm at any point of measurement.</li> <li>Wall thickness ratio (before recovery) of all sleeves/ tubes shall not be less than 60% at any two points of measurement.</li> </ul>
2	Ferrule	<ul style="list-style-type: none"> <li>Material : 99% Electrolytic grade Aluminium with Anti-corrosive paste</li> <li>Shape: As per IS 8308</li> <li>Dimensions as per <b>Annexure-I</b> of this Specification</li> <li>Conductivity of Aluminium shall be min. 60% of IACS</li> </ul>
3	Mastic Tape	<ul style="list-style-type: none"> <li>Mastic tape OR Sealant shall be electrically insulating, non-tracking and water/humidity resistant.</li> <li>Volume resistivity of mastic shall not be less than volume resistivity of insulating tube as specified in ENA TS</li> </ul>
4	Tinned coated copper braid	<ul style="list-style-type: none"> <li>Uniformly tinned coated copper braid shall be provided for armor continuity.</li> <li>Size of tinned copper braid shall be:               <ol style="list-style-type: none"> <li>50 mm<sup>2</sup> x 1 Run for 4CX 400 sq.mm, 4CX 300 sq.mm. &amp; 4CX240 sq.mm. cable</li> <li>25 mm<sup>2</sup> x 1 Run for 4CX 150 sq.mm. and 4C X 95 sq.mm. cable</li> <li>10 mm<sup>2</sup> x 1 Run for 50 sq.mm. cable and below sizes.</li> </ol> </li> </ul>
5	Tinned copper wire mesh	<ul style="list-style-type: none"> <li>Minimum 2.5 mm<sup>2</sup> X 1000 mm for 4CX400 mm<sup>2</sup>, 4CX300mm<sup>2</sup>, 4CX240 mm<sup>2</sup> and 4C X 150 mm<sup>2</sup> and</li> <li>2.5 mm<sup>2</sup> X 300 mm – 95 sq.mm. and below sizes</li> <li>shall be provided for wrapping over armour</li> </ul>
6	GI wire mesh	<ul style="list-style-type: none"> <li>Mechanical protection shall be provided in GI armored cables by means of heavily zinc coated GI mesh as per IS</li> </ul>
7	Breakouts	<ul style="list-style-type: none"> <li>Adhesive coated Breakouts shall be provided on outer sheath at both sides on the cable to prevent water ingress.</li> </ul>
8	Wrap around insulating tube/Sleeve as outer most tube	<ul style="list-style-type: none"> <li>Material: cross-linked polyolefin (Heat Shrinkable) as a waterproof seal.</li> <li>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).</li> <li>Stainless steel channel shall be provided along the wrap around to close the sleeve during installation.</li> <li>Excellent mechanical and corrosion protection, and atmospheric sealing.</li> <li>High split resistance.</li> <li>*Note: Overlapping of wrap around sleeve is not acceptable.</li> </ul>
9	Sub-kit Components	<ul style="list-style-type: none"> <li>Tapes, Mastic, GI back-up rings, Worm Drive clip/ Jubilee clip of stainless steel, adhesive cloth, cleaning solvents and other</li> </ul>
10	Submission of BOM and instruction sheet	<ul style="list-style-type: none"> <li>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.</li> </ul>

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<b>6.0</b>	<b>Name plate and Marking</b>	Following details shall be printed on the box: a) Manufacturer's name b) Month & Year of manufacturing c) Voltage Grade d) Property of TPCODL e) Material
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		HS Sleeves/ tubes and breakout components shall be embossed with: a) Month and year of manufacturing b) Manufacturer name c) Batch no. / Lot no. d) Shrink ratio e) Size f) Type
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<b>7.0</b>	<b>Tests</b>	<p>All Routine, Acceptance &amp; Type tests shall be carried out in accordance with the Relevant IS/IEC/ ENA-TS 09-13.          Acceptance tests shall be witnessed by TPCODL authorized representative.          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:-</p> <p><b>A. Type Tests:</b></p> <p><b>(I) Terminations &amp; Straight Through Joints</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Test</th> <th style="width: 20%;">Clause No.</th> <th style="width: 20%;">Reference Standard</th> </tr> </thead> <tbody> <tr> <td>AC Voltage withstand Test (Air)</td> <td>8.6</td> <td>IS 13573(Part-1)</td> </tr> <tr> <td>AC Voltage withstand test (Immersed)</td> <td>8.6</td> <td>IS 13573(Part-1)</td> </tr> <tr> <td>Impulse voltage withstand at ambient Temp.</td> <td>8.2</td> <td>IS 13573(Part-1)</td> </tr> <tr> <td>Heat Cycle test (In air and water)</td> <td>8.3</td> <td>IS 13573(Part-1)</td> </tr> <tr> <td>Insulation Resistance (In air)</td> <td>8.4</td> <td>IS 13573(Part-1)</td> </tr> <tr> <td>Insulation Resistance (Immersed)</td> <td>8.4</td> <td>IS 13573(Part-1)</td> </tr> <tr> <td>Visual Examination</td> <td>8.8</td> <td>IS 13573(Part-1)</td> </tr> </tbody> </table> <p><b>(II) Kit Components</b></p> <p><b>a) For Tubing and Moulded Components</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Test</th> <th style="width: 20%;">Clause No.</th> <th style="width: 20%;">Reference Standard</th> </tr> </thead> <tbody> <tr> <td>Corrosion Resistance</td> <td>3.1</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Density</td> <td>3.2</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Dimensions</td> <td>3.3</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Electric Strength</td> <td>3.4</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Flame Retardance (for anti-tracking tubes &amp; Heat Shock)</td> <td>3.5</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Heat Shock</td> <td>3.7</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Low temperature flexibility</td> <td>3.8</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Relative Permittivity</td> <td>3.9</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Tensile strength and Ultimate elongation</td> <td>3.12</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Thermal Ageing</td> <td>3.13</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Tracking Resistance</td> <td>3.14</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Visual Examination</td> <td>3.15</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Volume Resistivity</td> <td>3.16</td> <td>ENA-TS 09-13</td> </tr> <tr> <td>Water Absorption</td> <td>3.17</td> <td>ENA-TS 09-13</td> </tr> </tbody> </table> <p><b>b) For Lugs, Ferrules and mechanical connectors</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Test</th> <th style="width: 20%;">Clause No.</th> <th style="width: 20%;">Reference Standard</th> </tr> </thead> <tbody> <tr> <td>Conductivity test</td> <td>8.3</td> <td>as per IS 8309</td> </tr> </tbody> </table> <p><b>B. Routine Tests:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Test</th> <th style="width: 20%;">Clause No.</th> <th style="width: 20%;">Reference Standard</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	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)	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 (for anti-tracking tubes & Heat Shock)	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	Test	Clause No.	Reference Standard	Conductivity test	8.3	as per IS 8309	Test	Clause No.	Reference Standard			
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8.0	<b>Type Test Certificate</b>	<p>The bidder shall furnish the type test certificates for the tests as mentioned above as per the corresponding standards.</p> <p>All the tests shall be conducted at CPRI/ERDA as per the relevant standards not exceeding 5 years from the date of opening of bid.</p> <p>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.</p> <p>TPCODL has rights for Surveillance test of random selected samples from third party lab for quality checks of item.</p> <p>TPCODL shall be intimated in case revision is done by manufacturer in product design/ dimension/ material during execution of contract. Subsequently Type test certificate shall be produced.</p>																																																																											
9.0	<b>Pre-dispatch inspection</b>	<p>Equipment shall be subject to inspection by a duly authorized representative of TPCODL. Inspection may be made at any stage of manufacturing at the option of TPCODL and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.</p> <p>Bidder shall grant free access to the places of manufacture TPCODL's representatives at all times when the work is in progress. Inspection by TPCODL's 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. The pre-dispatch inspection shall be carried out as per annexure-II.</p> <p>Following documents shall be sent along with material:</p>																																																																											



