

Dt. 10.09.2021

Procedure to Participate in Tender

Enquiry No- TPSODL/OT/2021-22/048

Tender EnquiryNo.	Work Description	EMD (Rs.)	Tender Fee (Inclusive of GST) (Rs.)	Last Date and Time for payment of Tender Fee
NIT Number: TPSODL/OT/21-22/048	System Improvement Works under the Elephant Corridor Program, on 'turnkey' basis for GNED of TPSODL.	35,000	5,000	22.09.2021, 18:00 Hrs

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

Procedure to Participate in Tender.

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

1. Eligible and Interested Bidders to submit duly signed and stamped letter on Bidder's letter head indicating
 - a. Tender Enquiry number
 - b. Name of authorized person
 - c. Contact number
 - d. E-mail id
 - e. Details of submission of Tender Fee
 - f. GST Registration No
2. Non-Refundable Tender Fee, as indicated in table above, to be submitted in the form of Direct Deposit in the following bank account and submit the receipt along with a covering letter clearly indicating the Tender Reference/ Enquiry Number –

Beneficiary Name – TP Southern Odisha Distribution Limited Bank
Name – Union Bank of India
Branch Name – Kamapalli Branch, Berhampur.
Account Type – TPSODL Corporate Expenditure Account.
Account No – 625901010050070
IFSC Code – UBIN0562599

E-mail with necessary attachment of 1 and 2 above to be send to soni.panda@tpsouthernodisha.com with copy to Netaji.Subudhi@tpsouthernodisha.com before "Last date and time for Payment of Tender Participation Fee".

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

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

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

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

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

Also, all future corrigendum to the said tender will be informed on Tender section on website <https://www.tpsouthernodisha.com/archivetenders.html>

OPEN TENDER NOTIFICATION

FOR

**SYSTEM IMPROVEMENT WORKS UNDER THE ELEPHANT
CORRIDOR PROGRAM, ON 'TURNKEY' BASIS FOR GNED
OF TPSODL**

Tender Enquiry No.: TPSODL/OT/2021-22/048

Due Date for Bid Submission: 05.10.2021; 17:00 Hrs

TP SOUTHERN ODISHA DISTRIBUTION LIMITED
(A Tata Power and Odisha Government Joint Venture)
Procurement & Stores Department
Corporate office: Kamapalli, Courtpeta, Berhampur, Ganjam, Odisha, India -760 004

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1.0 Event Information

1.1 Scope of work

Open Tenders are invited through e-tender bidding process from interested and eligible bidders for entering into a firm service order as defined below-

Tender Enquiry No.	Work Description	EMD (Rs.)	Tender Fee (Inclusive of GST) (Rs.)	Last Date and Time for payment of Tender Fee
NIT Number: TPSODL/OT/21-22/048	System Improvement Works under the Elephant Corridor Program, on 'turnkey' basis for GNED of TPSODL	35,000	5,000	22.09.2021, 18:00 Hrs

1.2 Availability of Tender Documents

Please refer "Procedure to participate in the e-tender".

1.3 Calendar of Events

(a)	Last Date of receipt of Tender Fee	22.09.2021 up to 18:00 Hours
(b)	Date & Time of Pre-Bid Meeting (If any)	Not Applicable
(c)	Last Date of receipt of pre-bid queries, if any	24.09.2021 up to 17:00 Hours
(d)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	27.09.2021 up to 17:00 Hours
(e)	Last date and time of receipt of Bids	05.10.2021 up to 17:00 Hours
(f)	Date & Time of opening technical bids & EMD	05.10.2021 up to 18:00 Hours onwards
(g)	Date & Time of opening of Price of qualified bids	Will be notified to the successful bidders through our website / e-mail.

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 TPSODL, the last date of submission of bids and date of opening of bids will be the following working day at appointed times.

1.4 Mandatory documents required along with the Bid

- 1.4.1 EMD of requisite value and validity
- 1.4.2 Tender Fee in case the tender is downloaded from website
- 1.4.3 Requisite Documents for compliance to Qualification Criteria mentioned in Clause 1.7.
- 1.4.4 Drawing, Type Test details along with a sample of each item as specified at Annexure I (as applicable)
- 1.4.5 Duly signed and stamped 'Schedule of Deviations' as per Annexure III on bidder's letterhead.
- 1.4.6 Duly signed and stamped 'Schedule of Commercial Specifications' as per Annexure IV on bidder's letter head.

- 1.4.7 Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.
- 1.4.8 Copy of PAN, GST, PF and ESI Registration (In case any of these documents is not available with the bidder, same to be explicitly mentioned in the 'Schedule of Deviations')

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

1.5 Deviation from Tender

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

1.6 Right of Acceptance/ Rejection

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

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

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

1.7 Qualification Criteria

- 1.7.1 The bidder should have Average Annual turnover of at least Rs. 50 Lacs for any of last 3 Financial Year (FY) out of FY 17-18, FY 18-19, FY 19-20, FY 20-21. (Copy of audited Balance Sheet and P&L Account to be submitted in this regard).
- 1.7.2 Bidder must enclose copies of the relevant work orders along with client certified copies of Final Invoices and/or Performance Certificates dully signed by the competent authority of the client and/or Final Inspection certificate issued by Electrical Inspector in proof of having executed the desired quantum of works during the last three financial years.
- 1.7.3 TPSODL reserves the right to waive minor deviation, if they do not materially affect the capacity of the bidder to perform the contract.
- 1.7.4 The bidder should submit the Performance Certificates for 3 years satisfactory performance from reputed companies for similar work. The work against these issued certificates should be completed in last seven years from the date of bid submission. Copy of performance certificates to be submitted in this regard.

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, TPSODL reserves the right to exclude a bidder from participating in future markets due to the bidder's violation of any of the rules or obligations contained in the General Condition of Contracts. A bidder who violates the marketplace rules or engages in behavior that disrupts the fair execution of the marketplace, may result in restriction of a bidder from further participation in the marketplace for a length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace
- Breach of terms as published in TENDER/NIT

1.9 Supplier Confidentiality

All information contained in this tender is confidential and shall not be disclosed, published or advertised in any manner without written authorization from TPSODL. This includes all bidding information submitted to TPSODL. All tender documents remain the property of TPSODL and all suppliers are required to return these documents to TPSODL upon request. Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

2.0 Evaluation Criteria

1. The bids will be evaluated technically on the compliance to tender terms and conditions.
2. The bids will be evaluated commercially on overall lowest all-inclusive lowest cost for the complete tender BOQ as calculated in Schedule of Items [Annexure I].
3. Bidder has to mandatorily quote against each line items as per schedule of item [Annexure- I]. Failing to do so TPSODL may reject the bid

NOTE: In case of a new bidder not registered, factory inspection and evaluation shall be carried out to ascertain bidder's manufacturing capability and quality procedures. However TPSODL reserves the right to carry out factory 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 TPSODL shall be final and binding on the bidder in this regard.

2.1 Price Variation Clause:

Price shall be quoted on Fixed and Firm basis without any Price escalation clause.

3.0 Submission of Bid Documents

3.1 Bid Submission

Bidders are requested to submit their offer in line with this Tender document. TPSODL shall respond to the clarification raised by various bidders and the replies will be sent to all participating bidders through e-mail.

Bids shall be submitted in 3 (Three) parts:

FIRST PART: “EMD” of **Rs. 35,000 /-** (Rupees Thirty-Five Thousand Only) shall be submitted.

The EMD shall be valid for 210 days from the due date of bid submission in the form of BG/ Bankers Pay Order favoring ‘TP Southern Odisha Distribution Limited’, payable at Berhampur only. The EMD 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. EMD in the form of BG/ Bankers Pay Order shall be required to be submitted only at the Office of HOD-Procurement as addressed hereunder-

TP SOUTHERN ODISHA DISTRIBUTION LIMITED

(A Tata Power and Odisha Government Joint Venture)

Procurement Department

Call Center /Training Center, Duduma Colony,

Ambagada, Berhampur, Odisha-761001

EMD May also be submitted through NEFT/ RTGS as per Bank details provided below with proper furnishing of submission details.

A separate non-refundable tender fee of stipulated amount also needs to be transferred online through NEFT/ RTGS in case the tender document is downloaded from our website.

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

Beneficiary Name – TP Southern Odisha Distribution Limited

Account No: 625901010050070

Type of Account: TPSODL Corporate Expenditure Account.

Name of the Bank: Union Bank of India, Kamapalli Branch, Berhampur.

IFSCode: UBIN0562599

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

- a) Documentary evidence in support of qualifying criteria
- b) Technical literature/GTP/Type test report etc. *(if applicable)*
- c) Qualified manpower available
- d) Testing facilities *(if applicable)*
- e) No Deviation Certificate as per the Annexure III – Schedule of Deviations
- f) Acceptance to Commercial Terms and Conditions viz Delivery schedule/period, payment terms etc. as per the Annexure IV – Schedule of Commercial Specifications.
- g) Quality Assurance Plan/Inspection Test Plan for supply items *(if applicable)*
- h) Acceptance of Annexure for Scope of work and Service level agreement.

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The technical bid shall be properly indexed and is to be submitted through TPSODL E-tender platform (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 along with explicit break up of basic prices, Taxes & duties, Freight etc. In case any discrepancy is observed between the item description stated in Schedule of Items mentioned in the tender and the price bid submitted by the bidder, the item description as mentioned in the tender document (to the extent modified through Corrigendum issued if any) shall prevail.

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

The EMD in the form of Bank Draft / BG / Bankers Pay Order shall be submitted in original hard copy and then placed in sealed envelope which shall be clearly marked as below:

EMD

**“System Improvement Works under the Elephant Corridor Program,
on ‘turnkey’ basis.”**

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the TPSODL, shall be written in the English Language.

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 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

All the bidders are requested to send their pre-bid queries (if any) against this tender through e-mail within the stipulated timelines. The consolidated reply to all the queries received shall be posted on TPSODL website by the stipulated timelines as detailed in calendar of events.

Communication Details:

Package Owner - Contracts

Name: Ms. Soni Panda
Department: Procurement
Contact No: 9178149826
E-Mail ID: soni.panda@tpsouthernodisha.com

DGM- Procurement & Stores

Name: Mr. Ch. Netaji Subudhi
Contact No.: 94379 59751
E-Mail ID: Netaji.Subudhi@tpsouthernodisha.com

Chief – Contract and Stores

Name: Mr. Subrata Dey
E-Mail ID: subrata.dey@tpsouthernodisha.com

Bidders are strictly advised to communicate with Package Owner through TPSODL E-tender System (Ariba) only. They need to pay Tender Participation Fee to receive the Ariba log-in.

3.3 Bid Prices

Bidders shall quote for the entire Scope of Supply/ work with a break up of prices for individual items and Taxes & duties. The bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total price with taxes, duties & freight up to destination at various sites of TPSODL. 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 elsewhere 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/ SLA mentioned in the tender, shall be deemed to be included in prices quoted.

Applicable GST to be specified clearly.

The quantity break up shown elsewhere 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/ SLA 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 TPSODL may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and responses thereto shall be made in writing.

3.6 Alternative Bids

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

3.7 Modifications and Withdrawal of Bids

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

3.8 Earnest Money Deposit (EMD)

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

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

- 3.8.1 Banker's Cheque/ Demand Draft/ Pay order drawn in favor of TP Southern Odisha Distribution Limited payable at Berhampur.
- 3.8.2 Online transfer of requisite amount through NEFT/ RTGS.
- 3.8.3 Bank Guarantee valid for 210 days after due date of submission.

The EMD shall be forfeited in case:

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

Or

- b) The successful Bidder does not
 - a) accept the Purchase Order, or
 - b) furnish the required Performance Security Bank Guarantee

3.9 Type Tests (if applicable)

The type tests specified in TPSODL 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 TPSODL.

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

4.2. Technical Bid Opening

Bids shall be opened as per the schedule mentioned in Calendar of Events. In case of limited tenders, the bids shall be opened internally by TPSODL. Owing to COVID Scenario, in case of Open Tenders also, the bids shall be opened internally by TPSODL. Technical bid must not contain any cost information whatsoever.

First the "EMD" will be checked. Bids without EMD/ cost of tender (if applicable) of required amount/ validity in prescribed format, shall be rejected.

Next, the technical bid of the bidders who have furnished the requisite EMD will be opened, one by one. The salient particulars of the techno commercial bid will be read out at the sole discretion of TPSODL.

4.3. Preliminary Examination of Bids/Responsiveness

TPSODL 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. TPSODL 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, TPSODL 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 TPSODL and/or the Bidder 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, TPSODL may, at its discretion, ask

the Bidder for a clarification on its Bid for any deviations with respect to the TPSODL 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 TPSODL. After all technical issues are clarified, the date of price bid opening will be intimated to the technically accepted bidders and same shall also be notified at TPSODL website.

4.5. Price Bid Opening

Price bids will be opened at the stipulated date and time. 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 TPSODL without any further correspondence in this regard.

4.6. Reverse Auctions

TPSODL 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

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

TPSODL 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 TPSODL 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 II)
5. Acceptance Form for Participation in Reverse Auction (Annexure VI)
6. General Conditions of Contract (Annexure VII)

7.0 Post Award Contract Administration

7.1 Special Conditions of Contract

- After finalization of tender, work order shall be issued on successful bidder for the work. Prices shall remain firm till the completion of work.

- Business Associate (BA) shall submit applicable Performance Bank Guarantee as per GCC-composite within 15 days of issuance of rate contract. PBG applicable shall 10% of the Contract Value. PBG submitted, shall be released after completion of applicable guarantee period plus one month.
- Guarantee applicable shall be as per technical specifications.
- BA shall submit GTP / Drawing within 1 week from issuance of work order. In case BA does not get necessary approvals for issuance of manufacturing clearances within mentioned/ mutually agreed timelines, then TPSODL reserve the right to cancel issued work order and also reserve the right to forfeit EMD / PBG.
- Completion period shall be 45 days from date of receipt of work order.
- TPSODL shall short close the issued work Order in case of any quality issues.
- Any change in statutory taxes, duties and levies shall be borne by TPSODL.
- All other terms and conditions of TPSODL GCC-Composite shall be applicable.

7.2 Delivery Timelines

The completion period shall be 45 days.

7.3 Payment Terms

After completion of work in good condition and certification of acceptance by certified official, Associate shall submit the Bills/ Invoices in original in the name of Tata Power Company Limited to Invoice Desk and same shall be paid within 45 days from the date of receipt of material and quality clearance at TPSODL's end.

7.4 Guarantee Period

Guarantee Period of the completed job shall be 2 years from the date of commissioning.

7.5 Climate Change

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

7.6 Ethics

TPSODL is an ethical organization and as a policy TPSODL 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.

TPSODL 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 GCC-composite attached at Annexure IX for more information.

Any ethical concerns with respect to this tender can be reported to the following e-mail ID: mpkulkarni@tpsouthernodisha.com with cc to Netaji.Subudhi@tpsouthernodisha.com.

8 Specification and standards

As per Annexure II

9 General Condition of Contract

Any condition not mentioned above shall be applicable as per GCC-composite attached along with this tender at Annexure IX.

10 Safety

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

All Associates shall strictly abide by the guidelines provided in the safety manual at all relevant stages during the contract period. All jobs in this tender have to be executed strictly in compliance to the Safety terms and Conditions of TP Southern Odisha Distribution Limited. Please refer attached Safety terms and conditions, Annexure-X, for details. Violation of Safety norms will result in Penalty as mentioned in the above document.

ANNEXURE I

Schedule of Items

Strengthening Electrical Infrastructure in Elephant Corridors and movement areas, on 'Turnkey' basis											
NAME OF THE BIDDER											
PRICE BID FOR THE PACKAGE GNED, Chatrapur:- (Including Supply of Material)											
Sl. No	Item-Description	UOM	Qty.	Supply			Installation			Total value Per Unit (Supply+ Erection) (Rs.)	Total Cost (Supply & Installation) of the Item (Rs.)
				Unit Price (Rs.)	GST (Rs)	All inclusive Unit Price (Rs.)	Unit Price (Rs.)	GST (Rs)	All inclusive Unit Price (Rs.)		
1	2	3	4			5			6	7=5+6	8=7*4
1	9Mtr long 300Kg PSC Pole	No	80								
2	8Mtr long, 200Kg PSC Pole	No	57								
3	11KV GI V Cross arm (10.2 Kg. each)	No	80								
4	Back Clamp for ' V' Cros Arm	No	80								
5	Pole Top bracket GI (F Clamp)	No.	80								
6	11 KV Pin Insulator (Polymer)	No.	240								
7	Earthing Of Support (Coil Type)	No	137								
8	M.S Nut, Bolt & washer	Kg	137								
9	GI base plate (500X500X10mm) for PSC Pole (20 Kg.)	No	137								
10	3x50+1X35 MM² LT AB Cable	Km	8.2								
11	1x35+1X25 MM²AB Cable	Km	0.7								
12	Suspension Clamp with 'I' Hook	No.	186								
13	Dead end clamp I hook	No.	66								
14	H.T. stay set (Complete)	Set	33								
15	H.T. Stay Insulator	No	33								
16	H.T. Stay clamp (1.95 K.g./ Pair)	Pair	33								
17	7/8 SWG Stay Wire	Kg	330								
18	Fencing of S/S (Size 16'x16'):- (i) 10nos of RCC 8' feet length barbed wire pillar (ii) G.I. 2ply 2.5mm dia Barbed Wire=80ftx5=400ft=121.97Mtr. or 122Mtr. @ 0.12Kg/mtr= 122Mtrx0.12=14.64Kg iii) Supply & installation of duple leaf M.S. Gate of height 1.5mtrx1.5mtr width, made out of 30x30x6mm Angle and 25x6mm Flat. The gate shall be painted with 2 coats. 1.5mtrx1.5mtr=2.25sqmtr or 24.22sqft @ 2.5Kg/sqft =24.22x2.5= 60.55Kg	No	2								
19	Concreting of support CC 1:3:6, using 40mm HBG metal=0.45mtrx0.45mtrx1.5mtr =0.3037cm	No	137								
20	Couping with C.C. 1:3:6 by using 12mm size hard broken granite chips =0.3Mtrx0.3Mtr x0.45Mtr =0.0405Cum	No	137								
21	Concreting for stay anchor plate CC 1:3:6, using 40mm HBG meta	No	33								

	l=0.45mtrx0.45mtrx1.5mtr=0.3037cm										
22	Sundries	Ls	5								
	Total Price of the package excluding GST										
	Add GST										
	Total value of the package including GST										
	NOTE :-										

1. All the materials required to complete the line works as detailed above are to be supplied by the bidder.
2. Bidder shall quote price for the above items as per the heads mentioned. Supply as well as erection prices of all the other accessories, assemblies, components, part etc associated with these items, not mentioned separately but required for completion of whole work & its commissioning as defined in Technical Specification and Volume of Work, are to be included in the prices of corresponding item mentioned in the price schedule.
3. The quantity break up for standard condition of work is indicative only for the purpose of tender quoting by the bidder. The actual quantity shall be as per site condition and accordingly payment shall be made after certification by Engineer In-Charge.

Signature & Seal of the Bidder

Supply of items-

- (i) Erection of Intermediate Poles (33 KV, 11KV &LT)
- (ii) Strengthening of Poles and Lines
- (iii) Coupling of existing Poles
- (iv) Fixing of spikes in the existing as well as newly installed poles
- (v) Fencing of distribution sub-station
- (vi) Replacement of bare conductor with AB cables in LT lines.
- (vii) Dismantling of existing LT Bare Conductors
- (viii) Any other work for strengthening of Electrical Infrastructure in Elephant corridor & Elephant movement areas.

The detailed scope of the work shall include

- a) Detailed survey of substation, line and preparation of SLD / BOQ to be done by the bidder.
- b) Complete manufacture, including shop testing & supply of materials from the approved vendor (materials which are to be supplied by the bidder) on subsequent approval of the owner (REC standard).
- c) Packing and transportation from the manufacturer's works to the site.
- d) Receipt, storage, preservation and conservation of equipment at the site.
- e) Pre-assembly, if any, erection testing and commissioning of all the equipment
- f) Reliability tests and performance and guarantee tests on completion of commissioning
- g) Loading, unloading and transportation as required.
- h) Erection of equipments in Sub-station including civil works.
- i) Erection of lines of specified voltage.
- j) Inspection, Testing, Commissioning of substations and lines / installations
- k) Storing before erection.
- l) Getting the substations & lines inspected as per BGJY circular of GoO after completion of work.

NOTE:

- The bidders are advised to quote prices strictly in the format attached.
- The bidder must fill each and every column of the format attached. **Mentioning "extra/inclusive" in any of the column may lead for rejection of the price bid.**
- No cutting/ overwriting in the prices is permissible.
- HSN/SAC codes for respective line item must be mandatorily provided wherever applicable.
- The bids will be evaluated commercially on the overall lowest cost on the complete BOQ

ANNEXURE II

SCOPE OF WORK AND SERVICE LEVEL AGREEMENT

As Per Annexure I

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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 TPSODL's specifications:*

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

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

Seal of the Bidder:

Signature:

Name:

ANNEXURE IV

Schedule of Commercial Specifications

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

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

Seal of the Bidder:

Signature:

Name:

ANNEXURE V

Checklist of all the documents to be submitted with the Bid

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

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

Seal of the Bidder:

Signature:

Name

ANNEXURE VI**ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT**

(To be signed and stamped by the bidder)

In a bid to make our entire procurement process more fair and transparent, TPSODL 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. TPSODL 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. TPSODL will make every effort to make the bid process transparent. However, the award decision by TPSODL would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPSODL, 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 TPSODL.
6. In case of intranet medium, TPSODL shall provide the infrastructure to bidders. Further, TPSODL 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 TPSODL.
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 TPSODL 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 auction event shall be considered by TPSODL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all-inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

Signature & Seal of the Bidder

ANNEXURE-VII

Technical Specifications

Attached separately with the tender document

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NIT No.: TPSODL/OT/21-22/048

ANNEXURE-VIII

General Condition of Contract for Composite Order

TECHNICAL

SPECIFICATION

STRENGTHENING OF INFRASTRUCTURE IN

**ELEPHANT CORRIDER FOR SAFETY MEASURES FOR
AVOIDING ELECTROCUTIONOF ELEPHANTS**

**TECHNICAL SPECIFICATION FOR CONSTRUCTION OF
1) 33 KV AND 2) 11KV DISTRIBUTION LINES**

1.0 NATURE OF WORK

The work covered by this Specification is for 33kV and/or 11 kV distribution lines as specified herein and in the attached Schedules. The overhead distribution lines will form part of the TPSODL distribution System.

1.1 GENERAL PARTICULARS OF THE SYSTEM

The following are the general particulars governing the design and working of the complete system of which the Works will form a part —

- a) Electrical energy is transmitted from 132/33 KV or from 220/33 KV grid S/S of OPTCL to TPSODL Primary 33/11 KV sub-stations as three-phase supply at a frequency of 50 Hz, and transmitted there from by means of overhead lines.
- b) The system will be in continuous operation during the varying atmospheric and climatic conditions occurring at all seasons.

1.2 SCOPE-

- (A) Construction of 33 KV & 11 KV New Lines under various packages
- (B) Up gradation of 33 KV & 11 KV lines under various packages which include replacement of damaged features like cross arms, insulators, hardwares, earthing device, induction of additional supports, rectification of joist poles and change of higher size of conductors etc
- (C) AB Cabling works.

Important: The eligible TPSODL has to obtain project license from the competent authority in respect of the mentioned works prior to commencement of the works. All the expenses towards the project license and inspection thereof have to be borne by the TPSODL.

The department will provide different size conductors and different size AB Cables along with AB Cable Accessories (Suspension clamp, Tension Clamp, Piercing connector, neutral Connector, Eye Hook only), which will be received from TPSODL store. All other items required for construction of New lines, up gradation or replacement of conductors, AB cabling works with inter posing of

poles, repair of old damaged poles, replacement of damaged X-arms, Post insulators with GI pin, replacement of tension fittings with Insulators (70KN or 45 KN), Mid-span joint, Al. tape, H/W fittings armoured rods concreting materials etc, along with suspension clamp, 'Eye' hook with shackle insulators, insulation piercing connector and dead end clamps required for AB Cables etc are to be supplied by TPSODL.

DISCLAIMER:

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

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

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

2.0 SURVEY (detail & check, estimating of quantities & spotting of towers / Poles)

Walk over survey, Theodolite survey, profile survey (if required) shall have to be carried out to establish the Route alignment by the TPSODL for new 33 KV, 11 KV lines. If the line is passing in any Municipal/ NAC areas permission from local bodies has to be obtained prior to execution of work. Suitable distance from the side of the road has to be made towards placement of line poles.

2.0.1 CHECK SURVEY

The TPSODL shall undertake the check survey during execution on the basis of the alignment profile drawing and tower schedule approved by the employer. If during check survey necessity arises for

minor change in route to eliminate way leave or other unavoidable constraints, the TPSODL may change the said alignment after obtaining prior approval from the employer

2.0.2 GENERAL: Preliminary route alignment in respect of the proposed 33KV & 11KV transmission lines has been fixed by the employer subject to alteration of places due to way leave or other unavoidable constraints. The Right of way shall be solved by the TPSODL and all expenses there of shall be borne by him. However, TPSODL shall render all helps in co-ordination with law and order department for solving the same. Involvement of Forest land should be restricted as far as possible.

2.0.3 Provisional quantities/numbers of different types of tower structures/Joist poles/PSC poles have been estimated and indicated in the BOQ Schedule given. However final quantities for work shall be as determined by the successful bidder, on completion of the detail survey, preparation of route profile drawing and designing of the different types of tower structures/Joist poles/PSC poles as elaborated in the specification and scope of work.

2.0.4 The TPSODL shall undertake detailed survey on the basis of the tentative alignment fixed by the employer. The said preliminary alignment may, however, change in the interest of economy to avoid forest and hazards in work. While surveying the alternative route the following points shall be taken care by the TPSODL.

- (a) The line is as near as possible to the available roads in the area
- (b) The route is straight and short as far as possible.
- (c) Good farming areas, religious places, forest, civil and defense installations, aerodromes, public and private premises, ponds, tanks, lakes, gardens, and plantations are avoided as far as practicable.
- (d) The line should be far away from telecommunication lines as reasonably possible. Parallelism with these lines shall be avoided as far as practicable.
- (e) Crossing with permanent objects are minimum but where unavoidable preferably at right angles.
- (f) Difficult and unsafe approaches are avoided.
- (g) The survey shall be conducted along the approved alignment only.

- (h) For river crossing/ Crossing of Nallas : Taking levels at 25 meter interval on bank of river and at 50 meter interval at bed of river so far as to show the true profile of the ground and river bed railway/road bridge, road The levels shall be taken at least 100 m. on either side of the crossing alignment. Both longitudinal and cross sectional shall be drawn preferably to a scale of 1:2000 at horizontal and 1:200 vertical.

After completing the detailed survey, the TPSODL shall submit the final profile and tower schedule/ pole schedule (with no. of stay or struct) for final approval of the employer. To facilitate checking of the alignment, suitable reference marks shall be provided. For this purpose, concrete pillars of suitable sizes shall be planted at all angle locations and suitable wooden/iron pegs shall be driven firmly at the intermediate points. The TPSODL shall quote his rate covering these involved jobs.

2.0.5 (a) Optimization of Pole Location

I. Pole Spotting

To optimize the line length, the TPSODL shall spot the poles in such a way so that the line is as close as possible to the straight line drawn between the start & end point of the line.

II. Crossings

Road Crossings:- At all road crossings, the double tension HW fittings should be used. There should absolutely no joints in the conductors in all road, power line and all other major crossing. The ground clearance from the road surfaces under maximum sag condition shall be not less than 8.5mtr over roads. In National High way the minimum height of guarding at the maximum sagging point should be less than 8.5 mts.

Railway Crossings- The railway crossing overhead or underground shall be carried out in the manner as approved & prescribed by the railway authorities from time to time.

The crossing shall normally be at right angle to the railway track. In case crossing is required to be done through underground cable, cost of the cable including laying and other accessories shall be in the scope of the TPSODL. During detailed engineering, the TPSODL shall submit his proposed arrangement for each railway crossing to the owner. The approval for crossing railway track shall be obtained by the owner from the Railway Authority.

Power Line Crossings-

Where the line is to cross over another line of the same voltage or lower voltage, provisions to prevent the possibility of their coming into contact with each shall be made in accordance with the Indian Electricity Rules.

III. Details En-route

After survey and finalization of route, the TPSODL shall submit detailed route map for each line. This would be including following details:

All poles on both sides of all the crossings shall be tension poles i.e. disc type insulators shall be used on these poles. At all the crossing described above the TPSODL shall use protective guarding as per REC Construction Standard A-1 to fulfill statutory requirements for 11 kV & 33 KV trunks & main spur line. 11kV & 33 KV branch spur line, being in the village, protective guarding shall be used wherever it will be required.

Clearance from Ground, Building, Trees etc. – Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date. The vendor shall select the height of the poles in order to achieve the prescribed electrical clearances.