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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)
10.0	Inspection after receipt at Stores	Material received at TPCODL'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 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 TPCODL 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, failing which TPCODL shall be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for free replacement for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by TPCODL.
12.0	Packaging	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. The material used for packing shall be environmentally friendly. Each components shall be supplied in a single package as a complete kit for one termination/joint.
13.0	Tender Sample	Bidder shall be submit the sample of material during tender evaluation process with the offer (in case of first supply to TPCODL).
14.0	Training	Detailed Installation instruction with drawings for all joints and termination shall be provided by Bidder with tender documents in English and Hindi Language. Updated installation manual shall be provided in the kit. Hands-on-training shall be conducted annually at our site location for BA and TPCODL jointers. Bidder shall provide installation/operational services at site.
15.0	Quality Control	The bidder shall submit with the offer, 'Quality Assurance Plan' indicating the various stages of inspection, the tests and checks which shall be carried out on the material of construction, components and bought out items. TPCODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.
16.0	Minimum Testing facilities	Bidder shall have adequate in house testing facilities for carrying out all routine tests, acceptance tests as per Indian /International standards.
17.0	Manufacturing activities	The successful bidder shall submit 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 shall be submitted within 15 days from the release of the order.
18.0	Spares, Accessories and Tools	Not applicable.
19.0	Drawings and Documents	After the award of the contract four (4) copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval.

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		<table border="1"> <thead> <tr> <th>S. No.</th> <th>Description</th> <th>For Approval</th> <th>For Review Information</th> <th>Final Submission</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Technical Parameters</td> <td>√</td> <td></td> <td>√</td> </tr> <tr> <td>2</td> <td>BOM ( at the time of pre-bid)</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Drawing showing Joints Details</td> <td>√</td> <td></td> <td>√</td> </tr> <tr> <td>5</td> <td>Termination drawings</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td>Manual/Catalogues</td> <td></td> <td>√</td> <td>√</td> </tr> <tr> <td>7</td> <td>Transport/ Shipping dimension drawing</td> <td></td> <td>√</td> <td>√</td> </tr> <tr> <td>8</td> <td>QA &amp; QC Plan</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>9</td> <td>Routine, Acceptance and Type Test Certificates</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>	S. No.	Description	For Approval	For Review Information	Final Submission	1	Technical Parameters	√		√	2	BOM ( at the time of pre-bid)	√			3	Drawing showing Joints Details	√		√	5	Termination drawings	√			6	Manual/Catalogues		√	√	7	Transport/ Shipping dimension drawing		√	√	8	QA & QC Plan	√	√	√	9	Routine, Acceptance and Type Test Certificates	√	√	√
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9	Routine, Acceptance and Type Test Certificates	√	√	√																																											
20.0	Guaranteed Technical Particulars	Bidder to comply all above clauses as per specification.																																													
21.0	Schedule of Deviations	<p>The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the purchasers specifications.</p> <p style="text-align: center;">(TO BE ENCLOSED WITH THE BID)</p> <p>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:</p> <table border="1"> <thead> <tr> <th>S.No.</th> <th>Clause No.</th> <th>Details of deviation with justifications</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p style="text-align: right;">We confirm that there are no deviations apart from those detailed above. Seal of the</p> <p style="text-align: right;">Company: Signature: Designation:</p>			S.No.	Clause No.	Details of deviation with justifications																																								
S.No.	Clause No.	Details of deviation with justifications																																													

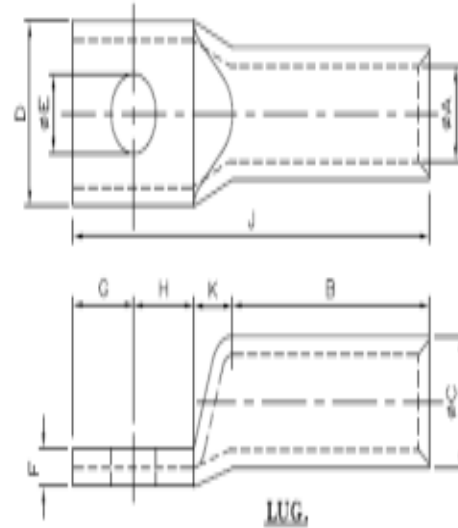
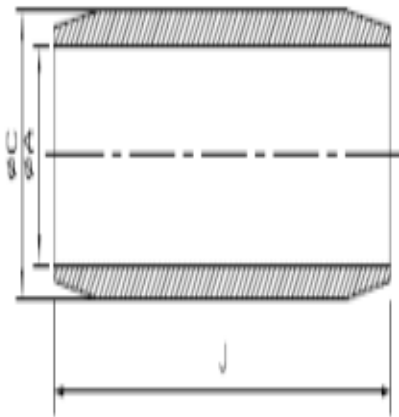
<b>TPCODL</b> TP CENTRAL ODISHA DISTRIBUTION LIMITED	<b>TATA POWER CENTRAL ODISHA LIMITED, BHUBANESWAR</b>		
	<b>TECHNICAL BOOKLET</b>		
<b>Document Title</b>	<b>GENERAL TECHNICAL PARTICULARS AND DRAWINGS</b>		
<b>Document No.</b>	TPCODL-ENGG. -001	<b>Issue Date: 05.07.2021</b>	
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### Annexure-I


#### Dimensions of ferrules & Lugs for LT power cables and LT ABC

Dimensional details of Aluminum ferrules for LT stranded compacted sector shaped XLPE cables			
Cable Size in MM <sup>2</sup>	$\phi A$ (mm) $\pm 0.3$ mm	$\phi C$ (mm) $\pm 0.3$ mm	J (mm)
10	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

Dimensional details of Aluminium Lugs for LT sector stranded compacted XLPE cables							
Cable Size in MM <sup>2</sup>	$\phi E$ (mm)	$\phi A$ (mm)	$\phi C$ (mm)	D (mm)	F (mm)	B $\pm 3.0$ mm	J (mm)
$\pm 0.1$ mm in centre of palm		$\pm 0.3$ mm	$\pm 0.5$ mm	$\pm 1.5$ mm	$-0$ mm		$\pm 5$ mm
300	17	23.9	31	45	7	89	157



For remaining cable sizes, dimensions of Ferrules & Lugs shall be as per IS.

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### Annexure- II

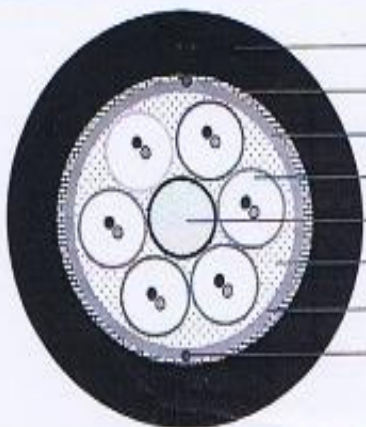
#### Inspection Test Plan for HS Jointing kit components

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 specification		
2	Physical verification of kit contents and dimensions	Dimensions as per TPCODL approved BOM			
3	Electric Strength test	10 KV /mm (Minimum)	ENA-TS-09-13 Clause No. 3.4		
4	Ultimate Elongation tests	200% (Minimum)	ENA-TS-09-13 Clause No. 3.12		
5	Tensile Strength	10 N/mm <sup>2</sup> (Minimum) For anti-track tube-8 N/mm <sup>2</sup>	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 <sup>10</sup> 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 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		
15	Area measurement of tinned copper braids (Area of one wire x no. of wires x no. of carriers)	As per TPCODL 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 CuSO <sub>4</sub> solution	as per IS 2633 Clause 4.1		

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## 54.0 Optical Fiber Cable

### GENERAL TECHNICAL PARTICULARS

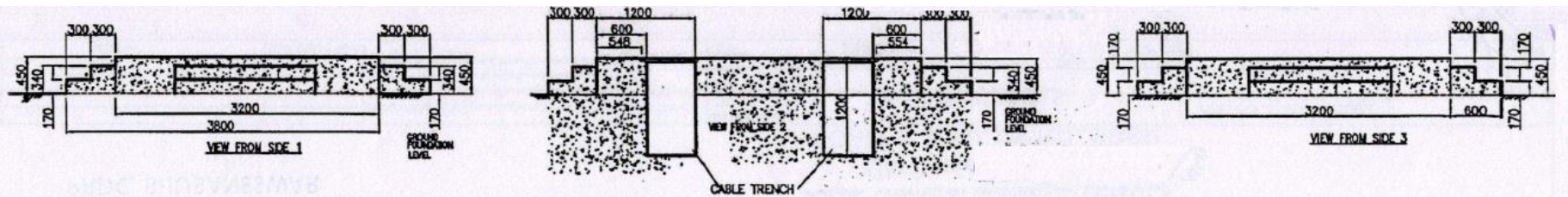
<b>12F SM(G652D) Multitube WetCore Single Sheath Armour Lite Optical Fiber Cable</b>			
<b>PRODUCT INFORMATION</b>			
<b>Fiber</b>			
Single Mode Optical Fiber	12 Nos	Single Mode ITU-T G652D	
Maximum Cabled Fiber Attenuation dB/Km		1310nm : 0.35, 1550nm : 0.22	
<b>Loose Tube</b>			
Water Blocking Compound		Thixotropic gel to prevent water ingress in loose tube	
Fiber per tube	2 Nos		
Tube	6 Nos	Thermoplastic Material (PBT)	1.8 mm Nominal
<b>Core</b>			
Central Strength Member		Fibre Reinforced Plastic to provide tensile strength and antibuckling properties.	
Water Blocking Compound		Cable Flooding Gel is added to prevent water ingress in the core of the cable	
Core Wrapping		Binders and Polyester Tape	
<b>Cable</b>			
Rip Cord	2 Nos	Polyester Based Twisted Yarns	Applied Below Steel Tape
Armouring		Corrugated Steel Tape	0.15 mm Nominal
Outer Sheath		UV Proof Black HDPE Sheath with Antitermite Properties	1.5 mm Minimum
<b>CONSTRUCTIONAL DETAILS</b>			
			
<b>OPTICAL FIBRE CABLE PERFORMANCE</b>			
<b>MECHANICAL</b>		<b>ENVIRONMENTAL</b>	
Max. Tensile strength	4000 N	<b>Temp. Performance</b>	
Minimum Bend Radius	Crush Resistance 4000 N / 100X100mm	<b>Installation</b>	-20°C to +70°C
-Short Term	Impact strength 25 Nm	<b>Service</b>	-30°C to +70°C
-Long Term	Torsion ±180°	<b>Storage</b>	-40°C to +70°C
Water Penetration	1m head, 3m samples, 24 hrs	<b>Drip Test</b>	30 cm, 70°C, 24 hr
Tests shall be carried out as per IEC 60794-1-2 Standards. Change in attenuations shall be < 0.1 dB/km.			
<b>COLOR DETAILS</b>			
Optical Fibre Colour	Blue, Orange		
Loose Tube Colour	Blue, Orange, Green, Brown, Slate, White		
Outer Sheath Colour	Black		
<b>PHYSICAL PARAMETERS</b>			
Cable Diameter (mm)	10.5 ± 5%	Cable Wt. (Kg/km) Nominal	120
		Cable Length	7/4 Km ± 5%
		Order Tolerance	± 5%
		Short Lengths	MAX 5%, Customer Approval

<b>TPC<sup>ODL</sup></b> TP CENTRAL ODISHA DISTRIBUTION LIMITED	TATA POWER CENTRAL ODISHA LIMITED, BHUBANESWAR		
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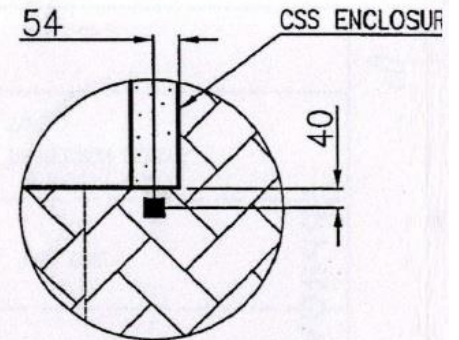
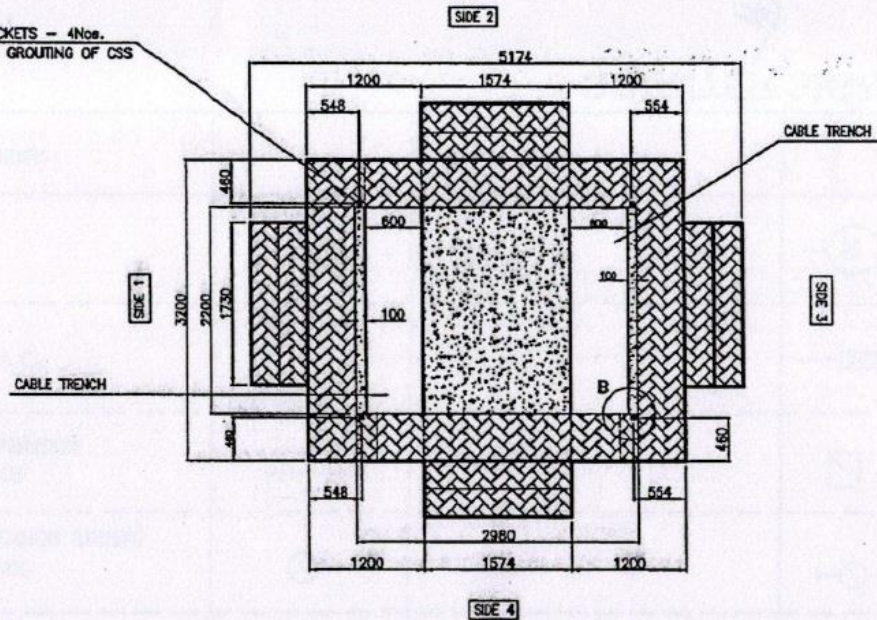
## 55.0 PVC Pipe Heavy Duty

### GENERAL TECHNICAL PARTICULARS

Particulars	50mm	110mm	160mm
Types of Pipes	Unplasticized PVC Pipe		
Standard according to which pipe is Manufactured	IS 4985:2000		
Mean Outside Diameter	Min. 50.0 mm Max. 50.3 mm	Min. 110.0 mm Max. 110.4 mm	Min. 160.0 mm Max. 160.5 mm
Wall Thickness	Min. 1.7 mm Max. 2.1 mm	Min. 3.7 mm Max. 4.3 mm	Min. 5.4 mm Max. 6.2 mm
Ovality	As per IS 4985:2000		
Working Pressure	Class 3, 0.6MPa (6.0kg/cm <sup>2</sup> )		
Length of Straight Pipe	In straight length of 6 m		
Hydrostatic Characteristic	2.514 MPa (25.14kg/cm <sup>2</sup> ) at 27°C for 1 h		
Resistance to External Blow	≤ 10% at 0° C		
Reversion Test	≤ 5%		
Density	1.40 – 1.48 g/cm <sup>3</sup>		
Sulphated Ash Content	≤ 11%		



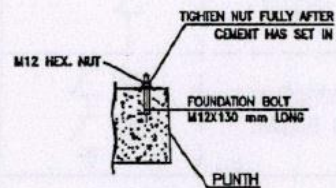
ROUTING POCKETS - 4Nos.  
LOCATION FOR GROUTING OF CSS