IV. Final Schedule

The final schedule including Bill of quantity indicating location of poles specifically marking locations of failure containment pole/structure, DTs 11 KV line sectionalizes, line tapping points; angle of deviation at various tension pole locations, all type of crossings and other details shall be submitted for the approval of the owner. After approval, the TPSODL shall submit six more sets of the approved documents along with one set in reproducible form to purchaser for record purpose.

V. Danger Boards

The vendor shall provide & install danger plates on all 33kv, 11 kV DP structures, H pole structures and towers besides in all poles where DT is installed. The danger plates shall conform to REC specification No. 57/1993.

VI. Anti-climbing Devices

The vendor shall provide and install anti-climbing device on all 33kv and 11 kV DP structures, towers and at all poles as per CEA guide line. This shall be done with G.I. Barbed wire or modified spikes as

specified. The barbed wire shall conform to IS-278 (Grade A1). The barbed wires shall be given chromatin dip as per procedure laid down in IS: 1340.

VII. Fittings Common to all Line

Pin Insulator Binding: The TPSODL shall use AL. Binding wire for binding shall be as per REC Construction Standards No. C-5 or better thereof.

Mid Span Compression Joint & Repair Sleeves: The TPSODL shall supply & install the Mid Span Compression Joint and Repair Sleeves as per IS: 2121 (Part II).

Guy/Stay wire Clamp: The TPSODL shall supply & install Guy/Stay wire Clamp as per REC Construction Standard G-1 or better here of as specified..

VIII. Stay/Guy Sets

a) The Stay/Guys shall be used at the following pole locations;

At all the tapping points & dead end poles

At all the points where DT is to be installed

At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree)

At every alternative pole for 11 KV line (two sets)

Both side poles at all the crossing for road, nallaha, railway crossings etc.

b) The arrangement and number of stay sets to be installed on different pole structures shall be as per REC Construction Standards no. A-23 to A-27, G-5 & G-8. However, this shall be decided finally during erection, as per the advice of Engineer.

c) The stay set to be installed complete in all respect and would broadly consist of following items:

7/10 SWG G.I. Stay wire for 11 kV lines and 7/12 SWG for LT line as per REC Specification No.46/1986 Stay Insulator type A for LT line and type C for 11 kV line as per REC Specification No. 21/1981, Turn Buckle. Anchor rod and plate (Hot Dipped galvanized). Thimbles and Guy Grip Complete

stay set shall be as per REC Construction Standards no. G-1. The stay clamp is envisaged as GS structure along with other clamps brackets etc.

IX. Erection of stay sets

The TPSODL shall install the stay set complete in all respect. This includes excavation of pit in all kinds of soil with PCC in the ratio 1:2:4 as specified which shall be placed in the bottom of the pit.

The rest (upper half) of the pit shall be filled with excavated soil duly compacted layer by layer. An angle between 30 to 45 degrees shall be maintained between stay wire and the pole. The stay wire shall be used with a stay insulator at a height of 5 mts. above ground level with F.I. turn buckle.

X. Stringing and Installation of Line with Bare Conductors.

General

The scope of erection work shall include the cost of all labour, tools and plants such as tension stringing equipment and all other incidental expenses in connection with erection and stringing work. The Bidders shall indicate in the offer the sets of stringing equipment he would deploy exclusively for work under each package.

The stringing equipments shall be of sufficient capacity to string AAA conductor ACSR conductor.

The TPSODL shall be responsible for transportation to site of all the materials to be provided by the TPSODL as well as proper storage, insurance etc. at his own cost, till such time the erected line is taken over by the owner.

TPSODL shall set up required number of stores along the line and the exact location of such stores shall be discussed and agreed upon with the owner.

Insulator Fixing

Pin insulators shall be used on all poles while strain insulators shall be used on all angle & dead end poles. The special type Pin Insulators should be used for conductors more than 100 mm². Damaged insulators and fittings, if any, shall not be used. Prior to fixing, all insulators shall be cleaned in a manner that shall not spoil, injure or scratch the surface of the insulator, but in no case shall any oil be used for this purpose. Torque wrench shall be used for fixing various line materials and components, such as suspension clamp for conductor, whenever recommended by the manufacturer of the same.

Running Out of the Conductors

The TPSODL shall be entirely responsible for any damage to the pole or conductors during stringing. The conductors shall be run out of the drums from the top in order to avoid damage to conductor

A suitable braking device shall be provided to avoid damaging, loose running out and kinking of the conductors. Care shall be taken to ensure that the conductor does not touch and rub against the ground or objects, which could scratch or damage the strands.

The sequence of running out shall be from the top to down i.e. the top conductor shall be run out first, followed in succession by the side conductors. Unbalanced loads on poles shall be avoided as far as possible.

Wherever applicable, inner phase off-line conductors shall be strung before the stringing of the outer phases is taken up.

When lines being erected run parallel to existing energized power lines, the TPSODL shall take adequate safety precautions to protect personnel from the potentially dangerous voltage build up due to electromagnetic and electrostatic coupling in the pulling wire, conductors and earth wire during stringing operations.

The TPSODL shall also take adequate safety precautions to protect personnel from potentially dangerous voltage build up due to distant electrical storms or any other reason.

Repairs to Conductors

The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations. Repair to conductors, if necessary, shall be carried out with repair sleeves and not more than one repair sleeve will be used in one span.

Repairing of the conductor surface shall be carried out free of cost only in case of minor damage, scuff marks, etc. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts, abrasions etc. After compression the sharp edges must be smoothened by filing.

The TPSODL shall be entirely responsible for any damage to the poles, insulators etc during stringing.

Stringing of Conductor

The stringing of the conductor shall be done by the standard stringing method.

The Bidder shall submit complete details of the stringing method for owner's approval. Conductors shall not be allowed to hang in the stringing blocks for more than 96 hours before being pulled to the specified sag.

Derricks/ scaffoldings or other equivalent methods shall be used to ensure that normal services are not interrupted and any property is not damaged during stringing operations for roads, telecommunication lines, power lines and railway lines. However, shut-down shall be obtained when working at crossings of overhead power lines. The TPSODL shall make specific request for the same to the owner.

Jointing

When approaching the end of a drum length at least three coils shall be left in place when the stringing operations are stopped. These coils are to be removed carefully, and if another length is required to be run out, a joint shall be made as per the recommendations of the accessories manufacturer.

Conductor splices shall not crack or otherwise be susceptible to damage during stringing operation. The TPSODL shall use only such equipment/methods during conductor stringing which ensures complete compliance in this regard.

All the joints on the conductor shall be of compression type, in accordance with the recommendations of the manufacturer, for which all necessary tools and equipment like compressors, dies etc., shall be arranged by the TPSODL. Each part of the joint shall be cleaned by wire brush till it is free of rust or dirt, etc. This shall be properly greased with anti-corrosive compound if recommended by the manufacturer, before the final compression is carried out with the compressors.

All the joints or splices shall be made at least 30 meters away from the pole. No joints or splices shall be made in spans crossing over main roads, railway line and Small River spans. Not more than one joint per conductor per span shall be allowed. The compression type fittings shall be of the self centering type or care shall be taken to mark the conductors to indicate when the fitting is centered properly.

During compression or splicing operation, the conductor shall be handled in such a manner as to prevent lateral or vertical bearing against the dies. After compressing the joint, the Aluminium sleeve shall have all corners rounded; burrs and sharp edges removed and smoothened.

To avoid any damage to the joint, the TPSODL shall use a suitable protector for mid span compression joints in case they are to be passed over pulley blocks/aerial rollers. The pulley groove size shall be such that the joint along with protection can be passed over it smoothly.

In case of ACSR conductors the filler compound should be used during compression. In case AAAC is used each press should overlap 25% of the previous press.

Tensioning and Sagging Operations:

The tensioning and sagging shall be done in accordance with the approved stringing charts or sag tables.

The sag shall be checked in the first and the last section span for sections up to eight spans and in one additional intermediate span for sections with more than eight spans. Tensioning and sagging operations shall be carried out in calm weather when rapid changes in temperature are not likely to occur.

Clipping In

Clipping of the conductors into position shall be done in accordance with the manufacturer's recommendations.

Jumpers at section and angle towers shall be formed to parabolic shape to ensure maximum clearance requirements. Pilot pin insulator shall be used, if found necessary, to restrict jumper swing & to ensure proper clearance to design values.

Fasteners in all fittings and accessories shall be secured in position. The security clip shall be properly opened and sprung into position.

Fixing of Conductors and Earth wire Accessories

Conductor and earth wire accessories supplied by the TPSODL shall be installed by the TPSODL as per the design requirements and manufacturer's instructions. While installing the conductor and earth

wire accessories, proper care shall be taken to ensure that the surfaces are clean and smooth and that no damage occurs to any part of the accessories or of the conductors.

Replacement:

If any replacements are to be effected after stringing and tensioning or during maintenance e.g. replacement of cross arms, the conductor shall be suitably tied to the pole at tension points or transferred to suitable roller pulleys at suspension points.

XI. Stringing of Aerial Bunched Cable (ABC)

Fixing of Suspension & Tension/ Dead end fittings to the Poles.

The suspension clamp is to be hung on eye hook/ suspension hook, which is fixed to the pole at a minimum distance of 0.15 mt. from top end of the pole. The messenger wire of bunched cable resting on a pulley is separated from the cable by separating wedges and inserted in the conductor groove of the suspension clamp.

The bolt is tightened to a torque of 20 N after which the pulley and wedges are to be removed. The cable is tied to the messenger wire with nylon tie on both sides of clamps. Pole clamps 50 x 8 mm flat shall be used. Eye hook of 20mm dia MS rod to be used as per the drawing. The pole clamp shall be made to suite the pole width. This shall be installed as per Fig. No. 2 (a) of REC Construction Standard. All ferrous items shall be hot dip galvanized with zinc coating of 610gms / m².

Fittings & Accessories

The following hardware fittings and accessories shall be used to install, erect & join the aerial bunched cable.

a) Suspension Clamp with Eye-Hook – The TPSODL shall install the suspension clamp with eye hook. This hook shall be used to attach the AB cable on the pole by means of a dead end clamp in terminal poles and for attaching a suspension clamp suitable for holding AB cables of size 35mm² to 95mm² in straight lines and angle up to 90 Deg.-

b) Suspension fittings & the corresponding eye hook shall be as per REC Construction Standard No. e – 34. The eye hooks shall be made from minimum 20mm dia MS rods with eye on one end and the other end being suitably flattened with two holes for M16 bolt & nut to fix with the back clamps made from

minimum 50x8mm flats as per drawing. The eye hook, back clamp and bolts & nuts are to be hot dip galvanized.

c) Dead End fittings shall be bolted type as per REC Construction Standard No. E-35 & the corresponding eye hook shall be as specified above. The dead clamps are to be anchored with the pole with similar arrangement of eye hook & back clamp. In this case, the back clamp shall have two nos. of holes on both sides for M16 bolts. One side of the clamp shall be used for holding the eye hook with dead end clamp and the other side shall be used for anchoring the Stay.

d) Nylon Tie- The TPSODL shall supply nylon ties. These ties shall be used for tying the conductors with the messenger wire to prevent the phase conductors from chatting against suspension clamp. The nylon tie is made of weather resistant black nylon.

e) Connectors- The TPSODL shall supply connector. These shall be used as non-tension aluminum to aluminum connections for conductor joints.

f) Plastic Covers for Connectors- The TPSODL shall install Plastic Covers for Connectors. These covers shall be used with aluminum/aluminum connectors to protect connectors against corrosion caused by climatic conditions.

Installation of Cable

The TPSODL shall be fully responsible for all activities related to installation of AB cable. His responsibilities consists of handling, pulling, stringing & jointing of the cable and effecting service connection to consumers as per direction of the Engineer-in-charge. The total no. of consumers per KM in urban area and rural area is approximately 200 & 50 nos. respectively. But payment shall be made as per actual use of piercing connectors to effect service connection to the consumers.

Handling of AB Cable

The TPSODL shall observe following precautions while handling the AB Cable: The

cable drums must be stored and transported in an upright position.

While loading/unloading, the drums shall not be thrown from transport vehicles.

Cable contact with sharp articles shall be avoided.

In order to prevent damage to the insulation, the cable shall not be dragged on the ground. Pulleys shall be used for this purpose.

In order to prevent strands from spreading, always cut the cable with a cutter.

Use nylon ties or electrical tape to prevent the cable from spreading away from messenger wire after the cutting. Staple the end of the cable on to the drum in order to prevent loosening.

Do not remove the protective boards from the cable drum before the cable is pulled off the drum.

While moving the drum by rolling it on ground, always roll the drum in the direction indicated by the arrow on the flange. When pulling the cable, the spinning direction must be opposite.

Do not store the drums on wet soil, sandy or humid places.

Store the accessories in good order for quick easy and correct handling.

Pulling the Cable

The principle is to pull the cable under mechanical tension so that contact with the ground or any other obstacles is avoided. The cable drum should be perfectly in alignment with line to be strung and fixed about 15-20 mts.

From the holding the first pulley. Open the cover of the drum to check and ensure that the insulation is not damaged.

The pulling which is sent up upto the cable drum is about 15-20 mts from the pole holding to the last pulley. The pulleys are directly hung to such hook on the poles. The pulley tandem is to be used on angle poles if the line is deviating more than 60°. Pull the guiding rope through all the pulleys.

Normal care shall be taken to assume a smooth passage of whole cable through the pulleys, especially in the first pole and on angle poles. One worker should act as brakeman at the cable drum so that the cable is not loosened during the pulling. One worker should follow the cable going through the pulleys and stop the pulling if anything goes wrong.

Stringing Operations.

The TPSODL shall follow one of the following methods for stringing.

1. Sag Method

Fix a dead end clamp on the neutral messenger wire at the pole. The messenger shall be bent behind the clamp to ensure sufficient friction between the messenger and the clamp in the initial stays during stringing.

Bind the conductor together beside the dead end clamp using a nylon tie.

Hand the clamp on the hook at the end pole Rewind simultaneously the slack cable length on the cable drum.

Attach the 'come along' on the neutral messenger wire at the first pole of the line.

Tighten the cable by the shackle or the winch when required sag is obtained.

Hand the dead end clamp on the hook and install it on the neutral messenger.

Remove the come along

Bind the conductors together on the messenger wire using a nylon tie

Check the length of the cable needed and cut it at an appropriate point.

2. Dynamometer Methods

Start the operation as above up to the stage.

Install the dynamo meter on the come-along

Tighten the cable at the required value by reading the Dynamo meter

Finish the stringing as in the sag method operation.

Jointing of Cables

Jointing of cable shall be in accordance with clause 12.3.3 of IS 1255:1993 and manufacturers special instructions given hereunder. This joining is to be done by skilled personnel.

Cable Damage and Repairs: If the cable is damaged for whatever reasons, it shall be brought to the notice of the engineer and shall not be used without his approval.

No joint or splice shall be made in spans crossings over main roads, small rivers or in tension spans.

Not more than one joint in the cable shall be allowed in one span.

The stringing rate includes rates for paving, stringing, clamping, jointing, tensioning and fitting of all necessary accessories.

Insulated piercing connectors suitable for AB cable size from 16mm² to 95mm² and service connection cable of size 2.5mm² to 35mm² shall be used for effecting service connections to the consumers.

Final Checking, Testing and Commissioning

After stringing has been done as approved by the engineer, to ensure that everything is complete in all respects, the works shall be thoroughly inspected keeping in view the following main points.

All the bolts and nuts should be of hot dip galvanized materials as per relevant IS.

The stringing of the cable has been done as per the approved sag and desired clearances are achieved.

No damage, minor or major to the cable, messenger wire and accessories

The TPSODL shall submit a report to the above effect to the Engineer in Charge, who shall inspect and verify the correctness of the report. In case it is noticed that some or any of the above is not fulfilled, the engineer shall get such items rectified by the TPSODL at no extra cost to the purchaser.

After final checking, the line shall be tested for insulation resistance in accordance with IS 1255:1983.

All arrangements for such testing or any other test desired by the Engineer-in-charge shall be done by the TPSODL and necessary labour, transport and equipment shall be provided by him. Any defect found out as a result of such tests shall be rectified by the TPSODL, forthwith at no extra cost to the purchaser.

In addition to the above, the TPSODL shall be responsible for testing and ensuring that the total and relative sags of the cable are within the specified tolerance. Such tests shall be carried out at selected points along the route as required by the Engineer-in-charge and the TPSODL shall provide all necessary equipment and labour to enable the tests to be carried out. After satisfactory test on the line and approval by the Engineer in Charge, the line shall be energized at full operating voltage before handing over. The cable shall be megger tested before and after jointing. The AB cable shall be tested for.

i) Continuity of messenger wire and conductors

- ii) Absence of cross phasing
- iii) Insulation resistance to earth
- iv) Insulation resistance between conductors
- v) DC Resistance
- vi) Capacitance

As per IS 1255:1983 of the latest issue and as per manufacturer's instructions.

Sufficient backfilled earth covers each foundation pit and is adequately compacted.

All poles are used strictly according to final approved drawing and are free of any defect or damage whatsoever.

The stringing of the conductors and earth wire has been done as per the approved sag and tension charts and desired clearances as clearly available.

All conductor and messenger wire accessories are properly installed.

All other requirements for completion of works such as fixing of danger plate and anti-climbing device have been fulfilled.

The insulation of the line as a whole is tested by the TPSODL through provision of his own equipment, labour etc., to the satisfaction of the owner. Proper earthing of the poles.

HT/LT/Road Crossing Guarding

The TPSODL shall provide & install protective guarding as per REC construction standard for both 33 and 11 kV line, The guarding shall be provided at all the crossing i.e. road, telecommunication & power lines, railway line, nallaha etc.

The TPSODL is required to follow local statutory regulations stipulated in Electricity (Supply) Act 1948, Indian Electricity Rules 1956 as amended and other local rules and regulations referred in these specifications.

Reference Standards

The codes and/or standards referred to in the specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the specifications, latter shall govern. Such codes and/or standards, referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies unless otherwise indicated. Other internationally accepted standards which ensure equal or better performance than those specified shall also be accepted, subject to prior approval by the owner. In case no reference is given for any item in these specifications, latest REC specification & Construction Standards shall be referred to.

2.0.6 SPAN

1. The span should be as near as possible to the basic design span so that the minimum ground clearance should not less than 7.0 mts in cross country at maximum sag condition.(The span length should be applicable for both 33KV& 11 KV lines.)
2. In urban areas minimum in every Half KM one angle tower (Cut point) has to be provided.
3. In other areas in every 1.5 KM one angle tower (Cut point) may be provided.

2.0.7 WAY-LEAVE AND TREE CUTTING

Way-leave permission which may be required by the TPSODL shall be arranged at his cost. While submitting final-survey report for approval, proposals for way-leave right of way shall be submitted by the TPSODL. Employer may extend help to get the permission within a reasonable time as mutually agreed upon for which due notice shall be given by the TPSODL in such a way so that obtaining permission from appropriate authority do not hinder the continued and smooth progress of the work.

The employer shall not be held responsible for any claim on account of damage done by the TPSODL or his personnel to trees, crops and other properties.

The TPSODL shall take necessary precaution to avoid damage to any ripe and partially grown crops and in the case of unavoidable damage, the employer shall be informed and necessary compensation shall be paid by the TPSODL.

All the documents required for application to the statutory authorities must be prepared by the TPSODL & submitted to the employer for submission of the application towards approval of Railway Crossing etc. However, the responsibilities lie with the TPSODL to get the clearance.

Trimming of tree branches or cutting of a few trees en-route during survey is within the scope of survey to be done by the TPSODL. TPSODL shall arrange for necessary way-leave and compensation in this regard. During erection of the line, compensation for tree cutting, damage caused to crops, actual cutting and falling of the trees including way-leave permission for such route clearance shall be arranged by the TPSODL at his cost. The TPSODL will identify the number of trees and detail of obstructions to be removed for erection of the line and intimate the employer well in advance in case of any help. Other related works like construction of temporary approach roads, etc.as required, shall be done by the TPSODL and the same will lie within the scope of TPSODL's work and such cost shall be considered to be included in the rates quoted by him.

2.0.8 SUB-SOIL INVESTIGATION (In case of river crossing locations/other locations where PILLING may be required)

To ascertain soil parameters in locations where higher tower will be required in order to get adequate ground clearance (Either 220KV or 132 KV tower normally used in OPTCL) the TPSODL shall carry out sub-soil investigation through reputed soil consultant as approved by the employer.

2.0.8.1 SCOPE OF WORK

The scope of sub-soil investigation covers execution of complete soil exploration for the transmission line under this contract including boring, drilling, collection of undisturbed soil sample where possible, otherwise disturbed samples, conducting laboratory test of soil samples to find out the various parameters as detailed in this specification and submission of detailed reports in 6 copies along with specific recommendation regarding suitable type of foundation for each bore-hole along with recommendation for soil improvement where necessary.

2.0.8.2 QUALIFYING REQUIREMENTS OF SOIL CONSULTANTS

The soil consultants shall provide satisfactory evidence concerning the following as and when asked for.

That, he/they has/have adequate technical knowledge and previous practical experience in carrying out complete soil investigation jobs in any kind of soil.

That he/they has/have well equipped, modernized soil testing laboratory of his/their own. If asked for by the employer, the TPSODL shall arrange inspection of such laboratory of the soil consultant by the representative of the employer.

If in the opinion of the employer, the soil consultant (proposed by the TPSODL) is not well equipped or capable to undertake the sub-soil investigation job relating to this contract, then such soil consultant shall not be engaged to undertake the job. In that case, they shall have to engage other agency as will be approved by the employer.

2.0.8.3 TEST BORING

The boring shall be done at the major locations / crossing of special towers. However, it is desirable that all 132 KV and 220KV in river X-ing spans sub-soil investigation bore-hole will be required.

The test boring through different layers of all kinds of soil shall have to be carried out by the TPSODL through the approved soil consultant as briefed hereunder.

- (a) Method of boring, selection of sampling tubes, sampling, recording of boring, protection, handling, leveling of samples shall be done as specified in IS: 1892/1977, if any, after obtaining approval from the employer. The TPSODL/consultant shall furnish in the soil report in details, the equipment and method of boring actually adopted.
- (b) Depth of boring below ground level shall be normally 15 Mts to 25 Mts., in river crossing locations.
- (c) Undisturbed soil samples shall be obtained for the initial 4M depths at every 1.5M interval and at change of strata. After these initial 4M depths, samples shall be obtained preferably at every 3M or where there is a change of strata, or as advised by the employer.
- (d) In case collection of undisturbed samples becomes difficult/impossible detailed soil testing on remolded soil samples is to be considered and reported in the soil report.
- (e) Standard penetration test as per IS: 2131 with latest amendment shall have to be conducted in different strata and recorded properly.

- (f) The ground water table shall be recorded during boring operation and incorporated in the bore log. If possible, the position of the water table just after monsoon period be ascertained from local people and indicated in the report.

2.0.8.4 LABORATORY TESTS OF SOIL SAMPLES

The method and procedure of testing of soil sample to be followed shall be as per relevant IS codes. Adequate volume of test samples shall be collected from site. Sample shall be properly sealed immediately after recovery as specified in relevant IS code and transported carefully to laboratory for carrying out necessary laboratory tests to find out the following parameters of every samples. Data and time of taking of the sample shall be recorded in the test report.

- (a) Natural moisture content, Liquid limit, Plastic limit and Plasticity index.
- (b) Bulk, dry and buoyant density of soil.
- (c) Void ratio (e-long P curve shall be submitted)
- (d) Specific gravity.
- (e) Grain size distribution (Sieve analysis and hydrometer analysis)
- (f) Tri-axial and consolidation tests (consolidation undrained and consolidated drained as and when application in table, graph and drawing.
- (g) Permeability tests
- (h) Chemical tests for both water and soil samples at different layers.
- (i) Evaluation of safe bearing capacity at different strata for square footings shall be done for a maximum value of 25-mm. settlements.
- (j) At depths. From 3M to 25 different strata.
- (k) Factor of safety shall be considered as 3 for evaluation of safe bearing capacity of soil.
- (l) Unconfined compression test for cohesive soil ($=0$) if encountered.

2.0.8.5 REPORT ON SUB-SOIL INVESTIGATION

The TPSODL shall make analysis of soil samples as collected by him in the field and approved by the employer. A comprehensive report shall have to be prepared by him, finally incorporating all the data collected in proper tabular forms or otherwise along with the analysis.

Three copies of report in the draft form shall be submitted for employer's approval. 6(six) copies of final report incorporating employer's comments, if any, shall be submitted within 3(three) weeks after completion of this work.

Recommendations shall include but not be limited to the following items (a) to (o)

- (a) Geological information of the region.
- (b) Past observations and historical data, if available, for the area or for other areas with similar profile or for similar structures in the nearby area.
- (c) Procedure of investigations employed at field as well as laboratory test results.
- (d) Net safe bearing capacity and settlement computation for different types of foundations for various widths and depths of tower and building.
- (e) Recommendations regarding stability of slopes, during excavations etc.
- (f) Selection of foundation types for towers, transformers and buildings etc.
- (g) Bore hole and trial pit logs on standard proforma showing the depths, extent of various soil strata etc.
- (h) A set of longitudinal and transverse profiles connecting various boreholes shall be presented in order to give a clear picture of the site, how the soil/rock strata are varying vertically and horizontally.
- (i) Modulus of sub grade reaction from plate load test for pressure ranging up to 6 kg/cm². The recommended values shall include the effect of size, shape and depth of foundations.
- (j) Deformation modulus from plate load test in various test depth/stratification.
- (k) Coefficient of earth pressure at rest.
- (l) Depth of ground water table and its effect on foundation design parameters.
- (m) Recommendations regarding stability of slopes, during shallow excavation etc.
- (n) Whether piles are necessary or not. If piles are necessary, recommendation of depth, diameter and types of piles to be used.
- (o) Recommendations for the type of cement to be used and any treatment to the underground concrete structure based on the chemical composition of soil and sub-soil water.

3.0 CONDUCTOR

In normal practice AAA conductors of 80 Sq mm, 100 Sq mm will be used in 11 KV lines and that of 232 sq. mm AAAC will be used in 33 KV lines. **55 sq. mm & 34 sq. mm size AAAC of good quality after recovery from augmentation may be utilized in LT system.**

3.0.1 ROAD CROSSING (Cross country, Village pucca roads)

At all major road crossings, the angle towers/ poles shall be provided. The ground clearance above the roads should not be less than 8.5 mts. Double tension fittings should be provided in every road crossing span. Guarding should be provided in each road crossing.

3.0.2 POWER LINE CROSSINGS

Where the lines cross over another line of the same voltage or lower voltage, provisions to prevent the possibility of its coming into contact with other overhead lines shall be made in accordance with the Indian Electricity Rules, 1956 as amended from time to time. All the works related to the above proposal shall be deemed to be included in the scope of the TPSODL.

3.0.3 TELECOMMUNICATION LINE CROSSINGS

- a) The angle of crossing shall be as near to 90 degree as possible. However, deviation to the extent of 20 degree may be permitted under exceptionally difficult situations. The existing line route may be changed where required.
- b) HT line shall be routed with requisite suppression with parallel telecom line to avoid inductance during faults.

3.0.4 DETAILS EN -ROUTE

All topographical details, permanent features, such as trees, telecommunication lines, building etc. 7.5 mtr (33 kV) and 3.5 mtr (11 kV) on either side of the alignment shall be detailed on the route plan before execution of work. However, any problems arising out of Right of way, shall be taken care of by the TPSODL. The owner shall extend all possible Co-operation.

3.0.5 CLEARANCE FROM GROUND, BUILDING, TREES ETC.

3.0.5.1 Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date. The bidder shall select the height of the poles such that all electrical clearances are maintained.

3.0.5.2 Guarding mesh shall be used in all electric line / telecom line / road / drain / canal crossing and at all points as per statutory requirements. The bidder shall provide & install anti climbing devices and danger plates on all poles and DT stations. Where there is no such provision in the existing line.

3.0.5.3 Pole accessories like danger plates, and number plates shall be provided.

3.0.6. TOWERS/ POLES

Support Structures may be of lattice type or joist or PSC poles. Double Ckt. both suspension and tension poles in case of all 33 KV lines and if required in case of 11 KV lines to be specified individually in the packages. **2 to 3 mts.** extension where ever necessary in case mini base tower is to be used. The total steel structures to be inducted to the existing or as additional features should be Galvanized with minimum zinc coating of 610 gms / Sq. Mts. Any new design (approved and tested in any approved test bed) as per the required parameters is also acceptable. In case of 11KV and LT lines the conventional PSC poles may be used. No more MS poles without Galvanization will be used. For easy transportation two pieces of galvanized poles with single splice joint using galvanized sections of channels/angles/plates of adequate size along with required size GI bolt nuts & spring washers is to be adopted. Joist with minimum 150x150mm or 116x100 mm sections are to be considered for the supports (in accordance to scope). 2 nos **450** mm long cleats with 65 x 65 x 5mm angle to be welded **or bolted by providing minimum 2 nos 16 mm B&N, sp. washer.** Full length welding is to be done on either side in the base level. The materials must conform to IS: 800. All the test on materials and fabrication etc will be as per the relevant Indian standards

In upgraded schemes all care must be taken to rectify the damaged steel supports especially in the base level through adequate size and height of coping. In case, section size is corroded splices be provided with 2 numbers of channels on either side to suit to the joints for coupling as per the approved drawing. The splices to be supported with welding which are to be embedded in RCC concrete.