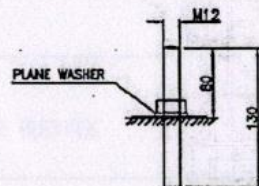
DETAIL OF VIEW-B  
SCALE 1:5

AREA HATCHED [diagonal lines] INDICATES WALKING AREA AROUND CSS

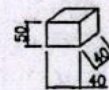
CSS Foundation



FOUNDATION PLINTH DETAILS



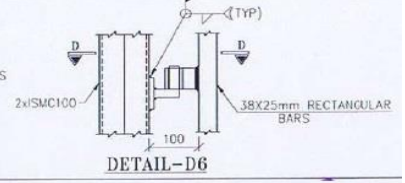
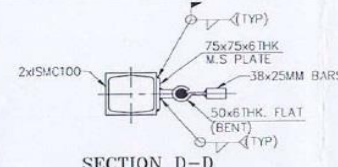
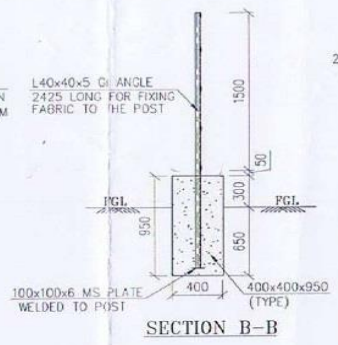
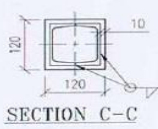
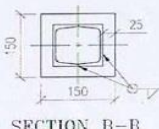
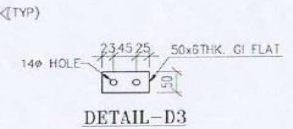
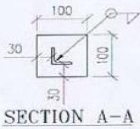
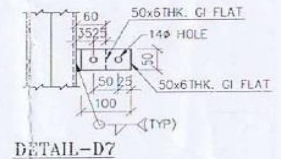
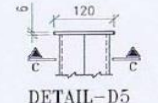
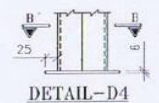
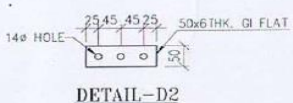
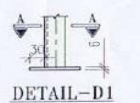
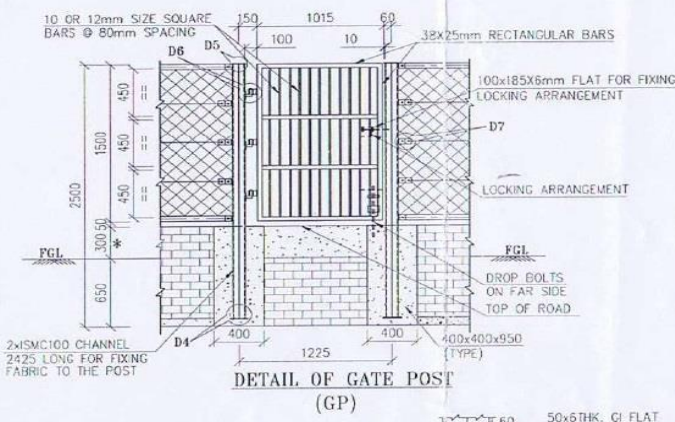
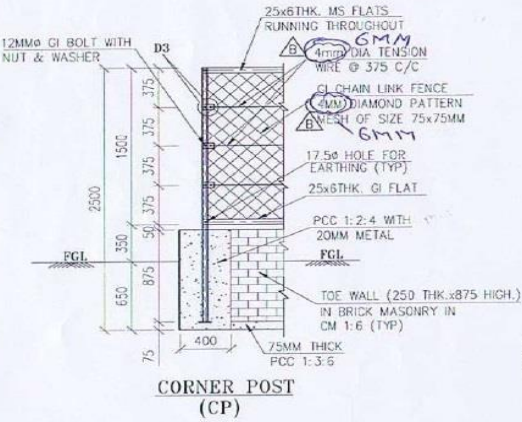
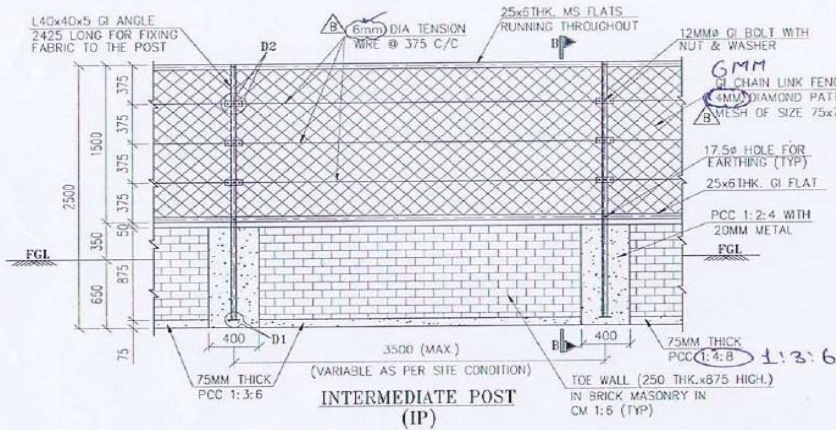
FOUNDATION BOLT



GROUTING POCKET

NOTES:-

- 1) REFER GA. DWG. FOR DIM. DETAILS OF PACKAGE SUB STATION
- 2) THE FOUNDATION SHOULD BE SUITABLE FOR STATIC LOAD OF 9 ton
- 3) THIS IS REF. DWG. FOR PREPARING REQUIRED CIVIL DWG. CONSIDERING THE SITE CONDITION..
- 4) HT/LT CABLE DEPTH SHOULD BE MIN. 1.2M
- 5) THE TOP OF THE PLINTH HAS TO BE PROPERLY LEVELLED (WITH MAX. VARIATION OF 4 MM). THIS IS ESSENTIAL FOR PROPER ALLIGNMENT OF PACKAGE SUB STATION DOORS.
- 6) PROVISION FOR EQUIPMENT EARTHING WILL BE PROVIDED FROM BOTTOM SIDE OF CSS.
- 7) INTERNAL EARTHING WILL BROUGHT OUT ON EARTHING POINTS INSIDE THE CSS.CONNECTION BETWEEN INSIDE CSS EARTHING POINTS & EARTHING PIT SHALL BE DONE BY STRIP OR CABLE,



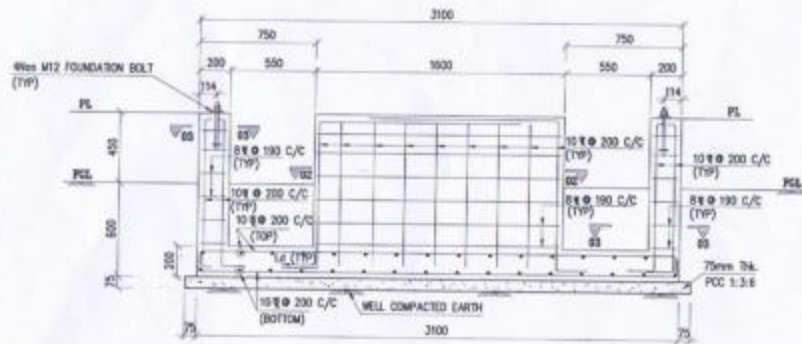
**LEGENDS:-**  
 FGL - FINISHED GROUND LEVEL  
 TYP - TYPICAL

**NOTES:-**

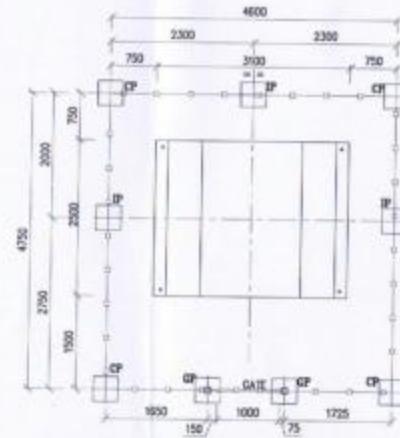
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. ALL ANGLES, CHAIN LINK MESH & FLAT SHALL BE GI.
3. ALL STRUCTURAL STEEL SHALL BE OF MILD STEEL OF E250 GRADE A CONFORMING TO IS.
4. 2nos. COIL EARTHING TO BE PROVIDED IN FENCING.
5. EXPOSED SURFACE OF CONCRETE & BRICK WORK SHALL BE PLASTERED 12mm THICK CEMENT PLASTER IN CM 1:

TYPICAL DETAILS OF FENCING & GATE FOR  
 RMU, COMPACT SUBSTATION,  
 CONSUMER MODULE, FEEDER PILLAR BOX

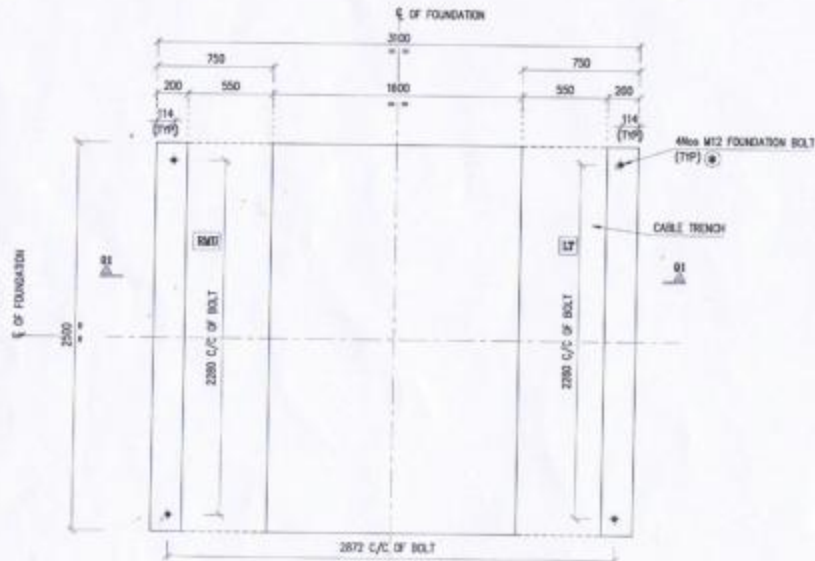




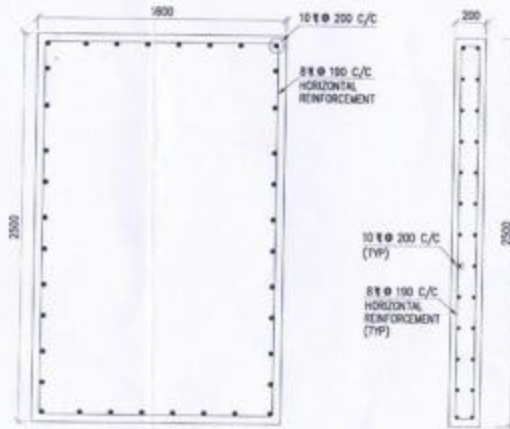
SECTION 01-01



FENCE LAYOUT FOR 11/0.433kV COMPACT SUBSTATION  
(SCALE 1:10)



FOUNDATION PLAN OF ABB MAKE



SECTION 02-02

SECTION 03-03

LEGEND:-

- CENTER LINE
- FGL - FINISHED GROUND LEVEL
- PL - FINISH LEVEL
- CL - CENTER LINE
- Ld - DEVELOPMENT LENGTH
- TYP - TYPICAL
- NTS - NOT TO SCALE
- CP - CP
- IP - IP
- GP - GP

REINFORCEMENT IS DENOTES AS :

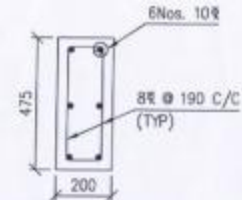
- 10 # 200 C/C
- SPACING OF BAR IN mm
- TMT BARS CONFORMING TO IS:1786
- DIA OF BAR IN mm

NOTES:-

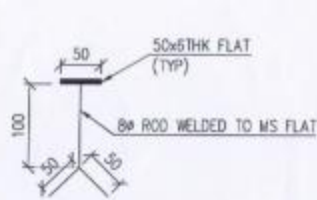
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. FGL CORRESPONDS TO FINISHED GROUND LEVEL.
3. ALL ROD USED SHALL BE OF GRADE M20
4. LEAN CONCRETE SHALL BE OF GRADE 1:3:6 (P.C.C)
5. CLEAR COVER TO REINFORCEMENT SHALL BE AS FOLLOWS.
  - a) PAD TOP & BOTTOM = 50mm
  - b) PAD SIDES = 50mm
  - c) PEDESTAL = 40mm
  - d) SLAB = 25mm
6. THE FOUNDATION SHALL BE PLACED ON COMPACTED EARTH.
7. ALL REINFORCEMENT STEEL SHALL BE TMT BARS CONFORMING TO IS:1786(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  $6 \frac{1}{10} \text{kg/cm}^2$  (min) AT FOUNDING LEVEL.
10. MINOR ADJUSTMENTS MAY BE DONE AT SITE IN CONSULTATION WITH ENGINEER IN-CHARGE
11. FOUNDATION BOLT SHALL BE PLACED IN POSITION DURING CONCRETE.

DETAIL OF FOUNDATION FOR  
11/0.433kV COMPACT SUBSTATION

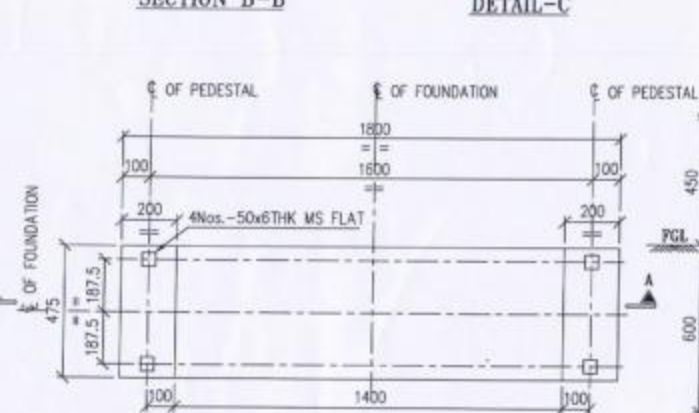
FOUNDATION BOLTS SHALL BE SUPPLIED BY EQUIPMENT VENDOR ALONG WITH EQUIPMENT.



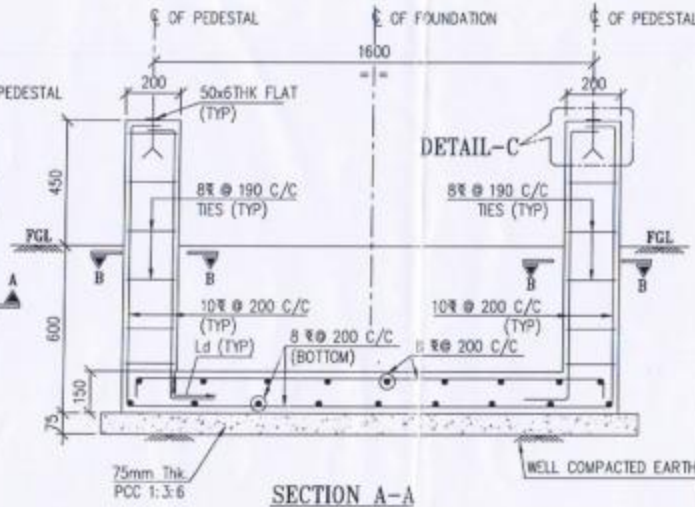
SECTION B-B



DETAIL-C



FOUNDATION PLAN



SECTION A-A

**LEGEND:-**

- — — — — CENTER LINE
- FGL — FINISHED GROUND LEVEL
- — — — — CENTER LINE
- Ld — DEVELOPMENT LENGTH
- TYP — TYPICAL
- ⊠ CP — CORNER POST
- ⊠ GP — GATE POST

REINFORCEMENT IS DENOTED AS :