In different crossings the TPSODL shall take into consideration the prevailing regulations of the respective authorities before finalizing type and location of the towers. While carrying out survey work, the TPSODL has to collect all relevant data, prepare and submit drawings in requisite number for obtaining clearance from road, aviation, railways, river and forest authorities.

4.0 ERECTION WORK

When the survey is approved, the TPSODL shall submit to the employer a complete detail schedule of all materials to be used in the line. Size and length of conductor etc. are also to be given in the list. This schedule is very essential for finalizing the quantities of all line materials. The TPSODL shall furnish the same.

4.1 SCHEDULE OF ERECTION PROGRAMME

After due approval of the detailed and check survey, the TPSODL shall submit to the employer a complete detailed schedule of erection programme with a Bar-Chart for construction of the lines indicating there in the target date of completion.

4.2 DRAWINGS FOR TOWER AND FOUNDATIONS

All indicative drawings of towers, structures etc with foundation will be provided by TPSODL. The final drawings which are actually to be used has to be submitted by TPSODL for approval by Hqs. Office.

(I) Mini Base Towers :-

In order to minimize the corridor width / difficulties, self supported Mini-based Towers can be used, having the base width varying from 0.5 mts to 1.0 mts. Also it will be made double circuit which can carry 232 sq. mm. Conductor. No stay or strut will be allowed for towers. The entire tower parts are to be from welded Galvanised structure having three nos of section. The details of Mini Based Towers is furnished below (This is indicative, the dimension, volume etc may vary according to soil data).

A' Type Tower Details: Back To Back :- 500x500 mm

Total Wt : 850 kg

Normal

WBC

Concrete Vol. : 1.75 cum - 2.0 cum

Reinforcement : 50 kgs - 60 kg

Excavation Vol : 6.97 cum - 7.21 cum

Lean Concrete : 0.15 cum - 0.17 cum

B' Type Tower Details : Back To Back :- 770x770 mm

Total Wt : 1760 kg -

Concrete Vol. : 4.04 cum - 5.14 cum

Reinforcement : 175 kg - 220 kgs

Excavation Vol : 25.2 cum - 36.35 cum

Lean Concrete: 0.39 cum - 0.58 cum

C'	Type Tower Details :	Back To Back :- 1000x1000 mm
	Concrete Vol. : cum	- cum
	Reinforcement : kg	- kgs
	Excavation Vol : cum	- cum
	Lean Concrete: cum	- cum

(II) GALVANISED 'H' POLE STRUCTURE.

In Urban areas where power demand is very much but it is very much difficult to draw lines with higher conductors either through NBLS towers or through Mini Base Towers the galvanized H pole structures can be used at tangent locations. It is preferably 148 sq. mm double ckt. Line can be drawn through these structures over PIN insulators. Though the higher size conductors over pin insulators are comparatively less reliable in comparison with suspension fitting, it can be made safe by fixing the conductors tightly over the grooves of the pin insulator by using the good quality Aluminum binding tape. These joints should be checked regularly after availing shut down. In H pole structure line the angle locations can be made of by using RS Joist DP structure or Mini Base angle Towers can be utilized which should be decided as per the field condition, availability of free land for putting stay or struts, height of structures required etc. When H pole structures are to be used the span length may be kept within 50 mts. both for 33 KV & 11 KV lines. Normally the back to back of H pole is around 250 mm. which is made up by using two nos. 100x50 channels welded with plates. The total H pole structures is divided in to two parts and jointed at the centre by using suitable clits and Bolt & Nuts.

For better stability point of view the base of all structures Joist poles RCC (1:2:4) foundation is to be adopted, in case of PSC pole PCC (1:2:4) will be provided without cooping.

5.0 CONSTRUCTION OF FOUNDATION FOR TOWER, G.I (RS Joist) POLES AND PSC POLES

5.0.1 ERECTION OF POLE, CONCRETING OF POLES AND COMPACTION OF SOIL

Drawing for the excavation of pits, Foundation of both wet and Black cotton soil is enclosed which are to be adopted. If better design with less volume approved or tested by any other distribution agencies will also be acceptable.

5.0.2 Following arrangement shall be adopted for proper erection of poles wherever necessary and properly compacting of the soil around the base / foot of the poles, under this package.

- (a) Excavation has to done as per the drawing to the required depth and size. After final excavation the pit should be dressed properly so that uneven portion and loose soil should be removed before PCC (**M-7.5**) of thickness 75 mm is laid. The base footing of the pole concreting RCC (M-15) has to be done by proper alignment and verticality.
- (b) The verticality and leveling of pole/structure should be done by the help of plumbob or with theodolite and leveling instrument.
- (c) **In case of Joist pole Base clits and in case of PSC pole GI base plate (450x450x10) mm or RCC Pre –cast slab of size (500 x 500 x 100) mm has to be provided over the Lean concrete.**

5.0.3 CEMENT CONCRETE (PLAIN OR REINFORCED), STUB SETTING GROUNDING AND BACK FILLING etc.

A) Materials

All materials whether to be consumed in the work or used temporarily shall conform to relevant IS specification, unless stated otherwise, and shall be of the best approved quality.

B) Cement

Cement to be used in the work under the contract shall generally conform to IS:269/455-1989. Cement bags shall be stored by the TPSODL in a water tight well ventilated store sheds on raised wooden platform (raised at least 150 mm above ground level) in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter. Cements to be used within three months from the date of manufacture. Sub-standard or partly set cement shall not be used and shall be removed from the site by the TPSODL at his cost.

- C) Coarse Aggregates i.e Stone chips or stone ballast. For M15 concrete (mix 1:2:4) the aggregate will be in the ranges from 12mm to 20mm.size and for M7.5 concrete (mix 1:4:8) these will be from 25mm to 40mm size.

D) Pole erection

1. **After proper alignment**, checking of verticality and leveling, the pole or structure should be properly tied before placing of base concrete of required height. Again the verticality and leveling should be checked.
2. **The RCC pedestal concrete** (M-15) is to be done by providing good quality of shutters, so that there will no leakage of cement slurry during concreting. The cooping height should be **450 mm/750 mm** above the existing ground level in urban area and in cultivated lands respectively. The top portion of the cooping should be made tapered.
3. **Above** the cooping 450 mm of pole or structure should be painted with double layer of Black Bituminous paints.
4. **All the bolted joints** should be tightened properly by providing suitable size GI Bolt Nuts and Spring washers. After completion of erection works all the bolts should be spot welded in order to avoid theft of members.
5. **The back filling** of locations should be done by using the excavated soil only in layers (each layer should not be more than 500 mm) by putting water and ramming by using wooden rammers. In no case stone of size more than 75mm used for back filling. Back-filling has to be done 75mm above ground level or as specified
6. **Curing of concrete** should be done for 28 day continuously. Curing should not be done within 24 Hours of concreting.
7. **All the excess** excavated materials and other unused materials from the concreting site should be disposed of to a suitable site by the TPSODL.
 - a) Mixer (Running time-2 min.)
 - b) **In case of** hand mixing, 10% extra cement has to be provided. Hand mixing should be done on GI sheet platform only.
 - c) **Poking rod** may be used for compacting in locations at PSC poles only
 - d) **Use of vibrator** for compacting is mandatory.

- e) **Clean water** (free from saline and alkaline) should be used for concreting.
- f) **Aggregates** (both coarse and fine) used should be free from foreign materials.
- g) **Shutters** used should not be removed before 24hrs. of casting.
- h) **In case of** black cotton soil borrowed earth (morum soil mixed with sand is preferable) may be used for back filling.
- i) **Sufficient qty. of water** should be sprinkled over backfilled earth and chimney kept wet by using wet gunny bags.

5.0.4 All the persons working on tower shall wear safety helmet, safety belt and safety shoes, Similarly all the persons working on ground shall wear safety helmet and safety shoes.

5.0.4.1. If there is any LT/HT power line near the vicinity of tower erection, necessary shutdown of the power line shall be obtained in writing from the concerned Agency in order to avoid electrical hazards caused by accidental touching of stay/Guy ropes with power line.

5.0.4.2 Safety precaution Safety shall be given utmost importance during stringing. The following need to be ensured.

5.0.4.3 Safe working conditions shall be provided at the stringing site.

5.0.4.4 Full proof communication through walky- talkie / mobile phones shall be used in order to avoid any damage to workmen or public on ground.

5.0.5 In case of 11 KV and LT lines (PSC)

**5.0.5 (A) PSC Pole (9 mtr x 415 Kg, 9 Mtr x 300 Kg, 10mtr x 425Kg,
11mtr x 330 Kg & 8 Mtr x 200 Kg)**

TECHNICAL SPECIFICATIONS

I. Qualification Criteria of Sub Vendor / Manufacturer:-

The prospective bidder may source PSC Poles from manufacturers who should have supplied at least the following quantity of PSC Poles to Electricity Supply Utilities / PSUs. The bidder should enclose Performance Certificates from the above users, issued in favour of the Sub Vendor / manufacturer, as proof of successful operation in field.

Sl. No.	Size	Minimum Past Supply Qty
1	8 Mtr. X 200 Kg	1000
2	9 Mtr. X 300 Kg	1000
3	9 Mtr. X 415 Kg	200
4	10 Mtr. X 425 Kg	200
5	5 11 Mtr X 330 Kg	200

Applicable Standard:

The Poles shall comply with latest standards as under:

REC Specification No. 15/1979, REC Specification No. 24/1983, IS 1678, IS 2905, IS 7321.

II. Materials :

Cement

Cement to be used in the manufacture of pre-stressed concrete poles shall be ordinary for rapid hardening Portland cement confirming to IS: 269-1976 (Specification for ordinary and low heat Portland cement) or IS: 8041 E-1978 (Specification for rapid hardening Portland cement).

Aggregates

Aggregates to be used for the manufacture of pre-stressed concrete poles shall confirm to IS: 383 (Specification for coarse and fine aggregates from natural sources for concrete) .The nominal maximum sizes of aggregates shall in no case exceed 12 mm.

Water

Water should be free from chlorides, sulphates, other salts and organic matter. Potable water will be generally suitable.

Admixture

Admixture should not contain Calcium Chloride or other chlorides and salts which are likely to promote corrosion of pre-stressing steel. The admixture shall conform to IS: 9103.

Pres-Stressing Steel

Pre-stressing steel wires including those used as un tensioned wires should conform to IS:1785 (Part-I) (Specification for plain hard-drawn steel wire for pre-stressed concrete, Part-I cold drawn stress relieved wire).IS:1785 (Part-II)(Specification for plain hard-drawn steel wire) or IS:6003 (Specification for indented wire for pre-stressed concrete).The type design given in the annexure are for plain wires of 4 mm diameter with a guaranteed ultimate strength of 160 kg/mm². All pre-stressing steel shall be free from splits, harmful scratches, surface flaw, rough, aged and imperfect edges and other defects likely to impair its use in pre-stressed concrete.

Concrete Mix

Concrete mix shall be designed to the requirements laid down for controlled concrete (also called design mix concrete) in IS: 1343-1980 (Code of practice for pre-stressed concrete) and IS: 456 – 1978 (Code of practice for plain and reinforced concrete) subject to the following special conditions:

Minimum works cube strength at 28 days should be at least 420 Kg/cm².

The concrete strength at transfer should be at least 210 Kg/cm².

The mix should contain at least 380 Kg of cement per cubic meter of concrete.

The mix should contain as low water content as is consistent with adequate workability. It becomes necessary to add water to increase the workability the cement content also should be raised in such a way that the original value of water cement ratio is maintained.

III. Design Requirements

The poles shall be designed for the following requirements:

The poles shall be planted directly in the ground with a planting depth as per IS: 1678. Wherever, planting depth is required to be increased beyond the specified limits or alternative arrangements are required to be made on account of ground conditions e.g. water logging etc., the same shall be in the scope of the bidder at no extra cost to owner. The bidder shall furnish necessary design calculations/details of alternative arrangements in this regard.

The working load on the poles should correspond to those that are likely to come on the pole during their service life.

The factor of safety for all poles 9.0Mts. Shall not be less than 2.0 and for 8.0 M poles, the factor of safety shall not be less than 2.5.

The average permanent load shall be 40% of the working load.

The F.O.S. against first load shall be 1.0.

At average permanent load, permissible tensile stress in concrete shall be 30 kg/cm².

At the design value of first crack load, the modulus of rupture shall not exceed 53.0kg/cm² for M-40.

The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in the transverse direction.

The maximum compressive stress in concrete at the time of transfer of pre-stress should not exceed 0.8 times the cube strength.

The concrete strength at transfer shall not be less than half, the 28 days strength ensured in the design, i.e. $420 \times 0.5 = 210 \text{ kg/cm}^2$. For model check calculations on the design of poles, referred to in the annexure, a reference may be made to the REC "Manual on Manufacturing of solid PCC poles, Part-I- Design Aspects".

IV. Dimensions and Reinforcements

The cross-sectional dimensions and the details of pre-stressing wires should conform to the particulars given in the enclosed drawing. The provisions of holes for fixing cross-arms and other fixtures should conform to the REC specification No.15/1979.

All pre-stressing wires and reinforcements shall be accurately fixed as shown in drawings and maintained in position during manufacture. The un-tensioned reinforcement as indicated in the drawings should be held in position by the use of stirrups which should go round all the wires.

All wires shall be accurately stretched with uniform pre-stress in each wire. Each wire or group of wires shall be anchored positively during casing. Care should be taken to see that the anchorages do not yield before the concrete attains the necessary strength.

V. Cover

The cover of concrete measured from the outside of pre-stressing tendon shall be normally 20 mm.

VI. Welding and Lapping of Steel

The high tensile steel wire shall be continuous over the entire length of the tendon. Welding shall not be allowed in any case. However, joining or coupling may be permitted provided the strength of the joint or coupling is not less than the strength of each individual wire.

VII. Compacting

Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Hand compacting shall not be permitted.

VIII. Curing

The concrete shall be covered with a layer of sacking, canvass, Hessian or similar absorbent material and kept constantly wet up to the time when the strength of concrete is at least equal to the minimum strength of concrete at transfer of pre-stress. Thereafter, the pole may be removed from the mould and watered at intervals to prevent surface cracking of the unit the interval should depend on the atmospheric humidity and temperature. The pre-stressing wires shall be de-tensioned only after the concrete has attained the specified strength at

transfer (i.e. 200 or 210 kg/cm² as applicable). The cubes cast for the purpose of determining the strength at transfer should be cured, as far as possible, under condition similar to those under which the poles are cured. The transfer stage shall be determined based on the daily tests carried out on concrete cubes till the specified strength indicated above is reached. Thereafter the test on concrete shall be carried out as detailed in IS: 1343 (code of practice for pre-stressed concrete). The manufacture shall supply, when required by the

owner or his representative, result of compressive test conducted in accordance with IS: 456 (Code of practice for plain and reinforced concrete) on concrete cubes made from the concrete used for the poles. If the manufacture so desired, the manufacture shall supply cubes for test purpose and such cubes shall be tested in accordance with IS: 456 (Code of practice for plain and reinforced concrete).

IX. Lifting Eye-Hooks or Holes

Separate eye-hooks or hoists shall be provided for handling the transport, one each at a distance of 0.15 times the overall length, from either end of the pole. Eye-hooks, if provided, should be properly anchored and should be on the face that has the shorter dimension of the cross-section. Holes, if provided for lifting purpose, should be perpendicular to the broad face of the pole.

X. Holes for Cross Arms etc

Sufficient number of holes shall be provided in the poles for attachment of cross arms and other equipments.

XI. Stacking & Transportation

Stacking should be done in such a manner that the broad side of the pole is vertical. Each tier in the stack should be supported on timber sleeper located at 0.15 times the overall length, measured from the end. The timber supported in the stack should be aligned in vertical line.

XII. Earthing

(a) Earthing shall be provided by having length of 6 SWG GI wire embedded in Concrete during manufacture and the ends of the wires left projecting from the pole to a length of 100mm at 250 mm from top and 1000 mm below ground level.

(b) Earth wire shall not be allowed to come in contact with the pre-stressing wires

**B. PSC Pole (9 Mtr x 415 Kg, 9 Mtr x 300 Kg, 10mtr x 425Kg, 11mtr
x 330 Kg & 8 Mtr x 200 Kg)**

GUARANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

SI No.	Description	Unit	Bidder's Offer				
			10mtr X 425 Kg	9 Mtr X 300 Kg	9mtr X 415 Kg	8 Mtr X 200 Kg	11 Mtr X 330 Kg
1	Type of pole						
2	Factor of Safety						
3	Overall Length of Pole Meters	meters					
4	Working Load Kg	Kg					
5	Overall Dimensions						
A	Bottom Depth	mm					
B	Top Depth						
C	Breadth						
6	Reinforcement Detail:						
7	Diameter of prestressing wire						
8	No. of Tensioned wires						
9	No. of Untensioned						

	wire						
10	Length of each untensioned wire						
11	Concrete Detail						
A	Cement Type						
B	Grade						
C	Type						
D	Quantity	Cubic meter/pole					
E	Standard confirming to:						
12	Steel Quality	Kg/Pole					
A	Ultimate Tensile Strength (UTS)	Km/Cm ²					
B	Weight						

5.0.5.1 All the poles shall be provided with a RCC block base or MS base plate having dimensions as mentioned at 5.0.2 © as per the site requirement to be decided by Engineer in Charge. The decision of Engineer in Charge will be Final.

5.0.5.2 The poles shall then be lifted to the pit with the help of wooden supports. The pole shall then be kept in the vertical position with the help of 25 mm (min.) manila ropes, which will act as the temporary anchor. The verticality of the pole shall be checked by spirit level in both longitudinal & transverse directions. The temporary anchor shall be removed only when **poles set properly in the pit for foundation concreting & backfilling with proper compacting the soil. The backfilling should be done in layers (maxm. 0.5 mts at a time with sprinkling of water and by using wooden hammer. No stone more than 75 mm should be used during back filling.**

5.0.5.3 Suspension type H/W fittings in all tangent locations and Four pair bolted type tension H/W fittings should be used in all new 33&11 Kv lines. 45 KN & 70 KN normal B&S insulators will be used in suspension & tension locations respectively.

5.0.5.4 Concreting of foundation up to a minimum height of 1.8 mtrs from the bottom of the pit with a circular cross-section of radius 0.25 mtrs. (volume of 0.3 cu.mtr. per pole) in the ratio of 1:2:4 shall be done at the following locations: The **depth** has to be increased to 2mtr or as required at site condition if poles more than 11 Mts. are to be used.

- i) At all the tapping points and dead end poles.
- ii) At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree) or **better there of as per the instruction of Engineer in charge. The decision of Engineer in charge will be final.**
- iii) Both side poles at all the crossing for road, Nallaha railway crossings etc.
- iv) Where Rail poles, Joist poles, double pole and four pole structures are to be erected.

6.0. Earthing of Support

6.0.1 Each pole shall be earthed with coil type earthing as per REC Construction Standard J-1.

6.0.2 All DP & Four pole structures & the poles on both sides of railway crossing shall be earthed by providing two nos. **pipe earthing as per Drawing provided by TPSODL.**

6.0.3 Each tower/structures should be earthed by providing 2.5 mts. 50x6 GI flat and 40 x 3000 mm heavy gauge ISI mark earthing pipe. The top of the earthing pipe should remain 600 mm below ground level. All railway X-ing locations two nos. earthing should be provided.

In case the required footing resistance is not achieved on measurement, counterpoise earthing has to be provided as per the standard.

6.0.3 (A)

EARTHING COIL

TECHNICAL SPECIFICATION

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source Earthing Coil from manufacturers who must qualify all the following requirements:

- a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.
- b) The manufacturer should have supplied at least 1000 no.s of electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. SCOPE

The specification covers design, manufacture, testing and dispatch to the owner's stores of Earthing Coils for use in earthing of the HT & LT poles.

III. GENERAL REQUIREMENTS

Earthing coils shall be fabricated from soft GI Wire Hot Dip Galvanized. The Hot Dip galvanized wire shall have clean surface and shall be free from paint enamel or any other poor conducting material. The coil shall be made as per REC constructions standard.

The Hot Dip galvanizing shall conform to IS: 2629/1966, 2633/1972 and 4826/1969 with latest amendments.

IV. TESTS

Galvanizing Tests

Minimum Mass of Zinc

On GI Wire used 280 gm/m²

After Coiling-266 gm/m². The certificate from recognized laboratory shall be submitted towards mass of zinc.

Dip Test

Dip test shall stand 3 dips of 1 minute and one dip of ½ minute before coiling and 4 dips of 1 minute after coiling as per IS: 4826/1979

Adhesion Test

As per ISS 4826 – 1979.

V. DIMENSIONAL REQUIREMENT

Nominal dia of GI Wire -4 mm (Tolerance±2.5%)

Minimum no. of turns – 115 Nos.

External dia of Coil (Min) – 50 mm

Length of Coil (Min) – 460 mm

Free length of GI Wire at one end coil (Min.) – 2500 mm

The turns should be closely bound. Weight of one finished Earthing Coils (min.) – 1.850 Kg.

6.0.3(B)

EARHTING COIL

GUARANTEED TECHNICAL PARTICULARS

(To be submitted along with Offer)

Sl. No.	GENERAL TECHNICAL PARTICULARS	Bidder's Offer
1	Nominal diameter of wire	
2	No. of turns	
3	External dia of Coil	
4	Length of Coil	
5	Mass of Zinc	
6	Total weight of Coil	
7	Whether drawing enclosed (yes)	

6.0.4 EXTENSION POLE

Pole with pole extension arrangement up to two **to three** meters (**in case** of 33 KV new **Mini base** GI tower structure) shall be used at low ground level locations for maintaining ground clearance and for road crossings for HT Lines.

7.0 PROVISION OF GUYS/STRUT POLES TO SUPPORTS

7.0.1 The arrangement for guys shall be made wherever necessary. Strut poles/flying guys wherever required shall be installed on various pole locations as per REC construction standards. In order to avoid guys/ Strut self supported GI poles/ structures may be used.

7.0.2 In this work anchor type guy sets are to be used. These guys shall be provided at following locations where guys are damaged or not provided.

(i) Angle locations

(ii) Dead end locations

(iii) T-off points

(iv) Steep gradient locations.

(v) Double Pole, & four pole

The stay rod should be placed in a position so that the angle of rod with the vertical face of the pit is 30° to 45° as the case may be maximum movement for tightening or loosening.

7.0.3 If the guy wire proves to be hazardous, it should be protected with suitable asbestos pipe filled with concrete of about 2 m length above the ground level, painted with white and black strips so that, it may be visible at night.

7.0.4 The guy insulator should have a minimum vertical clearance of 3.5 mtr from the ground.

7.0.4 (A) HT & LT STAY SETS

TECHNICAL SPECIFICATION

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source Stay Sets from manufacturers only must qualify all the following requirements:

a) Manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

b) The manufacturer should have supplied at least 1000 sets (both HT & LT taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. SCOPE

This specification covers design, manufacture, testing and dispatch of LT Stay Sets of 16 mm and HT stay sets 20 mm dia.

III. GENERAL REQUIREMENTS

16 MM Dia Stay sets (Galvanized) – LT Stay Set

This stay sets (Line Guy set) will consist of the following components:-

Anchor Rod with one washer and Nut

Overall length of rod should be 1800 mm to be made out of 16 mm dia GI Rod, one end threaded up to 40 mm length with a pitch of 5 threads per cm and provided with one square GI washer of size 40X40x1.6mm and one GI hexagonal nut conforming to IS:1367:1967 & IS:1363:1967. Both washer and nut to suit threaded rod of 16 mm dia. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality welding.

Anchor Plate Size 200 x 200 x6 mm

To be made out of GI plate of 6 mm thickness. The anchor plate should have at its centre 18 mm dia hole.

Turn Buckle & Eye Bolt with 2 Nuts

To be made of 16 mm dia GI Rod having an overall length of 450mm, one end of the rod to be threaded up to 300 mm length with a pitch of 5 threads per cm and provided with two GI Hexagonal nuts of suitable size conforming to IS:1363:1967 & IS:1367:1967. The other end of rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality welding.

Bow with Welded Angle

To be made out of 16mm dia GI rod. The finished bow shall have an over all length of 995 mm and height of 450 mm, the apex or top of the bow shall be bent at an angle of 10 R. The other end shall be welded with proper and good quality welding to a GI angle 180 mm long having a dimension of 50x50x6mm. The angle shall have 3 holes of 18 mm dia each.

Thimble

To be made on 1.5 mm thick GI sheet into a size of 75x22x40mm and shape as per standard shall be supplied.

Average Weight of Finished 16mm Stay Sets shall be at least 7.702 KG (Minimum)

(Excluding Nuts Thimbles and Washer) 8.445 Kg. (Maximum)

20 mm Dia Stays Sets for 33 Kv,11 KV Lines (Galvanized) HT Stay Set

The Stay Set (Line Guy Set) will consist of the following components:

Anchor Rod with one Washer and Nut

Overall length of Rod should be 1800mm to be made out of 20 mm dia GI rod one end threaded up to 40 mm length with a pitch of threads per cm. And provided with one square G.I Washer of Size 50x50x1.6mm and one GI Hexagonal nut conforming to IS: 1363:1967 & IS:1367:1967. Both washer and nut to suit the threaded rod of 20mm. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality of welding. Dimensional and other details are indicated and submitted by bidders for owner's approval before start of manufacturing.

Anchor Plate Size 300 x 300 x 8 mm

To be made out of G.S. Plate of 8 mm thickness. The anchor plate to have at its centre 22mm dia hole.

Turn Buckle, Eye Bolt with 2 Nuts.

To be made of 20 mm dia G.I Rod having an overall length of 450 mm. One end of the rod to be threaded up to 300 mm length with a pitch of 4 threads per cm. The 20 mm dia bolt so made shall be provided with two G.I Hexagonal nuts of suitable size conforming to IS: 1363:1967 & IS: 1367:1967. The other end of the rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality of welding. Welding details are to be indicated by the bidder separately for approval.

Bow with Welded Channel:

To be made out of 16mm dia G.I Rod. The finished bow shall have an overall length of 995 mm and height of 450 mm. The apex or top of the bow shall be bent at an angle of 10°. The other end shall be welded with proper and good quality welding to a G.I Channel 200 mm long having a dimension of 100x50x4.7 mm. The Channel shall have 2 holes of 18 mm dia and 22 mm dia hole at its centre as per drawing No.3 enclosed herewith.

Thimble 2 Nos.

To be made of 1.5 mm thick G.I sheet into a size of 75x22x40mm and shape as per standard.

Galvanizing

The complete assembly shall be hot dip galvanized.

Welding

The minimum strength of welding provided on various components of 16mm and 20 mm dia stay sets shall be 3100 kg & 4900 kg respectively. Minimum 6mm fillet weld or its equivalent weld area should be deposited in all positions of the job i.e. at any point of the weld length. The welding shall be conforming to relevant IS: 823/1964 or its latest amendment.

Threading

The threads on the Anchor Rods, Eye Bolts and Nuts shall be as per specification IS: 4218:1967 (ISO Metric Screw Threads). The Nuts shall be conforming to the requirements of IS: 1367:1967 and have dimension as per IS 1363:1967. The mechanical property requirement of fasteners shall confirm to the properly clause 4.6 each for anchor rods and Eye bolt and property clause 4 for nuts as per IS: 1367:1967.

Average weight of finished 20 mm Stays Set: 14.523 Kg.(Min) (Excluding Nuts Thimble & Washer)
:15.569 Kg.(Max.)

IV. TESTS

The TPSODL shall be required to conduct testing of materials at Govt./Recognized testing laboratory during pre-dispatch inspection for Tensile Load of 3100 Kg/4900Kg. applied for one minute on the welding and maintained for one minute for 16 mm and 20mm dia stay sets respectively.

V. IDENTIFICATION MARK

All stay sets should carry the identification mark of the Purchaser (TPSODL) applicable.

This should be engraved on the body of stay rods to ensure proper identification of the materials. The nuts should be of a size compatible with threaded portion of rods and there should be not play or slippage of nuts.

Welding wherever required should be perfect and should not give way after erection.

VI. TOLERANCES

The tolerances for various components of the stay sets are indicated below subject to the condition that the average weight of finished stay sets of 16mm dia excluding nuts, thimbles and washers shall not be less than the weight specified above:-

B)

HT /LT STAY SET

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with Offer)

Sl No.	Item Description	Specified Parameters				Bidder's Offer
		Section Tolerances	Fabrication Tolerances	Material		
1	Anchor Plate	6mm thick +2.5%- 5% 8mm thick+2.5%- 5%	200x200mm+1% 300x300mm+1%	GI Plate 6 mm thick GI Plate 8 mm thick	LT Stay Set HT Stay Set	
2	Anchor Rod	16mmdia +5%- 3% 20mm dia +3%- 2%	Length 1800mm+0.5% Rounded Eye 40 mm inside dia + 3% Threading 40mm +11%-5% Length 1800mm +0.5% Round Eye 40mm inside dia + 3%. Threading	GI Round 16mm dia GI Round 16mm dia GI Round 20mm dai GI Round 20mm dia	LT Stay Set HT Stay Set	

			40mm +11%-5%			
3	Turn Buckle Bow	16mm dia +5%- 3%	Length 995mm +1% 16mm dia Length 180mm +1% 50x50x6mm Channel length 200mm + 1%	GI Round 16mm dia. GI Angle G I Channel 100x50x4.7mm	LT Stay Set HT Stay Set	
4	Eye Bolt Rod	16mm dia +5%- 3% 20mm dia + 3% - 2%	Length 450mm + 1% Threading 300mm +1% Round Eye 40mm inside dia+3% Length 450mm +1% Threading 300mm +1% Round Eye 40 mm inside dia +3%	GI Round 16 mm dia GI Round 20mm dia.	LT Stay Set HT Stay Set	
5	Galvanisation thickness				LT Stay Set HT Stay Set	
A	Anchor Plate				LT Stay Set HT Stay Set	

B	Anchor Rod				LT Stay Set HT Stay Set	
C	Turn Buckle				LT Stay Set HT Stay Set	
D	Eye Bolt Rod				LT Stay Set HT Stay Set	
6	Weight of complete set				LT Stay Set HT Stay Set	
7	Whether drawing submitted					

(C) STAY WIRE (7/8SWG) / (7/10 SWG) & (7/12 SWG)

TECHNICAL SPECIFICATIONS

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source Stay Wire from manufacturers only who must qualify all the following requirements :

- a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.
- b) The manufacturer should have supplied at least 1000 Kg (all sizes taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. Application Standards

Except when they conflict with the specific requirements of this specification, the G.I Stay Stranded Wires shall comply with the specific requirements of IS: 2141-1979. IS: 4826-1979 & IS: 6594-1974 or the latest versions thereof.

III. Application and Sizes

The G.I. stranded wires covered in this Specification are intended for use on the overhead power line

poles, distribution transformer structures etc.

The G.I stranded wires shall be of 7/8SWG 7/4 mm for 33 kv lines, 7/10SWG (7/3.15 mm for 11KV lines and 7/12 SWG 7/2.5 mm for LT lines standard sizes.

IV. Materials

The wires shall be drawn from steel made by the open hearth basic oxygen or electric furnace process and of such quality that when drawn to the size of wire specified and coated with zinc, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as specified in this specification. The wires shall not contain sulphur and phosphorus exceeding 0.060% each.

Tensile Grade

The wires shall be of tensile grade 4, having minimum tensile strength of 700 N/mm² conforming to 1S:2141.

General Requirements

The outer wire of strands shall have a right-hand lay.

The lay length of wire strands shall be 12 to 18 times the strand diameter.

Minimum Breaking Load

The minimum breaking load of the wires before and after stranding shall be as follows:

No. of Wires & Const.	Wire Dia (mm)	Min. breaking load of the Single wire before stranding (KN)	Min. breaking load of the standard wire (KN)
7 (6/1)	2.5	3.44	21.40
7 (6/1)	3.15	5.46	34.00
7 (6/1)	4.0	8.80	54.9

V. Construction

The galvanized stay wire shall be of 7-wire construction. The wires shall be so stranded together that when an evenly distributed pull is applied at the ends of completed strand, each wire shall take an equal share of the pull. Joints are permitted in the individual wires during stranding but such joints shall not be less than 15 meters apart in the finished strands.

The wire shall be circular and free from scale, irregularities, imperfection, flaws, splits and other defects.

VI. Tolerances

A tolerance of (+) 2.5% on the diameter of wires before stranding shall be permitted.

VII. Sampling Criteria

The sampling criteria shall be in accordance with IS :2141.

VIII. Tests on Wires before Manufacture

The wires shall be subjected to the following tests in accordance with IS :2141.

Ductility Test Tolerance on Wire Diameter

Tests on Completed Strand

The completed strand shall be tested for the following tests in accordance with IS:2141. Tensile and Elongation Test: The percentage elongation of the stranded wire shall not be less than 6%.

Chemical analysis Galvanizing Test

The Zinc Coating shall conform to "Heavy Coating" as laid down in IS:4826

IX. Marking

Each coil shall carry a metallic tag, securely attached to the inner part of the coil bearing the following information:

- a) Manufacturers name or trade mark
- b) Lot number and coil number
- c) Size
- d) Construction
- e) Tensile Designation
- f) Lay
- g) Coating
- h) Length
- i) Mass

j) ISI certification mark, if any

X. Packing

The wires shall be supplied in 75-100 Kg. coils. The packing should be done in accordance with the provisions of IS:6594

XI. Other Items:

For remaining items of stay sets mentioned in the enclosed drawing, relevant applicable Indian standards shall be applicable.

(D) STAY WIRE (7/10 SWG) (7/10 SWG) & (7/12 SWG)

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	GENERAL TECHNICAL PARTICULARS	7/08 SWG	7/10 SWG	7/12 SWG
1	Nominal diameter of wire			
2	Tolerance in diameter			
3	Sectional Area (In Sq. mm.)			
4	Tensile strength			
A	Min. N/mm ²			
B	Max. N/mm ²			
5	Minimum breaking load (KN)			
6	Type of coating Heavy/Medium/Light			
7	Variety Hard/Soft			
8	Weight of Zinc coating (Gms/Sq. Mtr.) Min.			
9	No. of dips the coating is able to withstand as 18 ± 20°C			

10	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)			
A	Min. complete turn of wrap			

B	Dia of mandrel on which wrapped			
11	Bend Test			
A	Angle			
B	Dia round a format to be bent			
12	Freedom from defect			
13	Chemical composition the MS Wire used shall not exceed			
A	Sulphur 0.060%			
B	Phosphorous 0.065%			

(E)

GI WIRE 6 SWG & GI WIRE 8 SWG

TECHNICAL SPECIFICATIONS

I. Qualification Criteria of Manufacturer:-

The prospective bidder may source GI Wire from manufacturers only who must qualify all the following requirements:

- a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.
- b) The manufacturer should have supplied at least 1000 Kgs. (all sizes taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

II. SCOPE

This specification covers manufacture, testing and supply of hot dip galvanized MS solid wire of sizes 6 SWG (5 MM) & 8 SWG (4 MM) diameters.

III. APPLICABLE STANDARDS

ZINC

Zinc shall conform to grade Zen 98 specified in IS 209& IS: 4826-1979 with up to date amendments.

ZINC COATING

Zinc coating shall be in accordance with IS: 4826-1979 for heavily coated hard quality.

GALVANISING

Galvanizing shall be as per IS: 2629-1966, IS 4826-1979 with up to date amendments

UNIFORMITY OF ZINC COATING

Uniformity of zinc coating shall be as per IS: 2633-1972 with up to date amendments

TENSILE PROPERTIES

The tensile strength of the wire after galvanizing shall be between 55-95 Kg/sq.mm ensuring MS wire mechanical properties as per IS-28:1972 8.1 to 8.3.

FREEDOM FROM DEFECTS

As per IS: 2629-1966 & 4826-1979 & with up to date amendments be ensured

IV. MATERIAL

The mild steel wire shall have chemical composition maximum sulphur- 0.055%, phosphorous -0.055%, Carbon 0.25%.

V. TESTS

During the process of manufacturer/fabrication and all tests for chemical, mechanical, galvanizing as per IS- 280-1979, IS1521-1972, IS-1755-1961, IS: 6745-1972 & 4826-1979 shall be carried out. The certificate towards, chemical composition shall be submitted for each lot offered for inspection.

The following tests shall be conducted in presence of the representative of the purchaser:

Visual physical inspection and measurement of specified dimension

Coating test as per IS: 1755-1961, IS 2629-1966, IS: 2633-1972, IS: 4826-1969

Adhesion test as per IS: 1755-1961, IS: 2629-1966, IS: 2633-1972, IS: 4826-1969,& IS:6745-1972

Tensile strength and breaking load and elongation determined as per IS: 1521-1972 with up to date amendments

VI. PACKING & MARKING

Packing shall be as per IS: 280-1979 and each coil shall be between 50-100 kg. marking shall be as per IS:280-1972.

(F)

GI WIRE 6 SWG & GI WIRE 8 SWG

GUARANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	GENERAL TECHNICAL PARTICULARS	6 SWG	8 SWG
1	Nominal diameter of wire		
2	Tolerance in diameter		
3	Sectional Area (In Sq. mm.)		
4	Tensile strength		
A	Min. N/mm ²		
B	Max. N/mm ²		
5	Minimum breaking load (KN)		
6	Type of coating Heavy/Medium/Light		
7	Variety Hard/Soft		
8	Weight of Zinc coating (Gms/Sq. Mtr.) Min.		
9	No. of dips the coating is able to withstand as 18 ± 20°C		
10	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)		
A	Min. complete turn of wrap		
B	Dia of mandrel on which wrapped		
11	Bend Test		
A	Angle		
B	Dia round a format to be bent		
12	Freedom from defect		
13	Chemical composition the MS Wire used shall not exceed		
A	Sulphur 0.060%		
B	Phosphorous 0.065%		

(G)

EYE BOLT FOR GUARDING

TECHNICAL SPECIFICATIONS

GENERAL REQUIREMENTS:

M20 eye bolts (120 mm long) shall preferably be of drop forged manufacture and shall be supplied complete with full thread and two full nuts.

Eye bolt shall be manufactured from steel to ISO 272, 885, 888, 4759/1 and shall meet the requirements for mechanical properties detailed in ISO 272, 885, 888, 4759/1.

Where a welding process is used in manufacture, each eye bolt shall be individually proof tested by the manufacture in accordance with ISO 272, 885, 888, 4759/1 to 125% of its safe working tensile load that is to 48kN. The safe working tensile load shall be the ultimate axial tensile strength divided by the factor of safety of 2.5.

The eye shall be permanently and legibly stamped with the letter METRIC in letters not less than 3mm high. The safe working load of any eye bolt is that load which may be safely carried in an axial direction. If loaded in any other direction the safe working load is reduced and reference shall be made to the following table for safe working load of M20 eye bolts and eye nuts.

(H)

ALUMINIUM BINDING WIRE

TECHNICAL SPECIFICATION

SCOPE:

Scope covers manufacture, testing and supply of 3.53 mm dia Aluminium Binding Wire as per IS 398.

MATERIALS:

The material comprising the wire shall have the following chemical composition:

Aluminium 99.5% minimum Copper, silicon and iron 0.5% maximum

The surface of the wire shall be smooth and free from all irregularities and imperfections. Its cross sections shall closely approximate that of true circle.

Characteristics of Aluminium Binding wire

Diameter of wire			Cross sectional area of nominal dia. Wires (mm)	Weight of wire kg/km	Breaking Load (kN)
Minimum	Nominal	Maximum			
3.15	3.53	3.55	9.787	26.45	1.57

Inspection and Tests

The following routine checks and tests shall be carried out on 10% of the coils of aluminium binding wire. If anyone sample fails to pass any one of the test nominated for that wire, then samples shall be taken from every coil in the consignment and any coil from which a sample proves defective shall be rejected. On no account shall any rejected material be presented for test again unless with the written approval of, and under conditions determined by the Purchaser.

Physical properties

The surface of the finished wires shall be checked to ensure that it is smooth , free from all irregularities, imperfections and inclusions and that its cross section approximates closely that of true circle.

The wire shall be checked to ensure that its diameter and weight are within the values given I the table above characteristic of a aluminium binding wire.

Ultimate tensile strength

When tested on a standard tensile testing machine, the value obtained for the ultimate tensile stress shall not be less than 1.57kN

Wrapping test

The wire shall withstand one cycle of a wrapping test as follows:

The wire shall be closely wrapped round a wire of its own diameter form a close helix of eight turns. Six turns shall then be unwrapped and again closely rewrapped in the same direction as the first wrapping. The wire shall not break or crack when subjected to this test.

Packing & Delivery

The aluminium binding wire shall be delivered in 30m coils, with a permitted tolerance of +5%.Random or non standard lengths shall not be permitted.

Each coil shall be adequately guarded against damage due to transportation and handling and shall have an outer layer of tightly wound polythene tape or be contained in a suitable, transparent plastic

bag.

The internal diameter of the wound coil shall not be such as to result in a permanent set in the conductor.

The coils shall be contained in non returnable wooden cases, with a gross weight not in excess of 300 kg. The number of coils contained shall be marked on the outside of each case.

(I)

ALUMINIUM BINDING WIRE

GUARANTEED TECHNICAL PARTICULARS

Item No.	Description	Bidder's Offer
1	Manufacturer Address	
2	Indian Standard No. IS 398 (Part-4) 1994	
3	Material of Binding Wire	
4	Dia. Of Wire	
5	Maximum D.C. resistance at 20 degree centigrade	
6	Individual Aluminium Alloy Strands	
a)	Tensile breaking stress	
b)	Elongation on 200 mm length in breaking	
7	Particulars of Raw Materials	
7.1	Aluminium	
	a) Minimum Purity of aluminium	
7.2	Aluminium Alloy	
	a) Aluminium redraw rod conforming to	
	Elements	
	(a) Si	
	(b) Cu	
	(c) Other Element (If any)	

8	Linear mass of Wire	
9	Modulus of Elasticity	
10	Coefficient of Linear Expansion (per deg. Cent.)	

8.0 CROSS ARMS

Cross Arms should be made by using 100x50x6 mm GI. channel. For both 33 KV & 11 KV system. Cross Arms made out of M.S. angle shall not be used.

In tower type poles (GI) all the X-arms are part of the structure.

33 KV, 11 KV "V" CROSS ARM, BACK CLAMP FOR "V"

CROSS ARM & POLE TOP BRACKET (F CLAMP)

TECHNICAL SPECIFICATIONS

8.0.1 Qualification Criteria of Manufacturer:-

The prospective bidder may source the above items from manufacturers who must qualify the following requirements:

The manufacturer should have supplied at least 1000 no.s (of each item) to electricity supply utilities / PSUs.

The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

a) Hot Dip Galvanised Cross arms and Pole Top Brackets for both 33 KV & 11kV construction at intermediate and light angle pole shall be fabricated from grade 43A mild steel of channel section and for heavy angle poles, end poles and section poles fabricated from grade 43A mild steel of angle section. The grades of structural steel shall conform to IS – 226: 1975.

b) The 33 KV & 11 KV ' V ' Cross arm shall be made out of 100x 50x5.6. mm MS Channel of (9.56 kg/mtr weight) .

The Back Clamp for both 33 KV & 11 KV shall be made out of 75 x 10 MS Flat and shall be suitably designed to fit PSC Pole 9 Mtr x 300 Kg , 8 Mtr x 200 Kg. and 9 mtr x 415 kg

c) The Pole Top Bracket (F Clamp) shall be made out of 75 x 10 MS Flat suitably designed to fit PSC Pole 9 Mtr x 300 Kg , 10X Mtr x 425 Kg. & 9mtr x 415 kg for both 33 KV & 11 KV.

Except where otherwise indicated all dimensions are subject to the following tolerances:

dimensions up to and including 50mm: +1mm: and dimensions greater than 50mm: +2%

All steel members and other parts of fabricated material as delivered shall be free of warps, local deformation, unauthorized splices, or unauthorized bends. Bending of flat strap shall be carried out cold. Straightening shall be carried out by pressure and not by hammering.

Straightness is of particular importance if the alignment of bolt holes along a member is referred to its edges.

Holes and other provisions for field assembly shall be properly marked and cross referenced. Where required, either by notations on the drawing or by the necessity of proper identification and fittings for field assembly, the connection shall be match marked. A tolerance of not more than 1mm shall be permitted in the distance between the center lines of bolt holes.

The holes may be either drilled or punched and, unless otherwise stated, shall be not more than 2mm greater in diameter than the bolts. When assembling the components force may be used to bring the bolt holes together (provided neither members nor holes are thereby distorted) but all force must be removed before the bolt is inserted. Otherwise strain shall be deemed to be present and the structure may be rejected even though it may be, in all other respects, in conformity with the specification.

The back of the inner angle irons of lap joints shall be chamfered and the ends of the members cut where necessary and such other measures taken as will ensure that all members can be bolted together without strain or distortion. In particular, steps shall be taken to relieve stress in cold worked steel so as to prevent the onset of embitterment during galvanizing.

Similar parts shall be interchangeable.

Shapes and plates shall be fabricated and assembled in the shop to the greatest extent practicable. Shearing flame cutting and chipping shall be done carefully, neatly and accurately. Holes shall be cut, drilled or punched at right angles to the surface and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges, and burrs resulting from drilling or reaming operations shall be removed with the proper tool.

Shapes and plates shall be fabricated to the tolerance that will permit field erection within tolerance, except as otherwise specified. All fabrication shall be carried out in a neat and workmanlike manner so as to facilitate cleaning, painting, galvanizing and inspection and to avoid areas in which water and other matter can lodge.

Contact surfaces at all connections shall be free of loose scale, dirt, burrs, oil and other foreign materials that might prevent solid seating of the parts.

8.0.2 Fabrication has to be made as per drg. of ' V ' X-arm, Back clamp & ' F ' clamp.

GALVANISING

All type of cross arms back clamps, F clamps & stay clamps shall be hot dip galvanized, are as following:

All galvanizing shall be carried out by the hot dip process, in accordance with Specification IS 2629. However, high tensile steel nuts, bolts and spring washer shall be electro galvanized to Service

Condition 4. The zinc coating (610 gms per sq.mt) 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.

There shall be no impurities in the zinc or additives to the galvanic bath which could have a detrimental effect on the durability of the zinc coating.

Before picking, all welding, drilling, cutting, grinding and other finishing operations must be completed and all grease, paints, varnish, oil, welding slag and other foreign matter completely removed.

All protuberances which would affect the life of galvanizing shall also be removed.

The weight of zinc deposited shall be in accordance with that stated in Standard IS 2629 and shall not less than 0.61kg/m² with a minimum thickness of 86 microns for items of thickness more than 5mm, 0.46kg/m² (64 microns) for items of thickness between 2mm and 5mm and 0.33kg/m² (47 microns) for items less than 2mm thick.

Parts shall not be galvanized if their shapes are such that the pickling solutions cannot be removed with certainty or if galvanizing would be unsatisfactory or if their mechanical strength would be reduced. Surfaces in contact with oil shall not be galvanized unless they are subsequently coated with an oil resistant varnish or paint.

In the event of damage to the galvanizing the method used for repair shall be subject to the approval of the Engineer in Charge or that of his representative.

In no case the repair of galvanisation on site will be permitted.

The threads of all galvanized bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for cleaning the threads unless specifically approved by the Engineer in Charge. All nuts shall be galvanized. The threads of nuts shall be cleaned with a tap and the threads oiled.

Partial immersion of the work shall not be permitted and the galvanizing tank must therefore be sufficiently large to permit galvanizing to be carried out by one immersion.

After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. To avoid the formation of white rust galvanized materials shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

The galvanized steel shall be subjected to test as per IS-2633.

8.0.3**33 KV & 11 KV V CROSS ARM****GURANTEED TECHNICAL PARTICULARS**

9 (To be submitted along with offer)

Sl. No.	Description Unit		Bidder's offer	
			33 Kv	11 Kv
1	Type of crossarm			
2	Grade of steel			
3	Steel standard			
4	Fabrication Standard			
5	Dimensions	Mm		
6	Steel section utilized			
7	Steel tensile strength	N/cm ²		
8	Working load	Kg		
9	Details of galvanizing method utilized and standard/specification conforming to?			
10	Weight of cross arm	kg		
11	Whether drawing has been submitted with the bid			

9.0.1**POLE TOP BRACKETS (F CLAMP)****GURANTEED TECHNICAL PARTICULARS**

(To be submitted along with offer)

Sl. No.	Description Unit		Bidder's offer	
			33 Kv	11 Kv
1	Type of crossarm			
2	Grade of steel			

3	Steel standard			
4	Fabrication Standard			
5	Dimensions	Mm		
6	Steel section utilized			
7	Steel tensile strength	N/cm ²		
8	Working load	Kg		
9	Details of galvanizing method utilized and standard/specification conforming to?			
10	Weight of cross arm	kg		
11	Whether drawing has been submitted with the bid			

9.0.2

BACK CLAMP FOR “V” CROSS ARM

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	Description Unit		Bidder's offer	
			33 Kv	11 Kv
1	Type of Clamp			
2	Grade of steel			
3	Steel standard			
4	Fabrication Standard			
5	Dimensions	Mm		
6	Steel section utilized			
7	Steel tensile strength	N/cm ²		
8	Working load	Kg		

9	Details of galvanizing method utilized and standard/specification conforming to?			
10	Weight of back clamp	kg		
11	Whether drawing has been submitted with the bid			

9.0.3 Fixing of Cross Arms

After the erection of supports and providing guys, the cross-arms are to be mounted on the support with necessary clamps, bolts and nuts. The practice of fixing the cross arms before the pole erection should be followed.

9.0 INSTALLATION OF LINE MATERIALS

9.0.1 Insulator and Bindings - These materials are to be procured from the approved vendors only after type test subsequent to the design approval of CPIO,TPSODL

1. Suspension type H/W fittings (Single suspension normally to be used and in important X-ings double suspension fittings to be used) in all tangent locations. In S/S fittings 3 nos. 45 KN normal disc insulators, D/S fittings 6 nos. 45 KN normal disc insulators to **be used in 33 KV line. In case of 11 KV line 2 nos & 4 nos 45 KN B&S normal insulators are to be used.**
2. In angle locations single tension fittings to be used with 4 nos. 70 KN disc insulators. In all road X-ings and other important X-ings Double Tension H/W fittings 8 nos. 70 KN disc insulators to be used **in case of 33 KV line & in 11 KV line it should be 45 KN insulators 2 nos. & 4 nos. are to be used.**
3. Suitable pre formed armoured rods should be used in all suspension fittings **in case of higher size Conductors.**
4. Guarding / pilot insulators at the sharp angle points has to be provided.
5. Four **pair** bolted type (**suitable for M-16 bolts**) tension fittings for AAA conductors and compression type tension fittings for ACSR conductors has to be used.
6. The "distribution tie " meant for pin insulator binding should be of no. 6 size and that of soft annealed wire having a minimum length of 3 mtr.

7. Compression type jointing sleeves should be used for jointing of conductors only.

9.0.2 Checking of Suspension Fitting

- a) It shall be checked that there is no damage to any component of hardware fittings.
- b) It shall be verified that all nuts and bolts are tightened properly.
- c) It shall be made sure that all the necessary security pins (split pins) are fixed properly as per approved drawings.

9.0.3 Insulator hoisting

- a) Insulators shall be completely cleaned with soft and clean cloth.
- b) It shall be verified that there is no crack or any other damage to insulators.
- c) It is very important to ensure that 'R' clips in insulator caps are fixed properly. This is a security measure to avoid disconnection of insulator discs.
- d) Both Arcing horns (both at top & bottom) of each insulators string has to be provided.

Where change of insulators required, prior to fixing, all insulators shall be cleaned in a manner that will not spoil, injure or scratch surface of the insulator, but in no case shall any oil be used for that purpose.

OR (If specified in areas where tower structures cannot be used)

Pin insulators shall be used on all poles in straight line and disc insulators on angle and dead end poles. Damaged insulators and fittings, if any, shall not be used. The insulator and its pin should be mechanically strong enough to withstand the resultant force due to combined effect of wind pressure and weight of the conductor in the span.

The pins for insulators shall be fixed in the holes provided in the cross-arms and the pole top brackets. The insulators shall be mounted in their places over the pins and tightened. In the case of strain or angle supports, where strain fittings are provided for this purpose, one strap of the strain fittings is placed over the cross-arm before placing the bolt in the hole of cross-arms. The nut of the straps shall be so tightened that the strap can move freely in horizontal direction.

All materials, which are to be supplied by the TPSODL should be procured from the approved Manufactures of TPSODL only. Procurement from any suppliers will not be permitted. All the related drawings of materials have to be approved by department. All the materials has to be tested in presence of authorized representative of department as well as officers of third party engaged by Government if any also.

10.0 Handling of Conductor

The Conductor will be supplied by the department from the designated stores of TPSODL which the TPSODL has to lift for the work at their cost. All cares should be taken not to damage conductor surface during transit. Necessary tools and plants for the same have to be effectively used by the agency.

10.0.1 Running Out of the Conductors:

The TPSODL shall be entirely responsible for any damage to the pole or conductors during stringing. Care shall be taken that the conductors do not touch and rub against the ground or objects, which could scratch or damage the strands.

10.0.2 The sequence of running out shall be from the top to down i.e. the top conductor shall be run out first, followed in succession by the side conductors. Unbalanced loads on poles shall be avoided as far as possible. When lines being erected run parallel to existing energized power lines, the TPSODL shall take adequate safety precautions to protect personnel from the potentially dangerous condition.

10.0.3 Monitoring of Conductors during Stringing

- a) The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations. Repair to conductors, if necessary, shall be carried out with repair sleeves. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts, abrasions, etc. The TPSODL shall be entirely responsible for any damage to the poles during stringing.
- b) Conductor shall be checked constantly as it is unwound from Conductor drum for any broken, damage or loose strand. If any major defect is noticed then the defective portion has to be removed and mid span joint provided. However if the defect is of minor nature i.e. number of damaged strands is not more than $1/6^{\text{th}}$ of the total strands in outer layer, a repair sleeve shall be provided.

- c) M.S. (mid span) Joint shall be provided at least 15 meters away from 33 KV line tower. All MS joints should be Compression type by providing suitable aluminium compression pipes. The compression joints should be continuous. In case of AAAC compression joints, minimum 25% over lapping with the previous compression should be done.
- d) There shall not be any Mid-Span joint over Rly / River / Main Road Crossing.
- e) Not more than one M.S. Joint shall be provided in one span for each conductor.

Rough sagged conductors of one phase shall be simultaneously tightened by which machine fixed on tower till the desired final sag is achieved.

N.B:- At some places single ckt. Line triangular fashion may be strung in double ckt. GI poles / GI structures with lower size conductors. Subsequently higher size conductors (Panther or 232 sq.mm AAAC) will be replaced depending on load growth.

10.0.4 Stringing of AB Cables

10.0.4.1 Fixing of Suspension & Tension/ Dead end fittings to the Poles.

The suspension clamp is to be hung on eye hook/ suspension hook, which is fixed to the pole at a minimum distance of 0.15 mt. from top end of the pole. The messenger wire of bunched cable resting on a pulley is separated from the cable by separating wedges and inserted in the conductor groove of the suspension clamp. The bolt is tightened to a torque of 20 N after which the pulley and wedges are to be removed. The cable is tied to the messenger wire with nylon tie on both sides of clamps. A hole of minimum diameter is to be made through poles for erection of suspension clamp. In case, drilling is not possible to make hole through poles, pole clamps/eye hook 50 x 6 mm flat shall be used. Eye/hook pole clamp shall be made to suite the pole width. This shall be installed as per Fig. No. 2 (a) & 2(b) of REC Construction Standard No. E-34 for suspension clamps and as Fig. No. 2 (a) of REC Construction Standard No. E-35 for tension (Dead end)clamps.

10.0.4.2 Fittings & Accessories

The following hardware fittings and accessories shall be used to install, erect & join the aerial bunched cable.

- a) Suspension Hook (Eye-Hook) – The TPSODL shall install the suspension hook (eye hook). This hook shall be used to attach the AB cable on the pole by means of a dead end clamp in terminal poles and for attaching a suspension clamp in straight lines and angle up to 90 Deg.-
- b) Suspension fittings & the corresponding eye hook shall be as per REC Construction Standard No. e –34.

- c) Dead End fittings shall be bolted type & the corresponding eye hook shall be as per REC Construction Standard No. E-35.
- d) Nylon Tie- The TPSODL shall supply nylon ties. These ties shall be used for tying the conductors with the messenger wire to prevent the phase conductors from chatting against suspension clamp. The nylon tie is made of weather resistant black nylon.
- e) Connectors- The TPSODL shall supply connector. These shall be used as non-tension aluminum to aluminum connections for conductor joints.
- f) Plastic Covers for Connectors- The TPSODL shall install Plastic Covers for Connectors. These covers shall be used with aluminum/aluminum connectors to protect connectors against corrosion caused by climatic conditions.

10.0.4.3 Installation of Cable

The TPSODL shall be fully responsible for all activities related to installation of AB cable. His responsibilities consists of Handling of the cable Pulling of the cable Stringing of the cable Jointing of the cable

Handling of AB Cable.

The TPSODL shall observe following precautions while handling the AB Cable:

The cable drums must be stored and transported in an upright position. While loading/unloading, the drums shall not be thrown from transport vehicles. Cable contact with sharp articles shall be avoided. In order to prevent damage to the insulation, the cable shall not be dragged on the ground. Pulleys shall be used for this purpose. In order to prevent strands from spreading, always cut the cable with a cutter.

Use nylon ties or electrical tape to prevent the cable from spreading away from messenger wire after the cutting. Staple the end of the cable on to the drum in order to prevent loosening.

Do not remove the protective boards from the cable drum before the cable is pulled off the drum. While moving the drum by rolling it on ground, always roll the drum in the direction indicated by the arrow on the flange. When pulling the cable, the spinning direction must be opposite. Do not store the drums on wet soil, sandy or humid places. Store the accessories in good order for quick easy and correct handling.

b) Pulling the Cable.