10mm @ 200 C/C

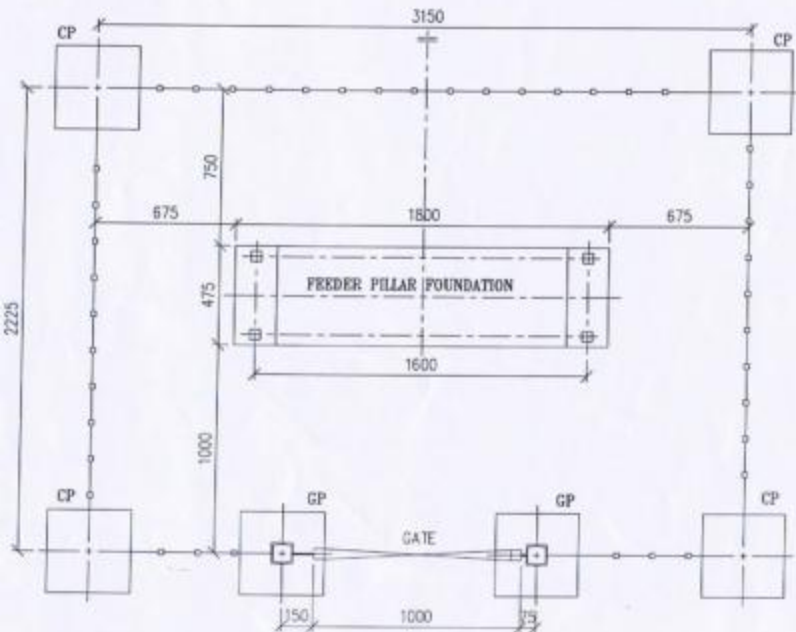
— — — — — SPACING OF BAR IN mm

— — — — — HYSD BARS CONFORMING TO IS:1786

— — — — — DIA OF BAR IN mm

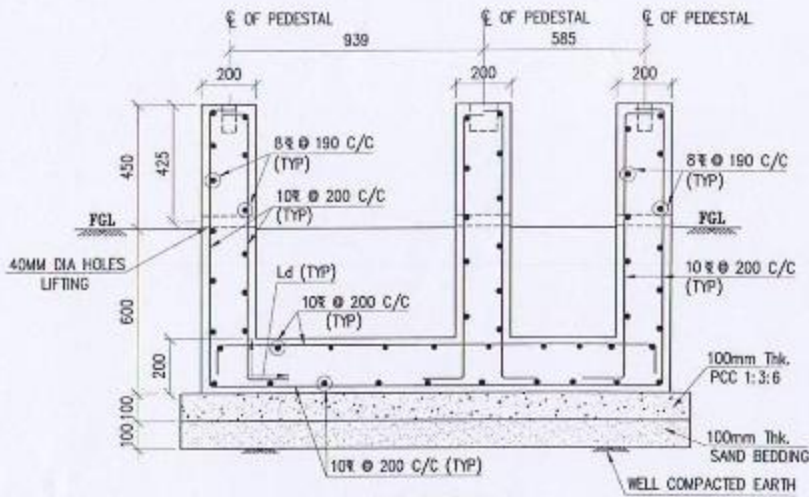
**NOTES:-**

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. FGL CORRESPONDS TO FINISHED GROUND LEVEL.
3. ALL RCC USED SHALL BE OF GRADE M25 (DESIGN MIX)
4. LEAN CONCRETE SHALL BE OF GRADE 1:3:6 (P.C.C)
5. CLEAR COVER TO REINFORCEMENT SHALL BE AS FOLLOWS.
  - a) PAD TOP & BOTTOM = 50mm
  - b) PAD SIDES = 50mm
  - c) PEDESTAL = 40mm
  - d) SLAB = 25mm
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.
11. FOUNDATION BOLT SHALL BE PLACED IN POSITION DURING CONCRETE.

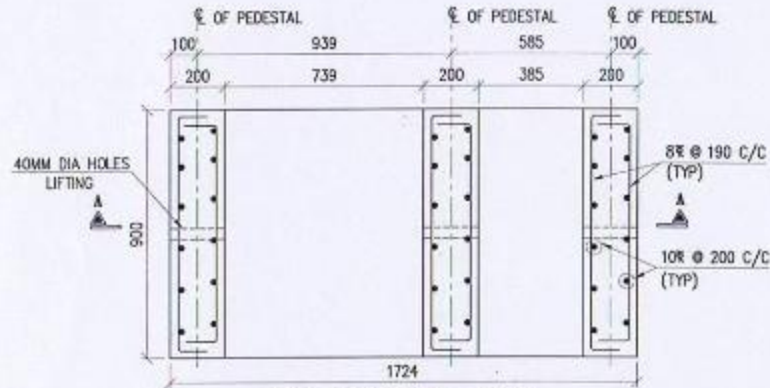


FENCE LAYOUT FOR FEEDER PILLAR BOX

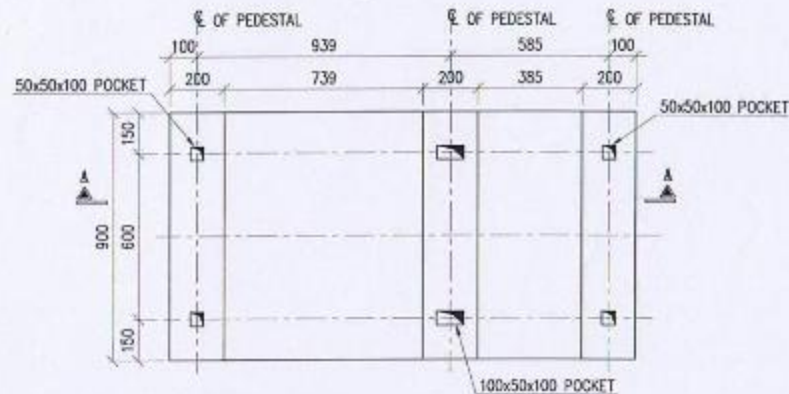
FOUNDATION DETAIL OF AC FEEDER PILLAR BOX



**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

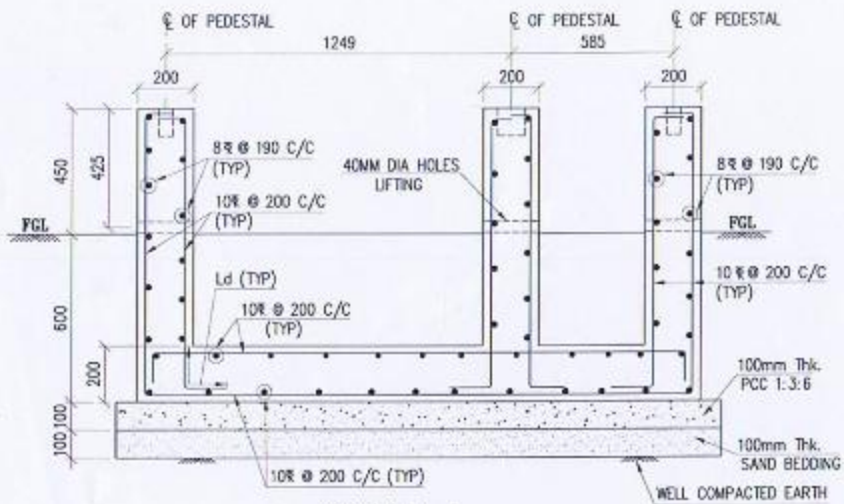
REINFORCEMENT IS DENOTED AS :  
10℄ @ 200 C/C

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

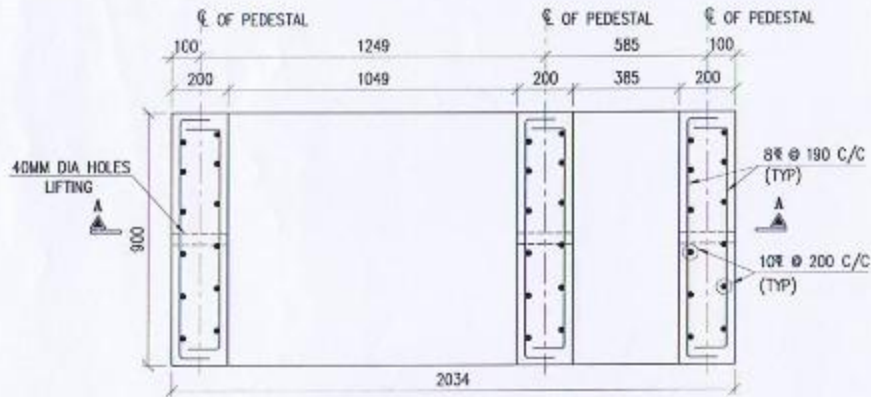
**NOTES:-**

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

**DETAIL OF PRECAST 11kV  
RMU FOUNDATION (3WAY)**



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

REINFORCEMENT IS DENOTED AS :

- 10℄ @ 200 C/C
- SPACNG OF BAR IN mm
- HYSD BARS CONFORMING TO IS:1786
- DIA OF BAR IN mm

**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:1786/1MT 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.(mn) AT FOUNDING LEVEL.
10. MINOR ADJUSTMENTS MAY BE DONE AT SITE IN CONSULTATION WITH ENGINEER IN-CHARGE

DETAIL OF PRECAST 11kV  
RMU FOUNDATION (4WAY)

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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
<b>A</b>	<b>Bidders already Registered with TPCODL</b>	<b>100</b>
	<b>Quality of the Products &amp; Services</b>	
	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
<b>A.1.</b>	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: <b>ZERO MARKS</b>	16
<b>A.2.</b>	<b>Timely Execution of Contracts</b> Total Achieved Score = {30 – 3 x (Avg. %age LD deductions in last 2 years)}	30
<b>A.3.</b>	<b>Legal Issues with TPCODL</b> Zero instances of Arbitration procedures / Court Cases / PBG forfeitures in last 2 years: 30 marks else 'Zero' marks	30
<b>B</b>	<b>Bidders new to TPCODL</b>	<b>100</b>
	<b>Visits</b> <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>B.1.</b>	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.	
	<b>Safety:</b>	20

S. No.	Evaluation Parameter	Max. Score
	Score achieved against the BA safety Management System questionnaire.	
<b>B.2.</b>	<p><b>Client Referrals</b> 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"> <li>▪ Govt. Organizations/ PSUs/ Power Distribution Utilities.</li> <li>▪ Private Organizations with an annual turnover of <math>\geq</math> 500 cr. PO copies or Completion Certificates are admissible.</li> </ul> <p>Each reference: 10 marks</p>	30
<b>B.3.</b>	<p><b>Blacklisting Information</b> 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



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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/outsourcing 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](http://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](http://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 Limited  
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 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 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<br>Banks full address        |
| 2. _____ | Designation of Signatory<br>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<br>Banks full address        |
| 2. _____ | Designation of Signatory<br>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 7<sup>th</sup> / 10<sup>th</sup> 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 26<sup>th</sup> day of every Month).
- c) Copy of ESI Challan (latest by 26<sup>th</sup> 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**

<b>Your Name</b>	
<b>Your Designation</b>	
<b>Your Organization</b>	
<b>Contact Nos.</b>	
<b>Email</b>	

*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 <b>fairness of treatment and transparency</b> with its Business Associates?						
3	How would you rate TPCODL in comparison to your other clients in terms of <b>processes and systems to manage partnership</b> with its Business Associates						
4	How would you rate TPCODL in comparison to your other clients in terms of <b>building long term &amp; mutually relationship</b> 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, altitudes 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 &amp; 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 &amp; 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 3<sup>rd</sup> 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 <b>MAJOR</b> contract)		Incident / Accident				Action Required
Sl. No	Type of the injury	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	<b>F</b> (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less than 48 Hrs)	<b>F</b>	<b>G</b>	<b>G</b>	<b>H</b>	
3	Major injury (Bone injury or burn or Hospitalization more than 48 Hrs)	<b>G</b>	<b>G</b>	<b>H</b>	<b>I</b>	
4	Single fatality	<b>J</b>	<b>K</b>			Intolerable
5	Multiple fatalities (Two or more fatalities during one event)	<b>K</b>				
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>		
<b>F</b>	Memo to BA and levy of penalty	Engineer Incharge	5,000/-			
<b>G</b>	Memo to BA and levy of penalty	Head of Group	20,000/-			
<b>H</b>	Memo to BA and levy of penalty	Head of Group	50,000/-			
<b>I</b>	Memo to BA and levy of penalty	Head of Department	2,00,000/-			
<b>J</b>	Memo to BA and levy of penalty	Head of Department	5,00,000/-			
<b>K</b>	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)	<b>L</b> (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less than 48 Hrs)	<b>L</b>	<b>M</b>	<b>M</b>	<b>N</b>	
3	Major injury (Bone injury or burn or Hospitalization more than 48 Hrs)	<b>M</b>	<b>M</b>	<b>N</b>	<b>O</b>	
4	Single fatality	<b>P</b>	<b>Q</b>			Intolerable
5	Multiple fatalities (Two or more fatalities during one event)	<b>Q</b>				
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>
<b>L</b>	Memo to BA and levy of penalty	Engineer Incharge		5,000/-		
<b>M</b>	Memo to BA and levy of penalty	Engineer Incharge		10,000/-		
<b>N</b>	Memo to BA and levy of penalty	Head of Group		25,000/-		
<b>O</b>	Memo to BA and levy of penalty	Head of Department		1,00,000/-		
<b>P</b>	Memo to BA and levy of penalty	Head of Department		3,00,000/-		
<b>Q</b>	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.

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## **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>				
- <b>Is there a written company Safety policy?</b> - If yes provide a copy of the policy, if No please refer Note 1.	1			
- <b>Does the company have an Safety Management system</b> - If yes provide details, if No please refer Note 1.	1			
- <b>Is there a company Safety Management System manual or plan?</b> - If yes provide a copy of the content page(s), if No please refer Note 1.	2			
- <b>Are Safety and occupational health responsibilities clearly identified for all levels of Management and staff?</b> - If yes provide details, if No please refer Note 1.	2			
<i>Safe Work Practices and Procedures</i>				
- <b>Has the company prepared safe operating procedures or specific safety instructions relevant to its operations and relevant work as per contract?</b> - If yes provide a summary listing of procedures or instructions, if No please refer Note 2.	1			

Certification				
- Comments				
- <b>Is there a register of injury or accident?</b> - If yes provide a copy (format)	1			
- <b>Is there a documented incident or accident investigation procedure?</b>  - If yes provide a copy of a standard incident report form, if No please refer Note 2.  - Comments	1			
<i>Safety Training</i>				
- <b>Describe how occupational health and safety training is conducted in your company</b>  If No please refer Note 1.	2			
- <b>Is a record maintained of all training and induction programs undertaken for employees in your company?</b>  - If yes provide examples of safety training records, if No please refer Note 2.	1			
- <b>Are regular safety inspections / audits are undertaken at worksites?</b>  -If yes provide details (formats), if No please refer Note 3.	1			
- <b>Is there a procedure by which employees can report hazards at workplaces?</b>  - If yes provide details if No please refer Note 1.	1			
<i>Safety Monitoring</i>				
- <b>Is there an officer / supervisor responsible for monitoring workplace / worksite safety?</b>	1			



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Certification				
- If yes provide details				
<i>Safety Performance Monitoring</i>				
- <b>Are employees regularly provided with information on company health and safety performance?</b> - If yes provide details	1			
- <b>Has the company ever been convicted of an occupational health and safety offence?</b> - 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"> <li>1. Mandatory usage of JSA checklist prior to start of work</li> <li>2. Use appropriate ladder</li> <li>3. Use full body safety harness having double lanyard.</li> <li>4. Use Electrical Safety Shoes if working on electrical network otherwise use safety shoes.</li> <li>5. Use Safety helmet.</li> <li>6. Use PPE as per the annexure 7 of this CSM document</li> <li>7. Refer Work instruction related to Working at Height for other details</li> <li>8. Use of metal scaffold to be ensured in height work (cup lock type)</li> <li>9. Deploy competent workforce who are medically fit</li> </ol>