The principle is to pull the cable under mechanical tension so that contact with the ground or any other obstacles is avoided. The cable drum should be perfectly in alignment with line to be strung and fixed about 15-20 mts. from the holding the first pulley. Open the cover of the drum to check and ensure that the insulation is not damaged. The pulling which is sent up up-to the cable drum is about 15-20 mts from the pole holding to the last pulley.

The pulleys are directly hung to such hook on the poles. The pulley tandem is to be used on angle poles if the line is deviating more than 60°. Pull the guiding rope through all the pulleys.

Normal care shall be taken to assume a smooth passage of whole cable through the pulleys, especially in the first pole and on angle poles. One worker should act as brakeman at the cable drum so that the cable is not loosened during the pulling. One worker should follow the cable going through the pulleys and stop the pulling if anything goes wrong.

c) Stringing Operations.

The TPSODL shall follow one of the following methods for stringing.

1. Sag Method

Fix a dead end clamp on the neutral messenger wire at the pole. The messenger shall be bent behind the clamp to ensure sufficient friction between the messenger and the clamp in the initial stays during stringing. Bind the conductor together beside the dead end clamp using a nylon tie. Hand the clamp on the hook at the end pole. Rewind simultaneously the slack cable length on the cable drum. Attach the 'come along clamp' on the neutral messenger wire at the first pole of the line. Tighten the cable by the shackle or the winch when required sag/ Ground Clearance is obtained. Hand the dead end clamp on the hook and install it on the neutral messenger. Remove the come along. Bind the conductors together on the messenger wire using a nylon tie. Check the length of the cable needed and cut it at an appropriate point.

2. Dynamometer Methods

Start the operation as above up to the stage. Install the dynamo meter on the come-along clamp. Tighten the cable at the required value by reading the dynamo meter. Finish the stringing as in the sag method operation.

d) Jointing of Cables.

Jointing of cable shall be in accordance with clause 12.3.3 of IS 1255:1993 and manufacturers special instructions given hereunder. This joining is to be done by skilled personnel. Cable Damage and Repairs: If the cable is damaged for whatever reasons, it shall be brought to the notice of the Engineer in charge and shall not be used without his approval. No joint or splice shall be made in spans crossings over main roads, small rivers or in tension spans. Not more than one joint in the cable shall be allowed in one span.

- e) The stringing rate include rates for paving, stringing, clamping, jointing, tensioning and fitting of all necessary accessories.

Final Checking, Testing and Commissioning

After stringing have been done as approved by the Engineer in charge, to ensure that everything is complete in all respects, the works shall be thoroughly inspected keeping in view the following main points.

All the bolts and nuts should be of GI materials as per relevant IS.

The stringing of the cable has been done as per the approved sag and desired clearances are achieved. No damage, minor or major to the cable, messenger wire and accessories

The TPSODL shall submit a report to the above effect to the Engineer in Charge, who shall inspect and verify the correctness of the report. In case it is noticed that some or any of the above is not fulfilled, the engineer shall get such items rectified by the TPSODL no extra cost to the purchaser. After final checking, the line shall be tested for insulation resistance in accordance with IS 1255:1983. All arrangements for such testing or any other test desired by the Engineer-in-charge shall be done by the TPSODL and necessary labour, transport and equipment shall be provided by him. Any defect found out as a result of such tests shall be rectified by the TPSODL, forthwith at no extra cost to the purchaser.

In addition to the above, the TPSODL shall be responsible for testing and ensuring that the total and relative sags of the cable as within the specified tolerance. Such tests shall be carried out at selected points along the route as required by the Engineer-in-charge and the TPSODL shall provide all necessary equipment and labour to enable the tests to be carried out. After satisfactory test on the line and approval by the Engineer in Charge, the line shall be energized at full operating voltage before

handling over. The cable shall be megger tested before and after jointing. The AB cable shall be tested for.

- i) Continuity of messenger wire and conductors
- ii) Absence of cross phasing
- iii) Insulation resistance to earth
- iv) Insulation resistance between conductors
- v) DC Resistance
- vi) Capacitance

As per IS 1255:1983 of the latest issue and as per manufacturer's instructions.

Sufficient backfilled earth covers each foundation pit and is adequately compacted.

All poles are used strictly according to final approved drawing and are free of any defect or damage whatsoever. The stringing of the conductors and earth wire has been done as per the approved sag and tension charts and desired clearances as clearly available. All conductor and messenger wire accessories are properly installed. All other requirements for completion of works such as fixing of danger plate and anti-climbing device have been fulfilled.

GI Inter –posing RS joist (125x75) mm of length 8 mts may be provided wherever required (This will be decided by Engineer in charge) in all town areas with RCC concrete (M-15) of 1.4 mts below existing ground level and RCC (M-15) coping of 450 mm above the ground .as per the drawing .

11.0 CROSSINGS

- a) As far as possible all Railway line, telecommunication lines crossings shall be made at right angles. Scaffolding to be used during stringing operations where roads, channels, telecommunication lines, power lines and railway lines are crossing. The TPSODL shall co -ordinate with TPSODL for obtaining work permit and shut down of the concerned line. The TPSODL shall be entirely responsible for the proper handling of the conductor and accessories in the field.
- b) Guarding shall be provided at major crossings, if not provided. The Guarding shall consist of GI guard cross arm of length 2.5 mtrs made out of 75x40 x6 mm channel & shall be hot dipped galvanized

generally conforming to IS:2633/72. The clamps shall also be hot dipped galvanized generally conforming to IS: 2633/72. Guarding shall be erected with ground & line clearances as per the I.E. rules. The guarding shall be provided with GI wire 8 SWG for 33 KV.

12.0 PAINTING OF MATERIALS

All the metal parts except G.I. parts are to be painted with two coat of red oxide and one coat of aluminum paint.

- 12.0.1** At least two coats of cold galvanized zinc rich paint having 90% zinc contents shall be applied on the welding to avoid rusting.

13.0 STRINGING OF CONDUCTOR

- 13.0.1** The works include spreading of conductors without any damage and stringing with proper tension without any kinks/ damage Jumpering at cut points by using two nos., three bolted, PG claps has to be done. **No binding of two conductors with aluminium wires will be allowed.** In each and every joints three bolted very good quality PG clamps should be used wrapping of suitable aluminium tapes if required as per the decision of the EE/DE. The ground & line clearances at road crossings along roads other crossings shall be as mentioned in this specification.(which also should not be less than the relevant clearances mentioned in I.E. rules.)
- 13.0.2** While transporting conductors' drums to site, precautions are to be taken so that the conductor does not get damaged. The drum shall be mounted on cable drum support. The direction of rotation of the drum shall be according to the mark in the drum so that the conductor could be drawn. While drawing the conductor, it shall not rub against surface causing damage. The conductor shall be passed over poles on rubberized or aluminum snatch block (pulley) mounted on the poles for this purpose.
- 13.0.3** The conductor shall be pulled through come-along clamps to string the conductor between the tension locations.
- 13.0.4** Conductor splices shall not crack or otherwise be susceptible to damage in the stringing operation. The TPSODL shall use only such equipment / methods during conductor stringing which ensures complete compliance in this regard. All the joints including mid span joints on the conductor shall be of the compression type, in accordance with the recommendations of the manufacturer.

13.0.5 All the joints or splices shall be made at least 15 meters away from the pole. No joints or splices shall be made in spans crossing over main roads, railways and small river spans. Not more than one joint per sub-conductor per span. After compressing the joint, the aluminum sleeve shall have all corners rounded; burrs and sharp edges removed and smoothened

The TPSODL shall remain fully responsible for the exact alignment of the line. If after erection, any tower is found to be out of alignment, the same shall have to be dismantled and re-erected after correction by the TPSODL at his own cost, risk and responsibility, including installation of fresh foundation, if felt necessary by the employer.

NB:- 0.5% is the non-accountable allowable wastage (for both sag & wastage) will be permitted

14.0 SUPPLY OF TOWER STRUCTURES FOR THE TRANSMISSION LINES

14.0.1 SCOPE

This specification provides for design, proto fabrication, galvanizing and delivery FOR (destination) of line towers, tower structures (Narrow base& Mini-base in Urban areas and in cross country except special locations) / G.I (RS Joist) poles / PSC pole, stubs, tower extensions, stub-templates, tower accessories (Hangers, U-bolts, bird guards, anti-climbing devices), bolts and nuts, step bolts, flat and spring washers etc. as described hereinafter in this volume. **For easy in transportation all GI joist/channels should be made into two pieces (6&4, 6&5, 7&6 mts) with jointing GI channels plates etc as per sample drawing (which is indicative)**

The preliminary survey work has already been done and the following towers have been decided. The TPSODL shall design the tower foundation in accordance to the loading parameters supplemented by TPSODL and the concreting shall be done by M-15 (1:2:4) grade concrete only.

14.0.2 DESIGN PARAMETERS

a) Wind effects:

Tower shall be designed for **reliability Level-I, Terrain category-I & Wind Zone-V** Design wind pressure on towers, conductors, earth wire and insulator string in the range of 30.45 mt. And above 45 mt. Height shall be computed as per IS-802(Part/Sec-I) 1995 Bidder shall furnish the maximum wind pressure adopted in their design against each component mentioned above.

b) **Design Temperatures:**

The following temperature range for the power conductor and ground wires shall be adopted for the line design:

- (i) Minimum temperature: 5 deg. C
- (ii) Everyday temperature of conductor: 32 deg. C
- (iii) Maximum temperature of Conductor: 85deg. C for 80 mm², 100 mm²,
& 232 mm². AAAC
- (iv) Ground wire exposed to sun. 53 deg. C

The above values are subject to latest revision if any made in IS-802 (part-I/Sec-I) 1995.

c) **Maximum Tension:** (In case of River crossing span only)

Maximum tension shall be based on either:

- i) at 5 deg. C with 2/3rd. full wind pressure or Conform to IS 802-1995
- ii) at 32 deg. C with full wind pressure whichever Part-I/Sec-I-Clause No.10.3
is more stringent.

d) **Factors of Safety & Span details:**

Factor of Safety: Should conform to IS-802 Part-I-1995

Normal span: The normal span of the line shall be 75 meters.

Wind & Weight Span: The wind and weight span to be adopted in the design of the structures shall be as follows:

- (i) Wind span: The wind span is the sum of the two half spans adjacent to the support under consideration. In case of towers located on a perfectly horizontal terrain, this shall be the normal span. For design purpose the wind on conductor shall be calculated on a wind span of at least 1.1 times the normal span.

14.0.3 STANDARDS

Except as modified in this specification, the material and work covered under this specification, shall conform to the latest revision with amendments thereof to the Indian Standards and equivalent International Standards.

14.0.4 GENERAL TECHNICAL REQUIREMENTS

14.0.5 Tower Design – General

The employer is looking for a structurally safe design of transmission line towers in case of special locations, narrow base & mini base tower structures to be installed on 33 Kv & 11 Kv lines.

The Bidder may offer economical designs with rational sections or offer towers of recent design, proven in service and accepted by other reputed Distribution companies.

The technical particulars for vibration analysis and damping design of the system are as follows:

FOR 33 kV LINES

SL. No.	Description	Technical Particulars
1.	Configuration	Double Circuit (All three phases of each circuit in vertical configuration on each side of tower).
2	Span length in meters i) Ruling design (ii) Maximum span	60 meters span 75 meters
3	Tensile load in Wind Zone:5 a) Each conductor for Ruling span b) At temperature of 5 deg. C and still air c) At temperature of 5 deg. C and 36% full wind d) At temperature of 32 deg. C and full wind	50 m/s. 1791 Kgf. 2735 Kgf. 4469 Kgf.

14.0.6 PIN INSULATORS

14.0.6.1 33 Kv Pin Insulators.-IS-731/77 (Porcelain Insulator for O/H power lines with nominal voltage greater than 1000 volts.

14.0.6.2 33 Kv GI Pin: - Confirming to IS-2486 Part-I/1971.

14.0.6.3 11 Kv Pin Insulators: - IS-731/77 (Porcelain Insulator for O/H power lines with nominal voltage greater than 1000 volts.

14.0.6.4 11 Kv GI Pin: - Confirming to IS-2486 Part-I/1971.

14.0.7 DISC –INSULATORS:

14.0.7.1 Insulator Strings

Sl. No.	Particulars	Single Suspension string	Double suspension string	Single Tension string	Double Tension string
1.	No. of standard Discs (nos)				
	1) 33 KV	1X3	2X3	1X4	2X4
	2) 11 kv	1X2	2X2	1X3	2X3
2.	Size of Disc (33 Kv/11 Kv)	255X145	255X145	280x170	280x170

All the above materials must conform to the schedules at C2 and C3

14.0.7.2 PORCELAIN GLAZE:

Surfaces to come in contact with cement shall be made rough by stand glazing. All other exposed surfaces shall be glazed with ceramic materials having the same temperature coefficient of expansion as that of the insulator shell. The thickness of the glaze shall be uniform throughout and the colour of the glaze shall be brown. The glaze shall have a visible luster and smooth on surface and be capable of satisfactory performance under extreme tropical climatic weather conditions and prevent ageing of the porcelain. The glaze shall remain under compression on the porcelain body throughout the working temperature range.

14.0.7.3 METAL PARTS: Cap and

Ball pins:

Twin Ball pins shall be made with drop forged steel and caps with malleable cast iron. They shall be in one single piece and duly hot dip galvanized. They shall not contain parts or pieces joined together, welded, shrink fitted or by any other process from more than one piece of material. The pins shall be of high tensile steel, drop forged and heat malleable cast iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity with minimum of 6 dips. The bidder shall specify the grade, composition and mechanical properties of steel used for caps and pins.

14.0.7.4 SECURITY CLIPS:

The security clips shall be made of phosphor bronze or of stainless steel.

14.0.7.5 FILLER MATERIAL:

Cement to be used as a filler material shall be quick setting, for curing Portland cement. It shall not cause fracture by expansion or loosening by contraction. Cement shall not react chemically with metal parts in contact with it and its thickness shall be as small and as uniform as possible.

14.0.7.6 MATERIAL DESIGN AND WORKMANSHIP:

- i) All raw materials to be used in the manufacture of these insulators shall be subject to strict raw materials quality control and to stage testing quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted in the field of extra high voltage transmission. Bidders shall therefore offer insulators as are guaranteed by them for satisfactory performance on Transmission lines.
- ii) The design, manufacturing process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion good finish, elimination of sharp edges and corners to limit corona and radio interference voltage

14.0.7.7 INSULATOR SHELL:

The design of the insulator shell shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Shells with cracks shall be eliminated by temperature cycle test followed by temperature cycle test followed by mallet test. Shells shall be dried under controlled conditions of humidity and temperature.

14.0.7.8 METAL PARTS:

- a) The twin ball pin and cap shall be designed to transmit the mechanical stresses to the shell by compression and develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric and of such design that it will not yield or distort under loaded conditions. The head portion of the insulator or is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.
- b) Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting parts or irregularities which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly. Pins shall not show any macroscopically visible cracks, insulations and voids.

14.0.7.9 GALVANIZING:

All ferrous parts shall be hot dip galvanized six times in accordance with IS: 2629. The zinc to be used for galvanizing shall conform to grade Zn 99.5 as per IS: 209. The zinc coating shall be uniform,

smoothly adherent, reasonably light, continuous and free from impurities such as flux ash, rust stains, bulky white deposits and blisters. Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the designed dimensional requirements.

14.0.7.10 CEMENTING:

The insulator design shall be such that the insulating medium shall not directly engage with hard metal. The surfaces of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials.

14.0.7.10 (a) Specific Requirement for Insulators

The insulators shall conform in the following specific conditions of respective IS given in the table below

Insulator		Designation	Minimum mechanical failing load	Minimum Creepage distance
11 KV	Pin	Type-B of IS731	10 KN	320 mm
33 KV	Pin	Type-B of IS731	10 KN	580 mm
33KV/11KV	Stay	Type-C of IS 1445	88 KN	57 mm
LT	Stay	Type-C of IS 1445	44 KN	41 mm

14.0.7.11 SECURITY CLIPS (LOCKING DEVICES)

The security clips to be used as locking device for ball and socket coupling shall be 'R' shaped hump type to provide for positive locking of the coupling as per IS: 2486 (Part-IV). The legs of the security clips shall allow for some adding after installation to prevent complete withdrawal from the socket. The locking device shall be resilient corrosion resistant and of sufficient mechanical strength. There shall be no possibility of the locking device to be displaced or be capable of rotation when placed in position and under no circumstances shall it allow separation of insulator units and fitting 'W' type security clips are also acceptable. The hole for the security clip shall be countersunk and the clip shall be of such design that the eye of the clip may be engaged by a hot line clip puller to provide for disengagement under energized conditions. The force required for pulling the clip into its unlocked position shall not be less than 50 N (5 Kgs.) or more than 500N (50 Kgs.)

DISC INSULATORS (B & S Type)**GURANTEED TECHNICAL PARTICULARS**

(To be submitted along with offer)

Sl. No.	Description	TPSODL Approved Standard	Bidder's Offer
1	Manufacturer's name		
2	Address of manufacturer		
3	Location of type testing		
4	Applicable standard		
5	Type of insulator (Porcelain or toughened glass)		
6	Dry impulse withstand voltage		
7	Wet power frequency, 1 minute, withstand voltage		
8	Dry, Critical Impulse Flashover Voltage		
9	Dry, power frequency, Critical Flashover Voltage		
10	Wet, power frequency, Critical Flashover Voltage		
11	Power frequency Puncture Voltage		
12	Mechanical Routine Test Load		
13	Mechanical Impact Strength		
14	Shattered Strength (Glass)		
15	Electromechanical Failing Load		
16	Safe Working Load		
17	Minimum Failing Load		
18	Creepage Distance		

19	Protected Creepage Distance		
20	Type and Grade of Materials : Insulator		
21	Type and Grade of Materials : Cap		
22	Type and Grade of Materials : Pin		
23	Type and Grade of Materials : Locking Pin		
24	Type and Grade of Materials : Cement		
25	Type of semi conducting Glaze		
26	Colour of Insulator		
27	Weight of Insulator		
28	Number of Insulators per Crate		
29	Gross Weight of Loaded Crate		
30	Whether drawing showing dimensional details have been furnished along with Bid		

33 KV,11 KV PIN INSULATORS

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	Description	TPSODL Approved Standard	Bidder's Offer
1	Manufacturer's name		
2	Address of manufacturer		
3	Location of type testing		
4	Applicable standard		
5	Type of insulator (Porcelain or toughened glass)		

6	Dry impulse withstand voltage		
7	Wet power frequency, 1 minute, withstand voltage		
8	Dry, Critical Impulse Flashover Voltage		
9	Dry, power frequency, Critical Flashover Voltage		
10	Wet, power frequency, Critical Flashover Voltage		
11	Power frequency Puncture Voltage		
12	Safe Working Load		
13	Minimum Failing Load		
14	Creepage Distance		
15	Protected Creepage Distance		
16	Type and Grade of Materials : Insulator		
17	Type and Grade of Materials : Thimble		
18	Type and Grade of Materials : Cement		
19	Type of semi conducting Glaze		
20	Radius of conductor Groove		
21	Colour of Insulator		
22	Weight of Insulator		
23	Number of Insulators per Crate		
24	Gross Weight of Loaded Crate		
25	Whether drawing showing dimensional details have been furnished along with Bid		
26	Whether Type Test Certificate have been furnished		
27	Other particulars (if any)		

HT STAY INSULATOR & LT STAY INSULATORS**GURANTEED TECHNICAL PARTICULARS**

(To be submitted along with offer)

Sl. No.	Description	TPSODL Approved Standard	Bidder's Offer
1	Manufacturer's name		
2	Address of manufacturer		
3	Location of type testing		
4	Applicable standard & Type		
5	Type of insulator (Porcelain or toughened glass)		
6	Dry impulse withstand voltage		
7	Wet power frequency, 1 minute, withstand voltage		
8	Dry, Critical Impulse Flashover Voltage		
9	Dry, power frequency, Critical Flashover Voltage		
10	Wet, power frequency, Critical Flashover Voltage		
11	Power frequency Puncture Voltage		
12	Safe Working Load		
13	Minimum Failing Load		
14	Creepage Distance		
15	Protected Creepage Distance		
16	Type and Grade of Materials : Insulator		
17	Colour of Insulator		
18	Weight of Insulator		
19	Number of Insulators per Crate		

20	Type of semi conducting Glaze		
21	Minimum dia of Stay wire hole		
22	Whether drawing showing dimensional details have been furnished along with Bid		
23	Whether Type Test Certificate have been furnished		
24	Other particulars (if any)		

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	Description	Bidder's Offer	
		33 KV GI PIN	11 KV GI PIN
1	Manufacturer's name Manufacturer's name & Address		
2	Standard applicable specification		
3	Minimum failing load		
4	Dimensions (mm)		
A	Total length		
B	Shank length		
C	Stalk length		
5	Type of threads		
6	Threads per Inch		
7	Type of galvanization of pin & nuts		
8	Mass of zinc (minimum)		
9	Applicable specification		
10	No. of Nuts with each pin & its size		

11	No. of spring washer with each pin & its size		
12	Packing details		
A	Type of packing		
B	Weight of each pin approx, (with nut & washers)		
C	No. of Pins in each packing (Kg)		
13	Tolerance in weight / dimensions, if any		
14	I.S.I. Certificate License number		
15	Any other relevant information the bidder would like to indicate		
16	Manufacturer's Trade mark with each GS Pins		
17	Whether drawing has been submitted by the bidder		

14.0.8 LONG ROD INSULATOR

33KV Long Rod Insulator in conformity to IS: 2486 , IEC:433 & IS:731 can be used preferably in Saline affected area. The technical requirements are as under

a. minimum nominal creepage distance	850 mm
b. Lightning impulse withstand voltage	170KVp
c. Wet Power Frequency withstand voltage	75 KV
d. Tensile load	70KN

MILD STEEL CHANNEL & ANGLE

Clause TECHNICAL SPECIFICATIONS OF MILD STEEL CHANNEL & ANGLE

No.

1.00.00 SCOPE

This specification covers design, manufacture, testing and dispatch to owner's stores of M.S. Channel & Angle for use in structures in distribution system.

2.00.00 APPLICABLE STANDARD

Materials shall conform to the latest applicable Indian standards. In case bidders offer steel section and supports conforming to any other international specifications which shall be equivalent or better than IS, the same is also acceptable.

Sl.No.	Standard No.	Title
1	IS: 2062 Grade 'A'	Quality Specification for M.S.Angles, M.S.Channel
2	IS: 2062	Chemical and Physical composition of material
3	IS: 1852	Rolling and Cutting Tolerances for Hot Rolled Steel products

3.00.00 GENERAL REQUIREMENTS

3.01.00 Raw material

The Steel Sections shall be re-rolled from the BILLETS/INGOTS of tested quality as per latest version of IS: 2830 or to any equivalent International Standard and shall be arranged by the bidder from their own sources.

The Chemical composition and Physical properties of the finished material shall be as per the equivalent standards.

Chemical Composition and Physical Properties of M.S. Angles, M.S. Channels, and M.S. Flat conforming to IS: Conforming to IS: 2062/84

3.02.00 Chemical Composition

3.02.01 Chemical composition For Fe 410 WA Grade

- 1 C - 0.23% MAX
- 2 Mn - 1.5% MAX
- 3 S - 0.050% MAX
- 4 P - 0.050% MAX

5 SI - 0.40% MAX6 CE

(Carbon Equivalent)- 0.42% MAX

3.04.00 Mechanical Properties

1. Tensile strength Kg/mm ²	- 410
2. Yield stress Min. for thickness/diameter	
< 20 mm	- 26 Kg/mm ² OR 250 N/mm ²
20-40 mm	- 24 Kg/mm ² OR 240 N/mm ²
> 40 mm	- 23 Kg/mm ² OR 230 N/mm ²
3. Elongation %	- 23%
4. Bend Test (Internal Dia)	- Min-3t

(t—is the thickness of the material).

3.05.00 Tolerance

Variation in ordered quantity for any destination and overall ordered quantity be only to the extent of $\pm 2\%$.

Rolling and weight tolerances shall be as per version of IS: 1852 or to any equivalent International Standard.

4.00.00 TEST

Steel Section shall be tested in IS approved Laboratory or Standard Laboratory the Bidder country having all facilities available for conducting all the test prescribed in relevant IS or IEC or to any equivalent International Standard or any recognized and reputable International Laboratory or Institutions.

The bidders are required to specifically indicate that;

They hold valid IS (or equivalent IEC) License.

Steel Section offered are bearing requisite IS certification or equivalent marks.

The bidders are required to submit a copy of the valid IS (or equivalent IEC) License clearly indicating size and range of product against respective ISS or any equivalent International Standards along with their offer.

5.00.00 MARKING

It is desirable that the bidder should put his identification marks on the finished material. The mark shall be in "legible English letter" given with marking dies of minimum 18 mm size.

6.00.00 INSPECTION AND TEST CERTIFICATES

The material to be supplied will be subject to inspection and approval by the purchaser's representative before dispatch and/or on arrival at the destination. Inspection before dispatch shall not however, relieve the bidder of his responsibility to supply the Steel Sections strictly in accordance with the specification.

The purchaser's representative shall be entitled at all reasonable time during manufacture to inspect, examine and test at the bidder's premises the materials and workmanship of the steel section to be supplied.

As soon as the steel Section are ready for testing, the bidder shall intimate the purchaser well in advance , so that action may be taken for getting the material inspected. The material shall not be dispatched unless waiver of inspection is obtained or inspected by the purchaser's authorized representative.

Test certificates shall be in accordance with latest version of the relevant Indian Standards or any equivalent International Standard.

The acceptance of any batch/lot shall in no way relieve the bidder of any of his responsibilities for meeting all the requirements of the specification and shall not prevent subsequent rejection of any item if the same is later found defective.

15.0 FLEXIBLE COPPER BOND

At suspension and tension towers, the earth wire suspension and tension clamps shall be securely bonded to the tower steelwork by means of a multi-strand flexible copper bond wire. The copper bond shall be sufficiently flexible to allow movement of the suspension clamp under all operating conditions and terminated with compression lugs.

The flexible copper bond shall be of nominal 34 sq.mm equivalent copper area and not less than 500 mm in length. It shall consist of 259 wires of 0.417 mm dia. tinned copper conductor. It shall be laid up as seven stranded ropes, each of 37 bunched wires. The tinning shall be as per IS 9567. Two tinned copper connecting lugs shall be press jointed to either ends of the flexible copper cable. One lug shall be suitable for 12 mm, dia. bolt and the other for 16 mm dia. bolt. The complete assembly shall also include one 16 mm dia., 40 mm long mild steel bolt hot dip galvanized with nut and lock washers.

16.0 TRANSMISSION TOWERS

16.0.1 General Description (Special Towers)

220 Kv or 132 Kv OPTCL's used towers in River Crossing, Narrow base Tower used in TPSODL UTILITY, Newly developed Mini base Tower structures are designed by TPSODL UTILITY which will be provided to the bidders .However any lattice tower fitting to the base width of TPSODL UTILITY prescribed mini base tower can be offered. If techno economically found suitable this can also be considered.

Types of Towers

The towers shall normally be of the following standard types, and as stated in Schedule C-1.

Type of Tower	Deviation Limit	Typical Use
(1)	(2)	(3)
OA/PA	0deg- 2deg	To be used as tangent tower with suspension strings
OB/PB	0 deg- 30 deg	Angle towers with tension insulator string
OC/PC	30 deg to 60deg	Angle tower with tension insulator strings

Note: The above towers can also be used for longer span with smaller angle of deviations. (To be decided as per the tower spotting data to be submitted by the TPSODL and approved by Project Manager.)

16.0.2 The towers shall be of the self-supporting type, built up of lattice steel sections or members and designed to carry the power conductors with necessary insulators. Outline diagrams of the towers required are to be furnished by the Bidder.

16.0.3 The towers shall be fully galvanized structures built up of structural mild steel sections. All members shall be connected with bolts, nuts and spring washers.

16.0.4 TOWER HEIGHT

However, for calculating the tower height, an allowance of 150mm shall be provided, over and above the specified ground clearances, at still air and maximum conductor temperature, to account for any stringing error.

TABLE

Situation	Minimum clearance (metres)	
	33	11
System voltage (kV):		
Normal ground (open country) 85 deg.	6.10	6.10
*Road crossings, road level 85 deg (Also in Urban Areas)	8.50	8.50

*Any road which is normally maintained by Government and/or other recognized public authority.

16.0.5 STUBS AND SUPERSTRUCTURES:

- (i) The stub shall mean a set of four stub angles forming the foundation level steel section fully galvanized and shall include cleats, gussets, bolts and nuts, etc. The stub being cast in foundation footings. Stub length shall correspond to foundation depth of 3-0 metres from ground level.
- (ii) Superstructure shall mean the galvanized tower assembly above the stubs which includes structural members like angle sections, cross arms, ground wire peaks, accessories and fittings such as gusset plates, pack washers, spring, washers, ladders, step bolts, anti climbing devices and such other items which are required for completing the towers in all respect. Steel and zinc required for manufacturing these items will be arranged by the supplier.

- (iii) Supply of **GI** bolts and nuts and spring washers **3.5 mm thickness**, hangers/D-shackles for attaching suspension strings and 'U' bolts for attaching ground wire suspension assemblies are included in the supply of tower.
- (iv) The following provisions shall apply in connection with the procurement of steel and zinc by the supplier.
 - (a) The steel used for fabrication of tower parts extensions, templates etc. shall be of mild steel of tested quality as per IS: 2062 GRA.
 - (b) The Bidder shall take into account the fabrication wastage while quoting the rates. The employer will not accept any liability in connection with the wastage of steel during fabrication or otherwise.
 - (c) The Bidder shall indicate in his offer the sizes of steel sections which are proposed to be used by him in the design of towers.
 - (d) Substitutions, if any, of steel sections of the tower parts by higher sizes, due to non-availability or otherwise shall be to the supplier's account. The employer will not accept any liability on this account.
 - (e) The steel shall be procured exclusively from the main steel producers. However, sections not rolled by main producers, can be procured from re-rollers provided.
 - Re-rolling of structural steel sections is done from billets/ingots of tested quality.
 - Re-rolled sections are duly tested as per relevant standard.
 - (f) The zinc used for galvanizing fabricated material shall be of High Grade Electrolytic zinc.

16.0.6 EXTENSIONS:

The towers shall be designed so as to be suitable for adding 3 meters, 6 meters, 2 meters **or 3 meters** extensions (in case of Mini based towers) for maintaining adequate ground clearances without reducing the specified factor of safety in any manner.

16.0.7 STUB SETTING TEMPLATES:

Stub templates **if required** shall be designed and supplied by the supplier **free of cost** as per requirement for all types of towers with or without extensions. Stub templates for standard towers and towers with extension shall be fixed type. The stub templates shall be painted and members marked clearly with anti-corrosive paints.

16.0.8 FASTENERS: BOLTS, NUTS & WASHERS

- 16.0.8.1.1** All bolts shall be of property class 5.6 and nuts of property class 5.0 IS: 1367 (Part – 3) 1991 and IS: 6639-1972 shall conform to IS: 12427, they shall be galvanized and shall have hexagonal heads and nuts, the heads being forged out of solid steel rods and shall be truly concentric and square with the shank. The shank shall be perfectly straight.
- 16.0.8.1.2** Usually threaded bolts shall not be used, the length of bolts should be such that the threaded portion shall not extend into the place of contact of the members.
- 16.0.8.1.3** All bolts shall be threaded to take the full depth of the nut and threaded far enough to permit firm gripping of the members, but not any further. It shall be ensured that the threaded portion of each bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit hand tight to the point where the shank of the bolt connects to the head.
- 16.0.8.1.4** Spring washers shall be provided for insertion under all nuts. These washers shall be of electro-galvanized steel and of the positive lock type. Their thickness shall be 2.5 mm for 12 mm dia bolts, 3.5 mm for 16 mm dia bolts and 4.5 mm for 20 mm dia bolts.
- 16.0.8.1.5** The Bidder shall furnish bolt schedules giving thickness of members connected, size of bolts and nuts, the length of the shank, the length of the threaded portion of bolts, sizes of bolt holes, thickness of washers and any other special details of this nature.
- 16.0.8.1.6** To obviate bending stress in bolts or to reduce it to a minimum, no bolt shall connect aggregate thickness of more than three (3) times its dia.
- 16.0.8.1.7** Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.
- 16.0.8.2** Step Bolt Ladders: These bolts shall be of property class 4.6 conform to IS: 6639-1972.
- 16.0.8.2.1** Each tower shall be provided with step bolts on one of the main legs, of not less than 16 mm diameter and 175 mm long, spaced not more than 400 mm apart and extending from about 2.5 metres above the ground level to the top of the tower. Each step bolt shall be provided with two nuts on one end to fasten the bolt security to the tower and button head at the other end to prevent the feet from slipping away. The step bolts shall be capable of withstanding a vertical load not less than 1.5 KN and shall be used as a ladder for climbing.

17.0 TOWER DESIGNS SUPERSTRUCTURE (Mini base)

17.0.1 Wind Pressure

The wind pressure on towers, power conductors and earth wire shall be as per IS: 802 (Part-I/Sec-I) – 1995.

17.0.2 Design Temperatures

The following temperature range for the power conductor and ground wires shall be adopted for the line design confirming to IS: 802 (Part –I/Sec – I) – 1995.

i)	Minimum temperature:	50°C
ii)	Every day temperature:	32°C
iii)	Maximum temperature of:	
	a)	Conductor:
		75°C for ACSR
		90°C for AAAC
	b)	Ground wire exposed to Sun
		53°C

17.0.3 Factors of Safety & Span details

a) Factor of safety.

The factor of safety based on crippling strength of struts and elastic limit of tension members shall not be less than 2(two) under normal condition and 1.5 (one and a half) under broken wire conditions for all the members of the towers and their cross arms.

b) Broken Wire condition

i) Suspension Tower

Breaking of any one power conductor in one phase only, resulting in instantaneous unbalance tension of 50% of conductor tension at 32°C without wind. or breaking of one earth wire resulting in an unbalance tension equal to the maximum tension of the ground wire whichever is more stringent is to be considered for design along with appropriate impact factor.

ii) Tension Tower

Breakage of all the three phases on the same side and on the same span or breakage of two phases and any one ground wire on the same span, whichever combination is more stringent along with appropriate impact factor for a particular member. Cross arms for angle tower shall be of equal length for both sides.

17.0.4 Design Load

- (i) Employer's requirement for design longitudinal and transverse loads shall confirm to IS: 802(Part-I/Sec-I)-1995.

The Bidder shall furnish the details of design loads proposed to be adopted in the tower design in accordance with this specification.

The design criteria and other special requirements as stipulated for special towers shall be applicable for river crossing/special towers.

ii) Thickness of Members

The minimum thickness of angle sections used in the design of towers, shall be kept not less than the following values:

- a) Main corner leg members excluding the ground wire peak and main cross arm 6 mm.
- b) For all other main members 5 mm.
- c) Redundant members 4 mm.

iii) Bolt Arrangement

The minimum bolt spacing and rolled edge distance and sheared edge distances of sections from the centers of the bolt holes shall be provided as furnished in Table-1.

TABLE-1

Dia of Bolts (mm)	Hole Dia (mm)	Min. bolt Spacing (mm)	Min. rolled Distance (mm)	Min. Sheared Edge distance (mm)
12	13.5	30	16	19
16	17.5	40	20	23
20	21.5	50	25	27

Bolts sizes mentioned above shall only be used. The minimum width of flanges without bolt holes shall be 30 mm.

For the purpose of calculating stress and bearing stress for bolts refer clause 14.4 and 14.5 of IS: 802 (Part-I/Sec-2)-1992.

iv) Erection Stress

Where erection stresses combined with other permissible co-existent stresses could produce a working stress in any member appreciably above the specified working stress, then additional materials shall be added to the member or such other provision made so as to bring the working stress within the specified limit. For the purpose of this clause the specified working stress shall be the ultimate stress divided by the factor of safety of 2.0.

- a) Detailed structural drawings indicating section size, length of member. Sizes of plate along with hole to hole distances, joint details etc.
- b) Bill of materials indicating cutting and bending details against each member.
- c) Shop floor drawings showing all details relevant to fabrication.

17.0.5 Packing

Angle sections shall be wire bundled, cleat angles, gusset plates, blackets, filler plates, hanger and similar other loose items shall be netted and bolted together in multiples or securely wired together through holes.

Bolts, nuts, washers and other attachments shall be packed in double gunny bags, accurately tagged, in accordance with the contents.

The packings shall be properly done to avoid losses/damages during transit. Each bundle or package shall be appropriately marked.

17.0.6 Test for Galvanization

Galvanization of the members of the tower shall withstand tests as per IS:2633.

18.0 TOWER ACCESSORIES

18.0.1 Anti-climbing devices: This shall conform to IS: 5613 (Part-I/Sec –I), 19085.

Fully galvanized barbed wire type anti-climbing device shall be provided at a height of approximately 3 meters as an anti-climbing measure. Four layers of barbed wires will be provided each inside and outside the tower in horizontal plane, spacing between the layers being 140 to 150 mm. The towers to be designed by the supplier shall have provision to fix the barbed wire as indicated above. Thus the angle pieces with notches for accommodating barbed wire shall be designed and supplied with the towers along with provision for suitable bolt holes on leg members for fitting bolt holes on leg member for fitting the angles. The scheme of the anti-climbing device shall be submitted along with the tower drawing. Barbed wire shall be included in the scope of bidder. For Mini base towers the anti-climbing device shall be as per TPSODL design which shall be provided to the TPSODL along with the design drawings of the tower.

18.0.2 INSULATOR STRINGS AND GROUND WIRE CLAMP ATTACHMENTS

For the attachment of suspension insulator strings a suitable swinging hanger on the tower shall be provided so as to obtain requisite clearance under extreme swinging conditions and free swinging of the string. For Mini base towers ground wire stringing is not necessary.

18.0.3 (a) For ground wires at suspension towers suitable 'U' Bolts strong enough to withstand the full designed loads shall be provided to accommodate the hook of the ground wire suspension clamps.

(b) At tension towers, horizontal strain plates of suitable dimensions on the underside of each power cross-arm tip and at the top ground wire peak shall be provided for taking the 'D' Shackles of the tension insulator strings or ground wire tension clamps, as the case may be. Full details of the attachments shall be submitted by the supplier for the employer's approval before commencing with mass fabrication.

18.0.4 PHASE PLATE

Phase plate shall be of mild steel of 16 gauge vitreous enameled at back and front, circular in shape and diameter 75 mm. One set of phase plate shall be consisting of 3 plate red, yellow and blue colour accordingly to indicate the phase of the conductor. There shall be one fixing bolt on the plate. This shall conform to IS: 5613 (Part-II/Section01) of latest edition.

18.0.5 NUMBER PLATE

The number plate shall be mild steel vitreous enameled at back and front, 200 mm x 150 mm, **2 mm thick**, rectangular shape and inscribed thereon shall be the number of the tower location preceded by letter corresponding to the short name of the line and the type of towers. There shall be two fixing bolts on both end of the plates. The dimension and details of the number plate shall be as per IS: 5613 (Part-II/Section1 & Section-2), 1985.

18.0.6 DANGER PLATE

These shall be of mild steel vitreous enameled at back and front 250 x 200 mm, 2mm thick, rectangular shape and inscribed thereon shall be in signal red the work 'DANGER' with its Odia and Hindi translation and also with the inscription of Bone and Skull and voltage of the line. There shall be two holes on the plates for fixing. This shall conform to IS: 2551 (latest edition). The fixing of the plate should be above 3 (three) meters from ground level.

18.0.7 ERECTION MARK:

Each individual member shall have an erection mark conforming to the component number given to it in the fabrication drawings. This mark shall be done with marking dies of 16 mm size before galvanizing and shall be legible after galvanizing.

18.0.8 GALVANIZING

The super structure shall be galvanized. Galvanizing of tower members and stub shall be in conformity with IS: 4759-1984 and shall be done after all fabrication work has been completed except that the nuts may be tapped or return after galvanizing. Threads of bolts and nuts after galvanizing shall have a

neat fit and shall be such that they can be turned with fingers throughout the length of the threads of bolts and they shall be capable of developing the full strength of the bolts. Spring washers shall be electro-galvanized as per Grade – 4 of IS: 1573 – 1986. Galvanizing for fasteners shall conform to IS: 1367 (Part-XIII) – 1978.

19.0 QUANTITIES AND WEIGHTS

19.0.1 The quantities stated in Annexure – I are only provisional. Final quantities will be informed by the employer to the supplier on completion of detailed survey. However, bids will be evaluated based on quantities indicated.

19.0.2 The employer reserves the right to increase or decrease quantities at the rates quoted in the bid.

19.0.3 The unit weight of each type of tower stubs, super structure and extension be furnished by the Bidder.

20.0 INSPECTION

20.0.1 The supplier shall keep the employer informed well in advance of the commencement of manufacture, progress of manufacture thereof and fabrication of various tower parts at various stages. So that arrangements could be made for inspection by the employer.

20.0.2 The acceptance of any batch of items shall in no way relieve the supplier of any his responsibilities for meeting all the requirements and intent of this specification and shall not prevent subsequent rejection if any item of that batch is later found defective.

20.0.3 The employer or his authorized representatives shall have free access at all reasonable time to all parts of the supplier's works connected with the fabrication of the material covered under the contract for satisfying themselves that the fabrication is being done in accordance with the provisions of this specification.

20.0.4 Unless specified otherwise, inspection shall be made at the place of manufacture prior to dispatch and shall be conducted so as not to interfere unnecessarily with the operation of the work.

20.0.5 Should any member of the structure be found not to comply with the approved design, it shall be liable for rejection. No member once rejected shall be resubmitted for inspection except in cases where the employer or his authorized representative considers that the defects can be rectified.

20.0.6 Defects which occur during fabrication shall be made good with the consent of and according to the procedure to be laid down by the employer.

20.0.7 All gauges and templates necessary to satisfy the employer for conducting tests shall be made available at the test site by the supplier.

The correct grade and quality of steel shall be used by the supplier. To ascertain the quality of steel the employer may at his discretion get the material tested at an approved laboratory.

21.0 GENERAL TECHNICAL REQUIREMENTS FOR CIVIL WORKS

Design details	-	foundation
Line voltage	-	33kV / 11 Kv
No. of circuits	-	Double/ Single

a) Properties of soil for bidding purpose only

Sl. No.	Details	Soft Loose (normal dry)	Mud (Submerged)	Hard Rock	Soft Rock	WBC
1.	Angle of repose of soil(in degree)	30	15	45	20-30	0
2.	Ultimate bearing strength of earth (T/M ²)	11	5.5	87.0	50.0	

b) Properties of concrete

Weight of foundation concrete 1:2:4 mix for design purpose shall be taken as 2400 kg/ cu.m in dry location.

c) Factor of safety for foundation against overturning due to up-lift and thrust.

i) Normal condition 2.2

ii) Broken wire condition 1.65

22.0 FOUNDATION GENERAL DESCRIPTION

Design, construction and other relevant drawings shall be furnished by the tower designer for all types of towers for Normal soil WBC soil.

23.0 TAKING OVER

Tower and tower accessories received at site stores are to be stored item-wise and mark-wise to facilitate joint inspection of the materials (with reference to packing list and detailed order).

If the materials/equipment or any part thereof is damaged or lost during the transit, the replacement of such materials shall be effected by the TPSODL timely so as to maintain programme of work. However, the line under erection shall be taken over by the purchaser only when the entire line is completed in all respect and made ready for commissioning at rated voltage. Partly erected line will not be taken over.

Taking over of the line shall be in no way relieving the TPSODL from his responsibility for satisfactory operation of the erected line in terms of the guarantee clause of the specification.

24.0 MATERIALS HANDLING AND INSURANCE

The TPSODL shall deliver all equipment/materials against this contract to his site stores under cover of Transit Insurance to be taken in his name. Cost of such insurance is to be borne by the TPSODL.

Cost of transportation of all materials from TPSODL's store to the site of work as well as department supply items like Conductors, AB cables, Power cables, etc shall be borne by the TPSODL irrespective of mode of transportation and site condition.

The TPSODL has to bear the cost of premiums on insurance for all materials, tower accessories and total erection cost of the line including cement, rods for foundation.

It will be the responsibility of the TPSODL to report to the concerned Police Station about all incidents of thefts and lodge, pursue and settle all claims with Insurance Company in case of damage/loss due to theft, pilferage, flood and fire etc. and the employer of the work shall be kept informed promptly in writing about all such incidents. The loss, if any, on this account shall be recoverable from the TPSODL if the claims are not lodged and properly pursued in time or if the claims are not settled by the insurance company due to lapses on the part of the TPSODL. The TPSODL shall have to replenish promptly damaged, stolen tower members and accessories conductors, earth wire, hardware's etc.

and repair/re-erect the damaged lines, free of cost to the employer so as to maintain the programme of work. The employer will not be responsible in any way for such loss of materials.

25.0 Check List

Before the line is offered for taking over and disbursement of final payment subsequent to the materials reconciliations a comprehensive format in shape of check list as shown at schedule C-4 must be filled up and signed by the executing agency.

Schedule C 1 - Earth Wire (In River crossing Spans)

Description (Complete earth conductor)	Unit	GSW
Appropriate Indian Standard No		398(Part-2)
Appropriate British Standard No		183
Material of earth conductor		galvanized steel
Number and diameter of wires	No./mm	7/3.15

Overall diameter of conductor	mm	9.45
Mass of conductor per kilometer	kg	428
Ultimate strength of conductor	Newton	56000
Lay length	mm	160 +/- 15
Direction of the lay of the outer layer		Right hand
Chemical composition of the steel wire	%	
Carbon		not more than 0.55
Manganese		0.4 to 0.9
Phosphorous		not more than 0.04
Sulphur		not more than 0.04
Silicon		0.15 to 0.35
Purity of Zinc for galvanizing	%	99.95
Galvanizing after stranding		
a) Minimum weight of Zinc coating per sq. m. of the uncoated wire surface	gms	240
b) Minimum no. of one minute dips that the galvanized wire can withstand in Standard Preece Test		3 and 1/2
Maximum length of conductor on drum #	km	4 +/- 5%
D.C. resistance at 20 °C	ohms/km	3.375

Schedule C2 - Insulator Strings (Suspension Sets For 33 kV Lines)

Description	Unit	Single "I"	Double "I"	Pilot

		Suspension Strings	Suspension Strings	Suspension Strings
Mechanical strength of the complete insulator string along with all hardware fittings	KN	45	2x45	45
Maximum voltage (in percentage) across any disc in the complete insulator string under phase to earth voltage *	%	20	20	20
Number of insulator units in each string **		3	2x3	3
Purity of Zinc used for galvanizing	%	99.95	99.95	99.95
Minimum No. of one minute dips the ferrous parts can withstand in Standard Preece Test	No.	6	6	6

Schedule C3 - Insulator Strings (Tension Sets For 33 kV Lines)

Description	Unit	Single Tension Strings	Double Tension Strings
Mechanical strength of the complete insulator string along with all hardware fittings	kN	70	2x70
Maximum voltage (in percentage) across any disc in the complete insulator string under phase to earth voltage *	%	22	22

Number of insulator units in each string **		4	2x4
Purity of Zinc used for galvanizing	%	99.95	99.95
Minimum No. of one minute dips the ferrous parts can withstand in Standard Preece Test	No.	6	6

SCHEDULE C - 4

CHECK FORMAT

1. Excavation has been done as per approved drawing of Normal soil. **Yes/ No**
2. PCC has been done as per approved drawing. **Yes/ No**
3. RCC has been done as per approved drawing and as per required Qty. **Yes/ No**
Rods has been provided.
4. laping of rods has been done as per standard (Minimum 40 D). **Yes/ No**
6. Good quality of shutters has been used. **Yes/ No**
6. Is there any honey-combs after removal of shutters observed. **Yes/ No**
7. If honey-combs observed, has been repaired by providing rich Concrete **Yes/ No**
mixture after removal of loose ingredients.
8. Is there any deviation in alignment related to tangent tower. **Yes/ No**
9. Is there any deviation in verticality after concreting.(If any deviation **Yes/ No**
In verticality of pole or tower, the TPSODL should re-cast the
Foundation free of cost, otherwise it will not to be accepted)
10. Is there any deviation in bi-section of angles of the Angle tower **Yes/ No**
before taking up the concreting of pole or structure.
11. All the GI bolts-nuts of required size with required spring washer **Yes/ No**
has been provided.
12. All the bolts-nuts has been properly tightened (after full tight 3 Nos. **Yes/ No**
threads will be projected out)
13. Cooping of required height (in case of Urban area it is 30 cm, in **Yes/ No**
Cross country it is 75 cm) has been done.
14. Painting of pole or structures has been done as per specification. **Yes/ No**

15.	Split pins & “I” clips has been provided in each H/W fittings & Insulator strings.	Yes/ No
16.	All the accessories in each locations has been fixed properly.	Yes/ No
17.	Bird guard has been provided in each tangent towers.	Yes/ No
18.	Anti climbing devices has been provided in each locations.	Yes/ No
19.	All the jumpers has been properly tightened by providing Required nos. of PG clamps(2 nos. PG clamps has to be Provided per each side)	Yes/ No
20.	All the insulators and H/W fittings used has been free from all Defects.	Yes/ No
21.	Equal phase to phase clearance has been maintained.	Yes/ No
22.	Minimum ground clearance from bottom most conductor (7 mts. in cross country & 9 mts. In road crossings) has been maintained in each span.	Yes/ No
23.	Curing has been done for 28 days.	Yes/ No
24.	Proper back filling has been done as per specification.	Yes/ No
25.	Required earthing has done in every locations.	Yes/ No
26.	Material utilization accounts has been furnished.(In each and every Bills should have material accounts of both departmental supply items And TPSODL’s supply items, except civil items, otherwise the bills Will not accepted).	Yes/ No
27.	Stay	Yes/ No
28.	Guarding at Road Crossing.	Yes/ No
29.	Clearance with intercepting lines.	Yes/ No
30.	Proper Jumpering.	Yes/ No

26.0 DISC INSULATORS

26.1 SCOPE.

This specification provides for design, manufacture, engineering, inspection and testing before dispatch packing and delivery FOR (destination) for Indian manufacturers of disc. Insulators & Post Insulators as per technical requirements furnished in this specification.

These insulators are to be used in suspension and tension insulators strings for the suspension and anchoring of the bus-bar conductors.

Following is the list of documents constituting this package.

- (i) Technical specification.
- (ii) Technical data sheet.
- (iii) Drawings of insulators

All the above volumes along with amendments there of shall be read and interpreted together. However, in case of a contradiction between the “Technical Specification” and any other volume, the provisions of this volume will prevail.

The insulators shall conform in all respects to high standards of engineering, design workmanship and latest revisions of relevant standards at the time of offer and purchaser shall have the power to reject any work or material which in his judgment, is not in full accordance therewith.

26.2 STANDARDS:

26.2.1 Except as modified in this specification, the disc insulators shall conform to the following Indian Standards, which shall mean latest revisions and amendments. Equivalent International and Internally recognized standards to which some of these standards generally correspond are also listed below.

Sl. No.	Indian Standard	Title.	International Standard
1.	IS: 206	Method for Chemical Analysis of Slab Zinc.	
2.	IS: 209	Specification for Zinc.	BS: 3436
3.	IS: 731	Porcelain insulators for overhead power lines with a normal voltage greater than 1000V	BS: 137(I&II); IEC 274 IEC 383
4.	IS: 2071 Part-(I) Part-(II) Part-(III)	Method of High Voltage Testing.	
5.	IS: 2121 (Part-I)	Specification of Conductors and Earth wire Accessories for Overhead Power lines. Armour Rods, Binding wires and tapes for conductor.	
6.	IS: 2486	Specification for Insulator fittings for overhead power lines with a nominal voltage greater than 1000V.	
	Part – I	General Requirement and Tests.	BS: 3288
	Part – II	Dimensional Requirements.	IEC: 120
	Part – III	Locking devices.	IEC: 372
7.	IS: 2629	Recommended practice for Hot Dip Galvanisation for iron and steel.	
8.	IS: 2633	Testing for Uniformity of Coating of Zinc coated articles.	
9.	IS: 3138	Hexagonal Bolts & Nuts.	ISO/R 947 & ISO/R 272
10.	IS: 3188	Dimensions for Disc Insulators.	IEC: 305
11.	IS: 4218	Metric Screw Threads	ISO/R 68-1969 R 26-1963, R 262-1969 & R965-1969

12.	IS: 6745	Determination of weight of zinc coating on zinc coated iron and steel articles.	
13.	IS: 8263	Methods of RIV Test of HV insulators.	IEC 437 NEMA Publication No.107/1964 CISPR
14.	IS: 8269	Methods for switching impulse test on HV insulators.	IEC: 506
15.		Thermal mechanical performance test and mechanical performance test on string insulator units.	IEC: 575
16.	IEC	Long Rod Insulators	IEC-433

26.2.2 The standards mentioned above are available from:

Reference.	Abbreviation.	Name & Address:
BS		British Standards, British Standards Institution, 101, Pentonville Road, N-19 ND,U
IEC / CISPR		International Electro technical commission Electro Technique International. 1, Rue de verembe Geneva SWITZERLAND.
IS		Bureau of Indian Standards, Manak Bhavan, 9 Bahadurshah Zafar Marg, New Delhi-110001
ISO		International Organisation for Standardization. Danish Board of Standardization Dansk Standardizing Sraat Aurehoegvej-12 DK-2900 Hellestrup DENMARK.
NEMA		National Electric Manufacturers Association 1`55, East 44 th . Street New York, NY 10017 USA

26.3 (A) PRINCIPAL PARAMETERS.

26.3.1 DETAILS OF DISC INSULATORS:

The Insulator strings shall consist of standard discs for use in three phases, 50 Hz 33/11KV S/s of TPSODL in a moderately polluted atmosphere. The discs shall be cap and pin, ball and socket type, radio interference and have characteristics as shown in Table-I and all ferrous parts shall be hot dip galvanized as per the latest edition of IS 2629. The zinc to be used for making sleeves shall be 99.95 % pure.

The size of disc insulator, minimum creepage distance the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware shall be as follows:

Sl. No	Type of String.	Size of disc. Insulator (mm)	Minimum creepage distance of	No. of standard discs 33KV	Electro-mechanical strength of

			each disc(mm)		insulator string fittings (KN)
1.	Single suspension	255x145	430	1x3	45
2.	Double suspension	-do-	-do-	2x3	2x45
3.	Single Tension	280x170	-do-	1x4	70
4.	Double Tension	-do-	-do-	2x4	2x70

26.3.2 SPECIFICATION DRAWINGS:

The specification in respect of the disc insulators are described. These specification for information and guidance of the Bidder only. The drawings to be furnished by the supplier shall be as per his own design and manufacture and in line with the specification.

26.3 (B) GENERAL TECHNICAL REQUIREMENTS:

26.3.1 Porcelain:

The porcelain used in the manufacture of the shells shall be ivory white nonporous of high dielectric, mechanical and thermal strength, free from internal stresses blisters, laminations, voids, forgone matter imperfections or other defects which might render it in any way unusable for insulator shells. Porcelain shall remain unaffected by climatic conditions ozone, acid, alkalis, zinc or dust. The manufacturing shall be by the wet process and impervious character obtained by through verification.

The insulator shall be made of highest grade, dense, homogeneous, wet-process porcelain, completely and uniformly vitrified throughout to produce uniform mechanical and electrical strength and long life service. The porcelain shall be free from warping, roughness, cracks, blisters, laminations, projecting points foreign particles and other defects, except those within the limits of standard accepted practice. Surfaces and grooves shall be shaped for easy cleaning. Shells shall be substantially symmetrical.

3.3.2 Porcelain glaze:

Surface to come in contact with cement shall be made rough by sand glazing. All other exposed surfaces shall be glazed with ceramic materials having the same temperature coefficient of expansion as that of the insulator shell. The thickness of the glaze shall be uniform throughout and the colour of the glaze shall be down. The Glaze shall have a visible luster and smooth on surface and be capable of satisfactory performance under extreme tropical climatic weather conditions and prevent ageing of the porcelain. The glaze shall remain under compression on the porcelain body throughout the working temperature range.

26.4 METAL PARTS:

(i) Cap and Ball Pins:

Ball pins shall be made with drop forged steel caps with malleable cast iron. They shall be in one single piece and duly hot dip galvanized. They shall not contain parts or pieces joined together welded, shrink fitted or by any other process from more than one piece of materials. The pins shall be of high tensile steel, drop forged and heat-treated. The caps shall be cast with good quality black heart malleable cast

iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity. The bidder shall specify the grade composition and mechanical properties of steel used for caps and pins. The cap and pin shall be of such design that it will not yield or distort under the specified mechanical load in such a manner as to change the relative spacing of the insulators or add other stresses to the shells. The insulator caps shall be of the socket type provided with nonferrous metal or stainless steel cotter pins and shall provide positive locking of the coupling.

(ii) Security Clips:

The security clips shall be made of phosphor bronze or of stainless steel.

26.5 FILLER MATERIAL:

Cement to be used, as a filler material be quick setting, fast curing Portland cement. It shall not cause fracture by expansion or loosening by contraction. Cement shall not react chemically with metal parts in contact with it and its thickness shall be as small and as uniform as possible.

26.6 MATERIALS DESIGN AND WORKMANSHIP:

26.6.1 GENERAL:

All raw materials to be used in the manufacture of these insulators shall be subject to strict raw material quality control and to stage testing/ quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted in the field of extra high voltage transmission. Bidders shall therefore offer insulators as are guaranteed by them for satisfactory performance on Transmission lines.

The design, manufacturing process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish elimination of sharp edges and corners to limit corona and radio interference voltages.

26.6.2 INSULATOR SHELL:

The design of the insulator shells shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Shells with cracks shall be eliminated by temperature cycle test followed by mallet test. Shells shall be dried under controlled conditions of humidity and temperature.