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"> <li>1. Mandatory usage of JSA checklist prior to start of work</li> <li>2. Use Electrical Safety Shoes while working on electrical network.</li> <li>3. Use Electrical Safety gloves of appropriate voltage rating.</li> <li>4. Use face shield / visor attached with helmet.</li> <li>5. Use Safety helmet.</li> <li>6. Use PPE as per the annexure 7 of this CSM document</li> <li>7. Mandatory usage of Insulated tools &amp; tackles on electrical system</li> <li>8. Mandatory compliance for Lock Out &amp; Tag out system. Refer Work instruction related to Working on electrical equipment / network for other details</li> </ol>
Excavation / Civil work	Collapse of soil, Fall in excavated pit leading to Injury	2	<ol style="list-style-type: none"> <li>1. Use safety shoes.</li> <li>2. Use Safety helmet.</li> <li>3. Use PPE as per the annexure 7 of this CSM document</li> <li>4. Hard Barricading of the worksite.</li> <li>5. Refer Work instruction related to excavation / civil work for other details</li> </ol>
Material lifting & Mechanical Erection work	Fall of material/object, Topple of crane,	2	<ol style="list-style-type: none"> <li>1. Mandatory compliance of crane checklist</li> <li>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.</li> <li>3. The operator's physical fitness and alertness should be judged by sup. / EIC.</li> <li>4. Use PPE as per the annexure 7 of this CSM document</li> <li>5. Refer Work instruction related to Material lifting &amp; Mechanical Erection work</li> </ol>
Road Safety	Road Accidents	3	<ol style="list-style-type: none"> <li>1. Mandatory compliance of TPCODL Road Safety policy W07(COR-P-12)</li> </ol>

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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.

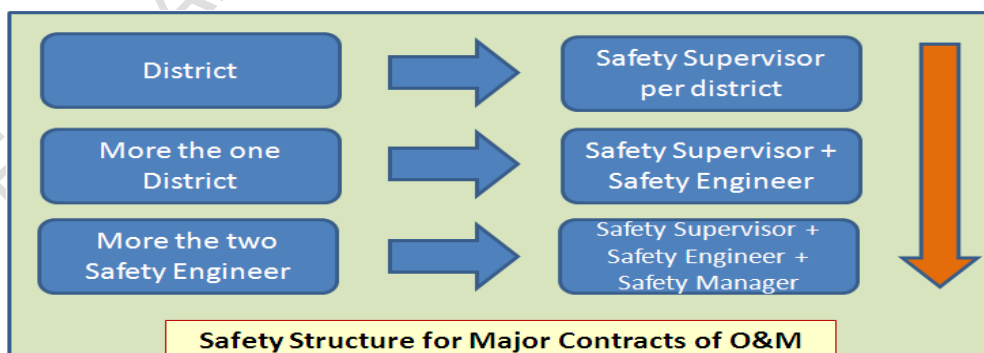
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### Annexure 3.1 (Refer Para 4.0)

#### 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.

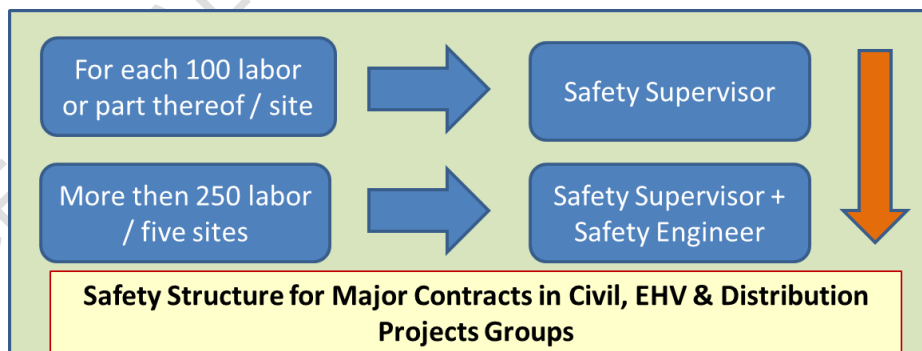


### Annexure 3.2 (Refer Para 4.0)

#### 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.

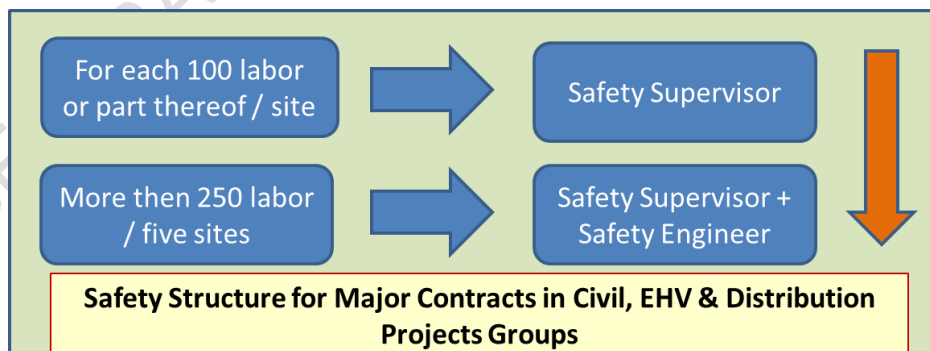


### Annexure 3.3 (Refer Para 4.0)

#### 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.



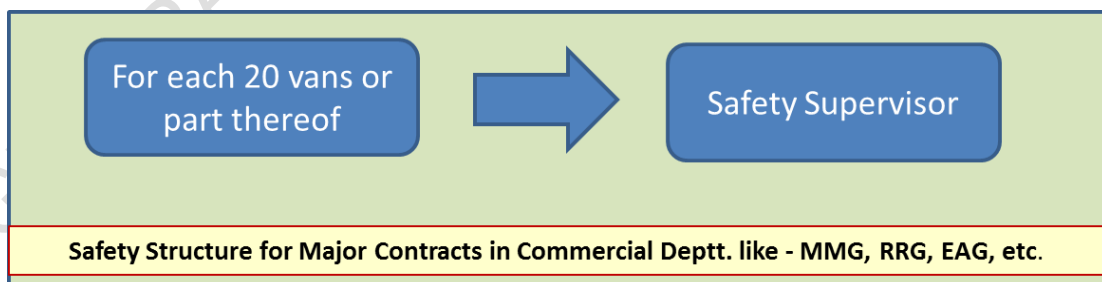
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### Annexure 3.6 (Refer Para 4.0)

#### **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:

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 5<sup>th</sup> 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**

<b>TO BE SUBMITTED BY VENDOR (To be filled as applicable)</b>		
<b>VENDOR:</b>		
<b>1.0</b>	<b>DETAILS OF THE FIRM</b>	
	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 :
<b>2.0</b>	<b>PRODUCTS MANUFACTURED</b> :	
<b>3.0</b>	<b>TURNOVER DURING THE LAST 3 YEARS (TO BE VERIFIED WITH THE LATEST PROFIT &amp; LOSS STATEMENT).</b> :	
<b>4.0</b>	<b>VALUE OF FIXED ASSETS</b> :	
<b>5.0</b>	<b>NAME &amp; ADDRESS OF THE BANKERS</b> :	
<b>6.0</b>	<b>BANK GUARANTEE LIMIT</b> :	
<b>7.0</b>	<b>CREDIT LIMIT</b> :	
<b>8.0</b>	<b>TECHNICAL</b>	
	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	:
<b>9.0</b>	<b>MANUFACTURE</b>		
	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	:
<b>10.0</b>	<b>INSPECTION / QC / QA / TESTING</b>		
	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	:
<b>11.0</b>	<b>EXPERIENCE (INCLUDING CONSTRUCTION / ERECTION / COMMISSIONING) TO BE FURNISHED IN THE FORMAT INDICATED IN APPENDIX)</b>		
<b>12.0</b>	<b>SALES, SERVICE AND SITE ORANISATIONAL DETAILS</b>		

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13.0	<b>CERTIFICATE FROM CUSTOMERS (ATTACH COPIES OF DOCUMENTS)</b>	:
14.0	<b>POWER SITUATION</b>	:
15.0	<b>LABOUR SITUATION</b>	:
16.0 *	<b>APPLICABILITY OF SC/ST RELAXATION (Y/N) IF YES, SUPPORTING DOCUMENTS TO BE ATTACHED</b>	
17.0	<b>ORGANIZATIONAL DETAILS</b> 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	<b>DOCUMENTS TO BE ENCLOSED:</b> 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