26.6.3 METAL PARTS:

- 1) The pin and cap shall be designed to transmit the mechanical stress to the shell by compression and develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric and of such design that it will not yield or distort under loaded conditions. The head portion of the pinball shall be suitably designed so that when the insulator is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.
- i) Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting part or irregularities, which may cause corona. All

load bearing surfaces shall be smooth and uniform so as to distribute the loading stress uniformly. Pins shall not show any microscopically visible cracks, inclusions and voids.

26.6.4 GALVANIZING:

All ferrous parts, shall be hot dip galvanized in accordance with IS: 2629. The zinc to be used for galvanizing shall conform to grade Zn 99.5 as per IS: 209. The zinc coating shall be uniform, smoothly adherent, reasonably light, continuous and free from impurities such as flux, ash, rust stains, bulky white deposits and blisters. Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the designed dimensional requirements.

26.6.5 CEMENTING:

The insulator design shall be such that the insulating medium shall not directly engaged with hard metal. The surface of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials. High quality Portland cement shall be used for cementing the porcelain to the cap & pin.

26.6.6 SECURITY CLIPS (LOCKING DEVICES)

The security clips to be used as locking device for ball and socket coupling shall be 'R' shaped hump type to provide for positive locking of the coupling as per IS: 2486 (Part-IV). The legs of the security clips shall allow for spreading after installation to prevent complete withdrawal from the socket. The locking device shall resilient corrosion resistant and of sufficient mechanical strength. There shall be no possibility of the locking device to be displaced or be capable of rotation, which placed in position, and under no circumstances shall it allow separation of insulator units and fittings. 'W' type security clips are also acceptable. The hole for the security clip shall be counter sunk and the clip shall be of such design that the eye of the clip may be engaged by a hot line clip puller to provide for disengagement under energized conditions. The force required for pulling the clip into its unlocked positions shall not be less than 50 N (5 kg.) or more than 500 N (50 kgs.).

26.6.7 MARKING:

Each insulator shall have the rated combined mechanical and electrical strength marked clearly on the porcelain surface. Each insulator shall also bear symbols identifying the manufacturer, month, and year of manufacture. Marking on porcelain shall be printed, not impressed, and shall be applied before firing.

26.6.7 BALL AND SOCKET DESIGNATION:

The dimensions of the ball and sockets for 70 and 90 KN discs shall be of 16 mm and for 120 KN and 160 KN discs shall be of 20 mm designation in accordance with the standard dimensions stated in IS: 2486 (Part-II).

26.6.8 DIMENSIONAL TOLERANCE OF INSULATOR DISCS:

It shall be ensured that the dimensions of the disc insulators are within the limits specified below:

a)	Diameter of Disc (mm)			
		Standard	Maximum	Minimum
	45 KN Disc	255	266	244
	70 KN Disc	280	293	267
b)	Ball to Ball spacing Between Discs (mm)			
		Standard	Maximum	Minimum
	45 KN Disc	145	149	141
	70 KN Disc	170	175	165

26.6.9 INTERCHANGEABILITY:

The insulators inclusive of the ball and socket fittings shall be of standard design suitable for use with hardware fittings of any make conforming to relevant Indian Standards.

26.6.10 FREEDOM FROM DEFECTS:

Insulators shall have none of the following defects:

- 1) Ball pin shake.
- 2) Cementing defects near the pin like small blow holes, small hair cracks lumps etc.
- 3) Sand fall defects on the surface of the insulator.

26.7 INSULATOR STRINGS:

26.7.1 TYPE AND RATING:

The insulator strings shall be formed with standard discs described in this specification for use on 3 phases 33 KV 50 Hz effectively earthed systems in an atmosphere with pollution level as indicated in project synopsis. Suspension insulator strings for use with suspension/tangent supports are to be fitted with discs 45 KN EMS rating while tension insulator strings for use with Anchor / Tension towers are to be fitted with discs of 70 KN KN EMS level rating.

26.7.2 STRING SIZE:

The sizes of the disc insulator, the number to be used in different types of strings, their electro-mechanical strength and minimum nominal creep age distance shall be as given in this specification.

26.7.3 Insulator units after assembly shall be concentric and coaxial within limits as permitted by Indian Standards.

26.7.4 The strings design shall be such that when units are coupled together there shall be contact between the shell of one unit and metal of the adjacent unit.

26.8 DIMENSIONAL TOLERANCE OF INSULATORS DISCS

It shall be ensured that the dimensions of the long rod insulators are within the limits as per relevant IEC/ISS.

26.9 TESTS (FOR DISC INSULATORS) :

The following tests shall be carried out on the insulator string and disc insulators.

26.9.1 TYPE TEST:

This shall mean those tests, which are to be carried out to prove the design, process of manufacture and general conformity of the material and product with the intents of this specification. These tests shall be conducted on a representative number of samples prior to commencement of commercial production. The Bidder shall indicate his schedule for carrying out these tests.

26.9.2 ACCEPTANCE TESTS:

This shall mean these tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection for the purpose of acceptance of the lot.

26.9.3 ROUTINE TESTS:

This shall mean those tests, which are to be carried out on each insulator to check the requirements, which are likely to vary during production.

26.9.4 TESTS DURING MANUFACTURE:

Stage tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture to ensure quality control such that the end product is of the designed quality conforming to the intent of this specification.

26.9.5 TEST VALUE:

For all type and acceptance tests the acceptance values shall be the value guaranteed by the bidder in the guaranteed technical particulars of the acceptance value specified in this specification of the relevant standard whichever is more stringent for that particular test.

26.9.6 TEST PROCEDURE AND SAMPLING NORMS:

The norms and procedure of sampling for the above tests shall be as per the relevant Indian Standard or the internationally accepted standards. This will be discussed and mutually agreed to between the supplier and purchaser before placement of order. The standards and normal according to which these tests are to be carried out are listed against each test. Where a particular test is a specific requirement of this specification, the norms and procedure for the same shall be as mutually agreed to between the supplier and the purchaser in the quality assurance programme.

26.9.7 TYPE, ROUTINE & ACCEPTANCE TESTS:

The following type test shall be conducted on a suitable number of individual unit components, materials or complete strings.

1. On complete insulator string with hardware fittings a) Power frequency voltage withstand test with corona	Standards control rings and

under wet condition.

BS:137(Part-I)

b)	Impulse voltage withstand test under dry condition.	IEC: 383
c)	Mechanical strength test.	As per this specification.
2. On Insulators:		
a)	Verification of dimensions.	IS: 731
b)	Thermal mechanical performance test:	IEC:575
c)	Power frequency voltage withstand and flashover (I) dry (ii) wet.	BS: 173
d)	Impulse voltage withstand flashover test (dry)	: IEC: 383
e)	Visible discharge test (dry)	: IS:731
All the type tests given under clause No.5.14 above shall be conducted on single suspension and Double Tension insulator string along with hardware fittings.		
3. ACCEPTANCE TESTS:		
For insulator:		
a)	Visual examination	: IS:731
b)	Verification of dimensions.	: IS:731
c)	Temperature cycle test.	: IS:731
d)	Galvanizing test.	: IS:731
e)	Mechanical performance test.	: IEC:575
f)	Test on locking device for ball and socket coupling.	: IEC:372
g)	Eccentricity test.	As per this specification.
h)	Electro-mechanical strength test.	:
i)	Puncture test.	: IS:731
j)	Porosity test.	: IS:731
4. ROUTINE TESTS:		
For insulators:		
a)	Visual inspection.	: IS:731
b)	Mechanical routine test.	:
c)	Electrical routine test.	: IEC:383
5. TEST DURING MANUFACTURE:		
	Chemical analysis, hardness test and magnetic particle inspection for forgings.	: As per this specification.

26.9.8 ADDITIONAL TESTS:

The purchaser reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/ laboratory or at any other recognized laboratory/ research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the purchaser to satisfy that the material complies with the intent of this specification.

26.9.9 CO-ORDINATION FOR TESTING:

For insulator strings, the supplier shall arrange to conduct testing of their disc insulators with the hardware fittings to be supplied to the purchaser by other suppliers. The supplier is also required to guarantee overall satisfactory performance of the disc insulator with the hardware fittings.

NOTE:

In respect of electrical tests on a complete string consisting of insulators and hardware guarantee of values of responsibility of testing shall be with hardware manufacturer of RIV corona and voltage distribution test and with insulator manufacturer for all other tests.

26.10 TEST CHARGES AND TEST SCHEDULE:**26.10.1 TYPE TEST:**

The insulator offered shall be fully type tested as per this specification. In case the equipment of the type and design offered, has already been type tested in an independent test laboratory. The bidder shall furnish four sets of type test reports along with the offer. These tests must not have been conducted earlier than five years. The purchaser reserves the right to demand repetition of some or all type tests in the presence of purchasers' carrying representative. For this purpose the bidder may quote unit rates for carrying out each type test. These prices shall be taken into consideration for bid evaluation. For any change in the design/type already type tested and the design/type offered against this specification, purchaser reserves the right to demand repetition of tests without any extra cost.

26.10.2 ACCEPTANCE AND ROUTINE TEST:

All acceptance and routine tests as stipulated herein shall be carried out by the supplier in the presence of purchaser's representative.

26.10.3 Immediately after finalization of the programme of type/ acceptance/ routine testing, the supplier shall give sufficient advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

26.10.4 For type tests involving tests on a complete insulator string with hardware fittings, the purchaser will advice the supplier of the hardware fittings to provide the necessary fittings to the place of the test.

26.10.5 In case of failure of the complete string in any type tests, the supplier whose product has failed in the tests shall get the tests repeated at his cost. In case of any dispute, assessment of the purchaser as to the items that has caused the failure in any of the type tests shall be final and binding.

26.10.6 VOLTAGE DISTRIBUTION TEST:

- a) The voltage across each insulator unit shall be measured by sphere gap method. The result obtained shall be converted into percentage and proportionate correction be applied as to give a total of 100% distribution.
- b) The complete insulator string along with its hardware fitting excluding arcing horn corona controlling/grading ring and suspension assembly/dead end assembly shall be subject to a load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased already rate to 68% of the minimum UTS specified. The load shall be held for five minutes and then removed. After removal of the load, the string components shall not show any visual deformation and it shall be possible to disassemble them by hand,. Hand tools may be used to remove cotter pins and loosen the nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing loads reached and the value recorded.

26.10.7 VIBRATION TEST:

The suspension string shall be tested in suspension mode, and tension string in tension mode itself in laboratory span of minimum 30 meters. In the case of suspensions string a load equal to 600 Kg. shall be applied along with the axis of the suspensions string by means of turn buckle. The insulators string along with hardware fittings and two sub conductors throughout the duration of the test vibration dampers shall not be used on the test span. Both the sub-conductors shall be vertically vibrated simultaneously at one of the resonance frequencies of the insulator string (more than 10Hz) by means of vibration inducing equipment. The amplitude of vibration at the antipode point nearest to the string shall be measured and the same shall not be less than 120.4 being the frequency of vibration. The insulator strings shall be vibrated for five million cycles then rotated by 90 deg and again vibrated for 5 million cycles without any failure, after the test, the disc insulators shall be examined for looseness of pins and cap or any crack in the cement. The hardware fittings shall be examined to fatigue fatter and mechanical strength test. There shall be no deterioration of properties of hardware components and disc insulators after the vibration test. The disc insulators shall be subjected to the following tests as per relevant standards.

	Test.	Percentage of disc to be tested
a)	Temperature cycle test followed by Mechanical performance test.	60 40
b)	Puncture test (for porcelain insulator only)	

26.11 INSPECTION:

- i. Purchaser and its representative shall at all times be entitled to have access to the works and to all places of manufacturer where insulators are manufactured and the supplier shall afford all facilities to them for unrestricted inspection of the works, inspection of materials, inspection of manufacturing process of insulators and for conducting necessary tests as specified herein.
- ii. The supplier shall keep the purchaser informed in advance of the time of starting and of progress of manufacture of insulators in its various stages so that arrangements could be made for inspection.
- iii. No material shall be dispatched from its point of manufacture unless the materials has been satisfactorily inspected and tested.
- iv. The acceptance of any quantity of insulators shall in no way relieve the supplier of his responsibility for meeting all the requirement of this specification and shall not prevent subsequent rejection, if such insulators are later found to be defective.

26.12 IDENTIFICATION MARKING:

- a) Each unit of insulator shall be legibly and indelibly marked with the trade mark of the supplier, the year of manufacture, the guaranteed combined mechanical and electrical strength in kilo-Newton abbreviated by 'KN' to facilitate easy identification and proper use.
- b) The marking shall be on porcelain for porcelain insulators. The marking shall be printed and not impressed and the same shall be applied before firing.

26.13 QUALITY ASSURANCE PLAN:

The bidder hereunder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.

- a. Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw material are tested, list of tests normally carried out on raw materials in presence of bidder's representative, copies of test certificates.
- b. Informations and copies of test certificates as in (i) above in respect of bought out materials.
- c. List of manufacturing facilities available.
- d. Level of automation achieved and lists of area where manual processing exists.
- e. List of areas in manufacturing process, where stage inspections are normally carried out in quality control and details of such tests and inspection.
- f. Special features provided in the equipment to make it maintenance free.
- g. List of testing equipping available with the bidder for final testing of equipment specified and test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test requirements.

The supplier shall within 30 days of placement of order submit the following information to the owner.

List of raw material and the names of sub-suppliers selected from those furnished along with the offer.

26.14 CHEMICAL ANALYSIS OF ZINC USED FOR GALVANIZING.

Samples taken from the zinc ingot shall be chemically analyzed as per IS: 209. The purity of zinc shall not be less than 99.95%.

26.15 TESTS FOR FORGINGS:

The chemical analysis hardness tests and magnetic particle inspection for forgings will be as per the internationally recognized procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and purchaser in quality assurance programme.

26.16 TESTS ON CASTING:

The chemical analysis mechanical and metallographic tests and magnetic particle inspection for castings will be as per the internationally recognized procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and purchaser in quality assurance programme.

26.17 HYDRAULIC INTERNAL PRESSURE TEST ON SHELLS:

The test shall be carried out on 100% shells before assembly. The details regarding test will be as discussed and mutually agreed to by the suppliers and purchaser in Quality Assurance Programme.

26.18 THERMAL MECHANICAL PERFORMANCE TEST:

The thermal mechanical performance test shall be carried out on minimum 15 number of disc insulators units as per the procedure given in IEC 575. The performance of the insulator unit shall be determined by the same standard.

26.19 ECCENTRICITY TEST:

The insulator shall be vertically mounted on a future using dummy pin and socket. A vertical scale with horizontal slider shall be used for the axial run out. The pointer shall be positioned in contact with the bottom of the outermost petticoat of the disc. The disc insulators shall be rotated with reference to the fixture and the slider shall be allowed to move up and down on the scale but always maintaining contact with the bottom of the outer most petticoats. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

Similarly using a horizontal scale with veridical slider the radial run out shall be measured. The slider shall be positioned on the scale to establish contact with the circumstance of the disc insulator and disc insulator rotated on its future always maintaining the contact. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

26.20 CRACK DETECTION TEST:

Crack detection test shall be carried out on each ball and pin before assembly of disc unit. The supplier shall maintain complete record of having conducted such tests on each and every piece of ball pin. The bidder shall furnish full details of the equipment available with him for crack test and also indicate the test procedure in detail.

POST INSULATORS

27.0 Post insulator shall conform in general to IS 2544, IEC 168 and IEC 815.

Technical Parameters

SI No.	Parameters	33kV
1	Type	Confirming to IEC 273 (solid core)
2	Voltage class (kV)	36
3	Dry and wet one minute withstand voltage (kV rms)	70
4	Dry lightning impulse withstand voltage (kV p)	170
5	Wet switching surge withstand voltage (kV p)	NA
6	Max. RIV at corona extinction voltage (micro volts)	NA
7	Corona extinction voltage (kV rms)	
9	Total minimum cantilever strength (kg)	Not < 300
10	Minimum torsion moment	As per IEC 273
11	Total height of insulator (mm)	325
12	Minimum PCD (mm) top/bottom	127/ 254

13	No. of bolts top/bottom	4/ 8
14	Diameter of bolt holes (mm) top/bottom	M16/ 18
15	Pollution level as per IEC 815	Heavy
16	Minimum total creepage distance (mm)	900

27.1 Constructional features

Post type insulators shall consist of a porcelain part permanently secured in a metal base to be mounted on the supporting structures. They shall be capable of being mounted upright and be designed to with stand any shocks to which they may be subjected to by the operation of the associated equipment. Only solid core insulators will be acceptable.

Porcelain used shall be homogeneous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture.

Glazing of the porcelain shall be of uniform brown in colour, free from blisters, burrs and other similar defects.

The insulator shall have alternate long and short sheds with aerodynamic profile. The shed profile shall also meet the requirements of IEC 815 for the specified pollution level.

When operated at normal rated voltage there shall be no electric discharge between conductor and insulators which would cause corrosion or injury to conductors or insulators by the formation of substance produced by chemical action.

The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

All ferrous parts shall be hot dip galvanized in accordance with the latest edition of IS: 2633, and IS: 4579. The zinc used for galvanizing shall be grade Zn 99.95 as per IS: 209. The zinc coating shall be uniform, adherent, smooth, reasonably bright, continuous and free from imperfections such as flux ash, rust stains, bulky white deposits and blisters. The metal parts shall not produce any noise generating corona under the operating conditions. Flat washer shall be circular of a diameter 2.5 times that of bolt and of suitable thickness. Where bolt heads/nuts bear upon the beveled surfaces they shall be provided with square tapered washers of suitable thickness to afford a seating square with the axis of the bolt.

Bidder shall make available data on all the essential features of design including the method of assembly of shells and metal parts, number of shells per insulator, the manner in which mechanical stresses are transmitted through shells to adjacent parts, provision for meeting expansion stresses, results of corona and thermal shock tests, recommended working strength and any special design or arrangement employed to increase life under service conditions.

27.2 TEST DETAILS

The following Type, acceptance and routine tests shall be carried out and results given along with certification as appropriate in the Technical Data Schedule and Test Certificates Schedule of this specification.

27.2.1 TYPE TESTS:

The post insulators shall be subjected to the following type test :

- Visible discharge test

- Impulse voltage withstand test
- Dry power frequency voltage withstand test
- Wet power frequency voltage withstand test
- Mechanical strength test for post insulators as per IEC 168 / IS: 2544.

27.2.2 Acceptance Tests

The test samples having withstood the routine tests shall be subjected to the following tests according to the sampling procedure of IEC 383 clause 23:

- Verification of dimensions
- Temperature cycle test
- Mechanical strength test for post insulators as per IEC 168/ IS 2544
- Porosity test on post insulators
- Puncture test
- Test for galvanization of ferrous parts

27.2.3 Routine Tests

- Visual examination
- Power frequency voltage dry test
- Tests to prove mechanical strength.

HARDWARES

28.0 TECHNICAL SPECIFICATION FOR HARDWARE FITTINGS

28.1 SCOPE

This Specification covers design manufacture, testing at manufacturer's Works, supply and delivery of power conductor accessories, insulator and hardware fittings for string insulators suitable for use in 33 KV Over-head transmission lines and sub-stations of TPSODL. The hardware to be supplied shall be as per approved drawings of TPSODL. Any change there of shall be with due permission of GM, (RE&CAPEX), TPSODL. The firm shall submit his drawings for approval of TPSODL and only after which the manufacturing shall be started.

The materials/equipment offered, shall be complete with all components, which are necessary or usual for the efficient performance and satisfactory maintenance. Such part shall be deemed to be within the scope of contract.

28.2 STANDARDS

The materials covered under this Specification shall comply with the requirement of the latest version of the following standards as amended upto date, except where specified otherwise.

i)	IS:2486 Part-II & III	Insulator fitting for overhead power lines with a nominal voltage greater than 1,000 volts.

ii)	IS:2121 Part I & II	Conductor & earth wire accessories for overhead power lines.
iii)	IS:9708	Stock Bridge Vibration Dampers on overhead power lines.
iv)	IS:2633	Method of testing of uniformity of coating on zinc coated articles
v)	IS:209	Specification for Zinc.
vi)	BS:916	Specification for Hexagonal bolts and nuts.

28.3 MATERIALS AND DESIGN

Aluminium and aluminium alloys, malleable iron and forged steel, having required mechanical strength, corrosion resistance and machinability depending on the types of application for which accessories / fittings are needed, shall be employed.

In manufacturer of the accessories / fittings, the composition of the aluminium alloys used shall be made available to Employer if required for verification.

The materials offered shall be of first class quality, workmanship, well finished and approved design. All castings shall be free from blow-holes, flaws, cracks or other defects and shall be smooth, close grained and true forms and dimensions. All machined surfaces should be free, smooth and well finished.

Metal fittings of specified material for conductor and earth wire accessories and string insulator fittings are required to have excellent mechanical properties such as strength, toughness and high resistance against corrosion. All current carrying parts shall be so designed and manufactured that contact resistance is reduced to the minimum.

All bolts, nuts, bolt-heads shall be the white worth's standard thread. Bolt heads and nuts shall be hexagonal. Nuts shall be locked in an approved manner. The threads in nuts and tapped holes shall be cut after galvanizing and shall be well fabricated and greased. All other threads shall be cut before galvanizing. The bolt threads shall be undercut to take care of increase in diameter due to galvanizing.

All nuts shall be made of materials to Clause 4.8 of IS:1367 (latest edition) with regard to its mechanical properties.

The general design conductor and earth wire accessories and insulator fittings shall be such as to ensure uniformity, high strength, free from corona formation and high resistance against corrosion even in case of high level of atmosphere pollution.

All hooks, eyes, pins, bolts, suspension clamps and other fittings for attaching to the tower or to the line conductor or to the earth wire shall be so designed that the effects of vibration, both on the conductor and the fittings itself, are minimized.

Special attention must be given to ensure smooth finished surface throughout. Adequate bearing area between fittings shall be provided and point or line contacts shall be avoided.

All accessories and hard wares shall be free from cracks, shrinks, slender air holes, burrs or rough edges.

The design of the accessories and hard wares shall be such as to avoid local corona formation or discharge likely to cause interference to tele-transmission signals of any kind.

28.4 GALVANISING :

All ferrous parts of conductor and ground wire accessories and insulator hard wares shall be galvanized in accordance with IS: 2629-Recommended Practice for hot dip galvanizing of iron and steel or any other equivalent authoritative standards. The weight of zinc coating shall be determined as per method stipulated in IS: 2633 for testing weights, thickness and uniformity of coating of hot dip galvanized articles or as per any other equivalent authoritative standards. The zinc used or galvanization shall conform to grade Zn 98 of IS: 209. The galvanized parts shall withstand four (4) dips of 1 minute each time while testing uniformity of zinc coating as per IS: 2633. Spring washers shall be electro galvanized.

28.5 INSULATOR HARDWARES

The insulator disc hardware and string assemblies to be offered by the bidder shall be suitable to meet the requirement given in the specific technical particulars as detailed hereinafter.

Hardware for suspension and tension insulator shall be suitable for insulator with normal pin shank diameter of 20 mm. in case of tension string unit and 16mm. for suspension string unit.

Each insulator string shall generally include the following hardware components.

Single Suspension Set.

- a) Ball Hook.
- b) tower side arcing horn
- c) Socket Eye with R-Type security clip.
- d) Line side arcing horn.
- e) Suspension clamps

Single Tension Set :

- a) Anchor Shackle.
- b) Ball Eye.
- c) Tower side arcing horn.
- d) Socket Clevis with R-Type security clip.
- e) Line side arcing horn
- f) Bolted type dead end clamp.

Double Suspension Set.

- i) Ball Hook.
 - (i) Socket clevis with R-Type security clip-3 Nos.
 - (ii) Yoke Plate-2 Nos.
 - (iii) Tower side arcing horns-2Nos.
 - (iv) Ball clevis – 2 Nos.
 - (v) Line side arcing horns-2 Nos.
 - (vi) Clevis Eye.
 - (vii) Suspension Clamp.
- ##### **Double Tension Set :**
- a) Anchor Shackle.
 - b) Chain Link.
 - c) Yoke Plate – 2 Nos.
 - d) Tower side arching horn.
 - e) Ball Clevis – 2 Nos.
 - f) Socket Clevis with R-Type security clip – 2 Nos.

- g) Line side arcing horns.
- h) Bolted type dead end clamps.

28.6 SUSPENSION CLAMPS

This clamp will be envelope type made out of aluminum alloy suitable for accommodating preformed armored rod.

28.7 TENSION CLAMPS

The Tension Clamps shall be made out of aluminium alloy and of 4 **pair** bolted **(M-16)** type suitable for 345 mm² AAA PANTHER –up conductor (**In case of lines it will be suitable for 80mm²100 mm² 150 mm²**)The tension clamps shall not permit slipping or damage to failure of the complete conductor or any part thereof at a load less than 90% of the ultimate strength of conductor. The mechanical efficiency of tension / clamps shall not be affected by method of erection involving come / along or similar clamps or tension stringing operation during or after assembly and erection of tension clamp itself. The tension clamp shall be of a design that will ensure unrestricted flow of current without use of parallel groove clamps.

The clamps shall be as light as possible.

28.8 ARCING HORNS

Each hardware assembly shall have provision for attaching arcing horns of both adjustable and non/adjustable type across the suspension and tension strings or tower side. However each hardware assembly shall be provided with arching horn of fixed type on line side only.

28.9 TESTS, TEST CERTIFICATE AND PERFORMANCE REPORTS

The fittings and accessories for the power conductor, insulator and hardware shall be tested in accordance with IS:2121, IS:2486, BS:916 for hexagonal bolts and nuts or any other authoritative equivalent standards. Six sets of type and routine test certificates and performance reports are to be submitted by the bidder.

The Employer however, reserves the right to get all the tests performed in accordance with the relevant I.S. Specification as Acceptance Test in presence of Employer-s representatives.

The bidder shall clearly state the testing facilities available in the laboratory at his Works and his ability to carry out the tests in accordance with this Specification. All the specified tests shall be carried out without any extra cost.

Acceptance Test for power conductor accessories.

- a) Visual examination
- b) Dimensional verification
- c) Failing load test
- d) Slip strength test (for clamps)
- e) Electrical resistance test
- f) Fatigue test (for vibration dampers)
- g) Mass pull off test (for vibration dampers)
- h) Galvanizing test.

28.10 ACCEPTANCE TEST FOR HARDWARES

- i) Dimensional verification.
- ii) Ultimate tensile test.
- ii) Slip strength test.
- iii) Electrical resistance test.
- iv) Heating cycle test
- v) Breaking strength of full string assembly.

vi) Galvanizing test.

28.11 BONDING PIECES:

a) material	:	flexible copper bond (37/7/0.417 mm. tinned copper flexible stranded cable).
b) Length	:	Not less than 750 mm.
c) Bolt size	:	16mm x 40 mm.
d) Copper area.	:	34 sq.mm.
e) Thickness of long	:	6 mm.
f) Material for connecting socket	:	Tinned Brass

28.12 FASTENERS: Bolts, Nuts & Washers

1. All bolts and nuts shall conform to IS-6639 – 1972. All bolts and nuts shall be galvanized. All bolts and nuts shall have hexagonal heads, the heads being truly concentric, and square with the shank, which must be perfectly straight.
2. Bolts up-to M16 and having length up-to ten times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolt for 5.6 grades should be 310 Mpa minimum as per IS-12427. Bolts should be provided with washer face in accordance with IS-1363 Part-I to ensure proper bearing.
3. Fully threaded bolts shall not be used. The length of the bolt shall be such that the threaded portion shall not extend into the place of contact of the component parts.
4. All bolts shall be threaded to take the full depth of the nuts and threaded enough to permit the firm gripping of the component parts but not further. It shall be ensured that the threaded portion of the bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit and be tight to the point where shank of the bolt connects to the head.
5. Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro-galvanized. The thickness of washers shall conform to IS-2016-1967.
6. The bidder shall furnish bolt schedules giving thickness of components connected, the nut and the washer and the length of shank and the threaded portion of the bolts and size of holes and any other special details of this nature.
7. To obviate bending stress in bolt, it shall not connect aggregate thickness more than three time its diameter.
8. Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.
9. Fasteners of grade higher than 8.8 are not to be used and minimum grade for bolts shall be 5.6.

28.13 GENERAL:

1. All ferrous parts including fasteners shall be hot dip galvanized, after all machining has been completed. Nuts may however be tapped (threaded) after galvanizing and the threads oiled. Spring washers shall be electro-galvanized. The bolt threads shall be undercut to take care of the increase in diameter due to galvanizing. Galvanizing shall be done in accordance with IS-2629-1985 and shall satisfy the tests mentioned in IS: 2633-1986. Fasteners shall withstand four dips while spring washers shall withstand three dips of one-minute duration in the standard Preece test. Other galvanized materials shall be guaranteed to withstand at least six successive dips each lasting one minute under the Standard Preece test for galvanizing.

2. The zinc coating shall be perfectly adherent of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The zinc used for galvanizing shall be of grade Zn 99.95 as per IS 209-1979.
3. Pin balls shall be checked with the applicable "G" gauges in at least two directions, one of which shall be across the line of die flashing and the other 90 deg. to this line. 'NO GO' gauges shall not pass in any direction.
4. Socket ends, before galvanizing shall be of uniform contour. The bearing surface of socket ends shall be uniform about the entire circumference without depressions or high spots. The internal contours of socket ends shall be concentric with the axis of the fittings as per IS 2486/IEC-120. The axis of the bearing surfaces of socket ends shall be coaxial with the axis of the fittings. There shall be no noticeable tilting of the bearing surfaces with the axis of the fittings.
5. All current carrying parts shall be so designed and manufactured that contact resistance is reduced to minimum.
6. Welding of aluminum shall be by inert gas shielded tungsten arc or inert gas, shielded metal arc process. Welds shall be clean, sound, smooth, and uniform without overlaps, properly fused and completely sealed. There shall be no cracks, voids incomplete penetration, incomplete fusion, undercutting or inclusions Porosity shall be minimized so that mechanical properties of the aluminum alloys are not affected. All welds shall be properly finished as per good engineering practices.

28.14 Electrical Design:

The normal duty and heavy duty suspension, light duty, normal duty and heavy duty tension insulator sets shall all comply with the technical requirements and satisfy the test requirements

28.15 Mechanical design:

The mechanical strength of the insulators and corresponding insulator fittings must match. The design shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to the development of defects.

Insulating material shall not engage directly with hard metal. All fixing materials shall be of approved quality, shall be applied in an approved manner and shall not enter into chemical action with the metal parts or cause fracture by expansion in service. Where cement is used as a fixing medium, cement thickness shall be as small and even as possible and proper care shall be taken to correctly centre and locate the individual parts during cementing.

28.16 Technical Specification for Design, Supply and Testing of Hardware fittings.

28.16.1 Type tests:

The following type tests shall be conducted on hardware fittings.

A. On suspension hardware fittings only.

- (i) Magnetic power loss test.
- (ii) Clamp slip strength Vs torque
- (iii) Mechanical strength test.
- (iv) On one test on elastomer.

B. On Tension hardware fittings only.

- (i) Electrical resistance test for Dead end assembly.

IS 2486 (Part-I) 1971

(ii)	Heating cycle test for dead end assembly.	-do-
(iii)	Slip strength test for dead end assembly.	IS 2486 (Part-I)
(iv)	Mechanical strength test.	

C. On both suspension and tension hardware fittings.

(i)	Visual examination.	IS-2486 (Part-I) 1971
(ii)	Verification of dimension.	-do-
(iii)	Galvanizing / electroplating test.	-do-
(iv)	Mechanical strength test of each component (including corona control ring/grading ring and arcing horn)	
(v)	Mechanical strength test of welded joint.	
(vi)	Mechanical strength test for corona control ring/ grading ring and arcing horn. BS-3288 (Part-I)	
(vii)	Test on locking device for ball and socket coupling.	IEC – 3721984
(viii)	Chemical analysis, hardness tests, grain size, inclusion rating and magnetic particle inspection for forging/casting.	

D. On suspension hardware fittings only.

(i)	Clamp slip strength ver as torque test for suspension clamp.	
(ii)	Shore hardness test of elastomer cushion for AG suspension clamp.	
(iii)	Bend test for armour rod set.	IS-2121 (Part-I)
(iv)	Resilience test for armour rod set.	-do-
(v)	Conductivity test for armour rod set.	-do-

All the acceptance tests stated at clause shall also be carried out on composite insulator unit, except the eccentricity test at clause. In addition to these, all the acceptance tests indicated in IEC 1109 shall also be carried out without any extra cost to the employer.

E. For hardware fittings.

(a)	Visual examination.	IS-2121 (Part-I)
(b)	Proof & test.	

F. Tests on conductor accessories.

G. Type tests.

H. Mid span compression joint for conductor and earth wire.

(a)	Chemical analysis of materials.	
(b)	Electrical resistance tests.	IS-2121 (Part-II) 1981 clause 6.5 & 6.6
(c)	Heating cycle test.	-do-
(d)	Slip strength test.	-do-

EQUIPMENT CLAMPS AND CONNECTORS

29.0 TECHNICAL SPECIFICATION FOR EQUIPMET CLAMPS & CONNECTORS

29.1 SCOPE

This specification covers design, manufacture, assembly, testing at manufacturer's works, supply and delivery at site of all terminal connectors of 33KV equipments (mainly breaker, isolator, CT,PT,CVT,BPI and LA) and all other clamps and dropper connectors required for the switch yard as per approved lay out and system design.

29.2 STANDARDS

The terminal connectors under this specification shall conform strictly to the requirements of the latest version of the following standards as amended up-to-date, except where specified otherwise.

- i) IS: 556 Power Connectors.
- ii) IS: 617 Aluminium & Aluminium Alloy
- iii) IS: 2629 Recommended Practice for hot dip galvanizing of iron and steel.
- iv) IS: 2633 Method of testing uniformity of coating of zinc coated articles.

The materials conforming to any other authoritative standards which ensure equal or better performance shall also be acceptable. The salient point of these specifications and points of difference between these and the above specifications shall be clearly brought out in the bid.

29.3 MATERIAL & WORKMANSHIP

The terminal connectors shall be manufactured from Aluminium Silicon Alloy and conform to designation A6 of IS: 617 (latest edition)

The connectors shall be of best quality and workmanship, well finished and of approved design. Specific materials for clamps and connectors should have high current carrying capacity, high corrosion resistance and be free from corona formation.

All connectors or its components to be connected with conductor shall be of bolted type having aluminium purity not less than 99.5%.

All bus bar clamps shall be made preferably from forged aluminium of purity not less than 99.5%. The thickness and contact surface should be maintained in such a way that the clamp should conform to IS: 5561/1970 or any latest revision thereof.

29.4 RATING

The connector rating shall match with the rating of the respective equipments for the terminal connectors and the connectors for bus bar and dropper should be of the following rating. Minimum thickness at any part of connector shall be 10(ten) mm. Indicative ratings are given below:

Sl No.	Rating	33 KV
1	Main bus bar connectors high level and low level (Amps)	1250
2	High level bus sectionalisation Isolator (Amps)	1250
3	-do- for CT	As per CT rating
4	-do- for PI	As per PI rating

5	-do- for LA	As per LA rating
6	-do- for PT	As per PT rating

29.5 EQUIPMENT CONNECTORS

Bimetallic connectors shall be used to connect conductors of dissimilar metal. The following bimetallic arrangement shall be preferred.

- i) Copper cladding of minimum 4 mm. thickness on the aluminium portion of connector coming in contact with the copper palm or stud of the equipment.
- ii) Alternatively, to provide cold rolled aluminium copper strip between the aluminium portions of the connection, the sheet thickness shall not be less than 2 mm.

Sufficient contact pressure should be maintained at the joint by the provision of the required number of bolts or other fixing arrangements, but the contact pressure should not be so great as to cause relaxation of the joint by cold flow, the joint should be such that the pressure is maintained within this range under all conditions of service, to avoid excessive local pressure, the contact pressure should be evenly distributed by use of pressure plates, washers or suitable saddles of adequate area of thickness should be less than that of an equal length of conductor where measured individually test results showing the milli drop test and resistance should be enclosed with the bid.

All connectors shall be so designed and manufactured as to offer ease of installation as these are to be used in overhead installations, design shall be such that full tightening of nuts and bolts should be possible with the use of double wrench.

The connectors shall be such as to avoid local corona, sound or visible discharge.

29.6 TEMPERATURE RISE

The temperature rise of connectors when carrying rated current shall not exceed 45° C above reference design temperature of 50° C.

- i) Acceptance Tests
 - (a) Tensile Test
 - (b) Temperature rise test
 - (c) Temperature rise test
- ii) Routine Test
 - (a) Visual Inspection
 - (b) Dimensional Check

Type test reports from a recognized laboratory shall have to be submitted.

29.7 WEIGHTS

Weights of different materials used in manufacture, such as aluminium, silicon, copper etc. should be clearly indicated in the bid.

29.8 INTERCHANGE ABILITY

Corresponding parts of similar clamps and connectors shall be made to gauge or jig and shall be interchangeable in every respect.

29.9 TECHNICAL SPECIFICATION FOR ACSR BUS-BAR

29.9.1 SCOPE

The specification covers design, engineering, manufacture, testing at manufacturer's works, supply and delivery of heavy duty AAAC bus-bar for use in 33 kV sub-station.

29.9.2 MATERIALS

The 345 sq. mm AAAC bus bar shall be drawn.

The strung bus-bar shall be of heavy duty type and design to operate within set temperature limits and to withstand thermal and electromechanical forces developed due to short circuits.

29.9.3 MECHANICAL CHARACTERISTICS

The mechanical strength of the strung bus-bar shall be limited to be maximum allowable tension for specific size of conductor as per ISS.

29.9.4 DIMENSIONAL TOLERANCE

Dimensional tolerances shall be as per relevant ISS.

30. EARTHING:

Earth Grid should not be more than TWO meters square. This should be done by using 75x10 mm GI flats. Earth risers should be 50x6 mm GI flats. All equipments & metal parts of the Sub- Station should be connected with main earth grid by using 50x6 GI flats at two different places. The main earth grid should be laid not less than 600 mm below the finished ground level. The lap welding should not less than 100 mm. The welding of joints should be done after removal of Zinc by using Blow lamps. Welding should be done in all four sides and should be double layer continuous. Before taking up the second layer welding the deposited flux should be removed. During welding the two flats should be tightened properly by using ' C ' clamps. Immediately after welding two layers of anti-corrosive paints should be painted over the welded portion along with two coats of Black bituminous paints. Before back filling of earth trenches the welded portion should be covered by wrapping with bituminous tape properly and also jointing portion should be covered with PCC (1:2:4) mix. The backfilling of earth pits and trenches should be done with powered loam soil mixed with Bentonate powder (10:1) mix.

All equipments, steel structures etc should be connected with Main earth mat at two rows separately. All LAs, PTs , Columns having spikes should individually connected with individual Pipe electrodes and again should be connected with main earth grid at two separate places. The Neutral of Power Transformer should be connected with two separate pipe electrodes and again connected with main earth electrodes at two separate places. The separation distance between each pipe electrodes should not be less than 2 mts. The back filling of pipe electrodes should be done in layer of Charcoal, Salt & loam soil mixed with Bentonate powder.

There should be a closely spaced earth grid (1.5 mts square having .5 mts spacing) below the mechanism boxes of each Isolators & AB switches. In Sub-station the diameter of pipe electrode should not be less than 50 mm. The Flange (50x6) mm GI flat should be welded in all sides with Pipe electrode. In each face of Flange there should be two nos 17.5 mm hole to accommodate 16 mm GI Bolt nut with 1 no spring washer.

The fencing of sub-station should not directly connected with main earth grid. There should be a separate earth grid (75x10) mm GI flat 2 mts away from fence and should be connected rigidly with the fence at an interval of 5 mts. There should be one 50x6 mm earth flat run over the cable rack and should be connected with main earth grid at an interval of 5 mts. The jointing portion of earth flats over the ground should be painted with two coats of Anti- corrosive paints and two coats of good quality of Aluminium paints (Berger/Asian paints).

The water hydrant system should be provided in the areas where earth resistivity more and soil is laterite and sandy in nature (Areas like BBSR, Khurda , Puri etc) as per the direction of Engineer in charge. Each handles of Isolators/AB switches etc should be connected with earth grid by using flexible Tinned Copper earth bonds. In each earth switches TWO nos flexible earth bonds should be provided. Each earth pits having pipe electrodes should be provided 250 mm Brick wall chambers with RCC cover Slab.

33.1 (A) G.I. Flat (75x 10 mm) & G.I. Flat (50 x 6 mm)

The specification covers manufacture, testing and supply of Galvanized Steel flat for Earthing arrangements.

I. APPLICABLE STANDARDS:

Materials shall conform to the latest applicable Indian standards. In case bidders offer steel section and supports conforming to any other international specifications which shall be equivalent or better than IS, the same is also acceptable.

Sl. No.	Standard No.	Title
1	IS: 2062 Grade 'A' Quality	Specification for M.S. Channel and M.S. Flat
2	IS: 2062	Chemical and Physical Composition of material
3	IS: 1852	Rolling and Cutting Tolerances for Hot Rolled Steel products

II. RAW MATERIAL:

The steel section shall be re-rolled from the BILLETS/INGOTS of tested quality as per latest version of IS: 2830 or to any equivalent International standard and shall be arranged by the bidder from their own sources. The chemical composition and physical properties of the finished materials shall be as per the relevant standards.

III. TEST

Steel sections shall be tested in IS approved laboratory or standard laboratory of the Bidder country having all facilities available for conducting all the tests as prescribed in relevant IS or IEC or to any equivalent International laboratory or Institutions.

The Bidders are required to specifically indicate that;

They hold valid IS (or equivalent IEC) License. Steel Section offered are bearing requisite IS certification or equivalent IEC marks.

The Bidders are required to submit a copy of the valid IS (or equivalent IEC) License clearly indicating size and range of product against respective ISS or any equivalent International Standards along with their offer.

IV. PHYSICAL & CHEMICAL

PROPERTIESLength

The GS Flat to be supplied shall be in 5.5 meters to 13 meters lengths.

Weighment

The weighment of GS Flat shall be witnessed by the consignee at the time of taking delivery. The weight recorded in the material receipt certificate issued by the consignees shall be final.

Chemical composition and physical properties of M.S.Channels and M.S.Flat conforming to

IS:2062/84L composition.

	Chemical Composition	For Fe 410 WA Grade
1	C -	0.23% MAX.
2	Mn -	1.5% MAX.
3	S -	0.050% MAX.
4	P -	0.050% MAX.
5	SI -	0.40% MAX.
6	CE -	0.42% MAX.

(Carbon Equivalent)

V. Mechanical Properties

1. Tensile strength Kg_f/mm² - 410
2. Yield stress Min. for thickness/diameter
 - <20 mm - 26 Kg_f/mm² OR 250N/mm²
 - 20-40 mm - 24Kg_f/mm² OR 240N/mm²
 - 40 mm - 23Kg_f/mm² OR 230N/mm²
3. Elongation % - 23%
4. Bend Test (Internal Dia) - Min-3t (this the thickness of the material)

VI. MARKING

It is desirable that the Bidders should put his identification marks on the finished

materials. The mark shall be in "legible English letters"

VII. INSPECTION AND TEST CERTIFICATE

The materials to be supplied will be subject to inspection and approval by the purchaser's representative before dispatch and / or on arrival at the destination. Inspection before dispatch shall not, however, relieve the bidders of his responsibility to supply the steel section strictly in accordance with the specification.

The bidders shall abide by all the statutory provisions, acts such as the Indian Electricity Act, Indian factory Act, Indian Boiler Act etc., and corresponding rules and regulations as may be applicable and as amended from time to time.

The purchaser's representative shall be entitled at all reasonable time during manufacture to inspect, examine and test at the bidder's premises the materials and workmanship of the steel section to be supplied. As soon as the steel section are ready for testing, the bidder's shall intimate the purchaser well in advance, so that action may be taken for getting the material inspected. The material shall not be dispatched unless waiver of inspection is obtained or inspected by the purchaser's authorized representative. The test certificate shall be in accordance with the latest version of the relevant Indian Standard or any equivalent International standards.

The acceptance of any batch /lot shall in no way relieve the bidder of any of his responsibilities for meeting all the requirements of the specification and shall not prevent subsequent rejection of any item if the same later found defective.

All conductors buried in earth and concrete and above ground level shall be galvanized steel. Galvanized steel shall be subject to four one minute dips in copper sulphate solution as per IS:2633/1922.

VIII. METHOD OF GALVANISING:

Sl. No.	Tests	For GI Flat
1	Dip test	6 dips of 1 min each
2	Mass of Zinc coating	610 gram/sq.m minimum

Pre dispatch inspection shall be performed to witness

following tests: Freedom from defects,

Verification of
dimensions

Galvanization tests

Mechanical tests

Chemical composition tests

These tests are to be performed and certified at Govt. recognized laboratory
MS flat shall conform to IS 2062 & its latest amendments for steel & Galvanization
as per IS4759 & its Latest amendments.

The flat shall be coated with Zn 98 Zinc grade.

The minimum Zinc coating shall be 610 gm/sqm for thickness more than 5 mm and
460gm/sqm for item thickness less than 5 mm.

IX. Inspection & Rejection:

The representative of Purchaser shall pick up samples at random from the GI Flats
offered for carrying out routine tests as per specified IS.

The representative shall make visual inspection on each & every GI flats.

The purchaser reserves the right to reject on inspection after the same is received
at destination.

33.2 (B) G.I. Flat (75 x 10 mm) & G.I. Flat (50x 6 mm)

(To be submitted along with Offer)

Sl. No	Particulars	Bidders' Offer
1	Location of Factory or Place of Manufacture	
2	Maker's Name, Address & Country	
3	Size of G.I. Flat	
4	Standard Length	
5	Galvanization Process	
6	Galvanization thickness	
7	Galvanization tests to be conducted	

33.3 (C) Earth Electrode (50/40 NB 3.0 Mtr Length)

I. Qualification Criteria of sub vendor / Manufacturer:-

The prospective bidder may source Earth Electrode from sub vendors /

manufacturers who must qualify all the following requirements :

a) The sub vendor /manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

b) The manufacturer should have supplied at least 200 no.s to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer / sub vendor as proof of successful operation in field.

II. Scope:-

This specification provides for design, manufacturing, testing before dispatch, supply & delivery of Earthing Device (Heavy Duty) (for use in line (40x3000) mm & SS (50x3000 mm), as per enclosed Drawing.

III. APPLICABLE STANDARDS:-

The Earthing Device must be made out of 50 mm for S/S, 40 mm for line (Heavy Gauge- No minus Tolerance allowed) Wall thickness Hot Dip G.I. Pipe (as per IS :- 1239, Part-1, 1990 of reputed Make (TATA/Jindal) & 3.0 mtrs length tapered finished smooth at one end for a length of 75 mm & Clamp at the other end.

Staggered drill hole of 12 mm Dia of interval of 150mm shall be made before galvanization.

The GI Earthing Clamp/ Strip (C- Clamp Type) is to be of 50mm width, 6mm thickness & flange length of 65 mm in each side. This should be suitable for termination of 4 nos of GI Flat earth electrodes. The Clamp/ Strip & Earthing pipe after fabrication will be hot dip galvanized confirming to IS: 2629/85 with latest amendments. The clamp shall have two holes in both sides suitable for 16 mm GI Bolts & Nuts.

IV. GALVANISING

For use in construction at coastal areas as well as other areas it shall be required for galvanizing the Cross arms and Pole top brackets as following:

All galvanizing shall be carried out by the hot dip process, in accordance with Specification IS 2629. However, high tensile steel nuts, bolts and spring washer shall be electro galvanized to Service Condition 4. The zinc coating 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. There shall be no impurities in the zinc or additives to the galvanic bath which could have a detrimental effect on the durability of the zinc coating.

Before picking, all welding, drilling, cutting, grinding and other finishing operations must be completed and all grease, paints, varnish, oil, welding slag and other foreign matter completely removed. All protuberances which would affect the life of galvanizing shall also be removed.

The weight of zinc deposited shall be in accordance with that stated in Standard IS 2629 and shall not less than 0.61kg/m^2 with a minimum thickness of 86 microns for items of thickness more than 5mm, 0.46kg/m^2 (64 microns) for items of thickness between 2mm and 5mm and 0.33kg/m^2 (47 microns) for items less than 2mm thick.

Parts shall not be galvanized if their shapes are such that the pickling solutions cannot be removed with certainty or if galvanizing would be unsatisfactory or if their mechanical strength would be reduced. Surfaces in contact with oil shall not be galvanized unless they are subsequently coated with an oil resistant varnish or paint.

In the event of damage to the galvanizing the method used for repair shall be subject to the approval of the Engineer in Charge or that of his representative.

Repair of galvanizing on site will generally not be permitted.

The threads of all galvanized bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for cleaning the threads unless specifically approved by the Project Manager. All nuts shall be galvanized. The threads of nuts shall be cleaned with a tap and the threads oiled.

Partial immersion of the work shall not be permitted and the galvanizing tank must therefore be sufficiently large to permit galvanizing to be carried out by one immersion.

After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. To avoid the formation of white rust galvanized materials shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate

treatment shall be provided to avoid formation of white rust after hot dip galvanization.

The galvanized steel shall be subjected to test as per IS-2633.

The galvanization tests are to be conducted as per IS: 2633/72 & IS: 6745/72 & its latest amendments.

33.4. (D) Earth Electrode (50 NB 3.0 Mtr Length)

Guaranteed Technical Particulars

(To be submitted along with Offer)

Sl. No.	Particulars	Bidder's Offer
1	Location of Factory or Place of Manufacture	
2	Maker's Name, Address & Country	
3	Size of	
	a) Pipe	
	b) Earthing Strips	
4	Length	
5	Thickness of Pipe	
6	Galvanization Process	
7	Galvanization thickness	
	a) For Earthing device	
	b) For Connecting Flat	
8	Galvanization tests to be conducted as per ISS	
9	Any other Particulars (like details of Clamp/ G.I. Bolts)	
10	Details of Drawings submitted	

Metal parts of all equipment other than those forming part of an electrical circuit shall be connected directly to the main earth system via two separate conductors of adequate capacity at two different points.

All main members of structural steelworks shall be earthed by galvanised iron flat connections bonded by welding or bolting to the steelworks.

Connections to apparatus and structures shall be made clear of ground level, preferably to a vertical face and protected as appropriate against electrolytic corrosion. They shall be made between clean surfaces and of sufficient size and pressure to carry the rated short circuit current without damage.

Earth bars installed directly into the ground should normally be laid bare and the trench back-filled with a fine top soil. Where the soil is of a hostile nature, special precautions must be taken to protect the earth bar. Wherever required to achieve the required resistance bentonite powder to be mixed in loam/ black cotton crushed soil in 1: 10 proportion is permissible, the method used being subject to the agreement of the Engg. In-charge (Divisional Engr.). In the event of bentonite powder being adopted, water supply through conduit to the area must be supplemented and regulated to keep the surface / mat moisture absorbent.

Joints in earth bars shall be welded and then coated with a suitable anti-corrosion protection treatment.

Facilities shall be provided on the earth bar run between equipment and the base of structures, comprising a looped strip, so as to permit the attachment of portable earth connections for maintenance purposes.

The cross sectional area of the earth bar and connections shall be such that the current density is not greater than 100 A/mm^2 for a 3 second fault duration.

33.5 Names of suppliers and copies of orders

If so required, and before ordering material of any description, the TPSODL shall submit for approval the names of makers or suppliers proposed. Copies of orders shall also be submitted if so required. The Engg In-charge (Divisional Engr.) may at any time

withdraw his previously given approval to obtaining materials from any maker or supplier should such maker or supplier fail to supply materials of the specified quality or quantity in the requisite time.

33.6 Rejection of materials and workmanship

The Engg In-charge (Divisional Engr.) shall at any time have power to reject materials and workmanship not complying with this Specification or with the approved Drawings. Materials so rejected shall be immediately removed from site and replaced by materials of an approved standard at the expense of the TPSODL. Rejected workmanship shall be broken out and replaced by work of an acceptable standard including the supply of new materials by the TPSODL, at the expense of the TPSODL, and without delay.

33.7 Erection of Distribution Transformers

33.7.1 General

As a part of this scheme, there is a provision to install distribution transformers on 11 kV line. The TPSODL shall transport the transformer along with the distribution board (OSM) from the store, install, test and commission the DT of 63/ 100/ 200 KVA capacity.

a. The TPSODL's scope is to install distribution transformers on DP structures up to 100 KVA and on plinth foundation beyond 100 KVA capacity including all support structures, channels, clamps, nut & bolts etc for DT and all other accessories. On 11 kV side, the accessories would be LA, A.B. Switch & HG fuse as specified while on LT side the TPSODL shall install LT Distribution Box. The construction of foundation is in the scope of TPSODL as per the approved drawings. Any other item, not specifically mentioned but necessary for safe operation of the distribution transformer is deemed to be included in the scope of the TPSODL.

b. The mounting of LTDB shall be same as that for DT and provision shall be kept for it. LTDB shall be used to take off LT feeders and service connections as well. Distribution box shall have proper locking arrangement.

c. The location for installation of DT shall be specified by the owner.

d. In rural areas 9 mtr DP structure using PSC poles should be considered where as 150x150 RS Joist are to be used in place of PSC poles in urban areas.

e. All steel structures including nuts bolts, fasteners etc should be hot dip galvanized.

33.7.2 Erection of Distribution Transformers

All distribution transformers shall be installed on 11 kV line DP structures / Plinths. Bimetallic connectors shall be provided on HT side of DT. The connectors shall be as per REC specifications.

The HT side connections shall be made with AAA conductor. LT side connections from transformer bushing to MCCB of LTDB shall be made by providing single core Al. un-armoured XLPE LT cable of suitable size and support. The outgoing from MCCB of LTDB to the overhead line are also to be made by providing single core Al. un-armoured XLPE LT cable of suitable size. In both the cases suitable clamping (made from 50x6mm GI Flats with GI Bolts & nuts) arrangement (3nos. at transformer side & 4 nos. at line side) with cushioning, cable gland and end termination kit at both ends shall be provided. The outgoing cable of LTDB has to be connected to the overhead LT line by providing minimum 2 nos. of 3-bolted (M-12) type PG clamps. Required layers of ampere tape and PVC tape are to be wrapped as per requirement.

In case of AB cables directly emanating from the LTDB to LT lines, suitable clamping arrangement with the pole as mentioned above shall be made. Necessary tension clamps, dead end clamps etc. shall be provided on the pole for holding the AB cable properly so that the load of the cable shall not be transferred to LTBD. The TPSODL shall provide all such clamps, nuts & bolts at no extra cost to the owner.

The TPSODL shall provide and install a Sign Board of 1ft x 1 ft size at each DT location. The sign board shall be mounted on the pole with suitable clamps. The board shall be of 1.6 mm (min) thick GI sheet and epoxy painted (minimum paint thickness 75 micron) the layout & the content to be written on the board shall be decided during detailed engineering. The boards shall be prepared through screen printing or better technology. The cost of providing and installing the board shall be included in the quoted rates for DT erection.

All materials required for completion of job in all respect beyond owner supply has

to be approved by the owner prior to procurement. During procurement, TPSODL supply items should also be inspected and tested including third party unless otherwise waived out.

33.7.3 Sub-station Fencing

Compound wall of size 4.5x4.75x 1.6 meter for plinth mounted S/s & 4.5x2.5x1.6 meter for DP mounted S/s shall be constructed with provision for a Grill gate of size 1.5x1 meter height.

33.7.4 Earthing of Distribution Sub-stations

Five nos. 50mm dia, 3 mtr. Long, heavy gauge Pipe (Jindal / Tata) earthings shall be provided for the distribution Sub-station complying with relevant IS. Adequate quantity of charcoal and salt shall be used to keep the earth resistance low. Two connections from transformer neutral, two nos. from HV side LAs, one from handle of AB switch, transformer body & DP structure shall be provided to the pipe earths. All the five pits shall be connected to an earth grid with 24mtr. long 50x10mm size GI Flats at a depth of 600mm below the ground level for plinth mounted S/s and for DP mounted the same is of 14 mtr. long. The earth risers should be with 50x6 mm GI Flats requiring 34mtrs in both type of S/s.

34 Fixing of Suspension & Tension/ Dead end fittings to the Poles.

The suspension clamp is to be hung on eye hook/ suspension hook, which is fixed to the pole at a minimum distance of 0.15 mt. from top end of the pole. The messenger wire of bunched cable resting on a pulley is separated from the cable by separating wedges and inserted in the conductor groove of the suspension clamp. The bolt is tightened to a torque of 20 N after which the pulley and wedges are to be removed. The cable is tied to the messenger wire with nylon tie on both sides of clamps. A

hole of minimum diameter is to be made through poles for erection of suspension clamp. In case, drilling is not possible to make hole through poles, pole clamps/eye hook 50 x 6 mm flat shall be used. Eye/hook pole clamp shall be made to suite the pole width. This shall be installed as per Fig. No. 2 (a) & 2(b) of REC Construction Standard No. E-34 for suspension clamps and as Fig. No. 2 (a) of REC Construction Standard No. E-35 for tension (Dead end)clamps.

34.1 Fittings & Accessories

The following hardware fittings and accessories shall be used to install, erect & join the aerial bunched cable.

- a) Suspension Hook (Eye-Hook) – The TPSODL shall install the suspension hook (eye hook). This hook shall be used to attach the AB cable on the pole by means of a dead end clamp in terminal poles and for attaching a suspension clamp in straight lines and angle up to 90 Deg.-
- b) Suspension fittings & the corresponding eye hook shall be as per REC Construction Standard No. E-34.
- c) Dead End fittings shall be bolted type & the corresponding eye hook shall be as per REC Construction Standard No. E-35.
- d) Nylon Tie- The TPSODL shall supply nylon ties. These ties shall be used for tying the conductors with the messenger wire to prevent the phase conductors from chatting against suspension clamp. The nylon tie is made of weather resistant black nylon.
- e) Connectors- The TPSODL shall supply connector. These shall be used as non-tension aluminum to aluminum connections for conductor joints.
- f) Plastic Covers for Connectors- The TPSODL shall install Plastic Covers for Connectors. These covers shall be used with aluminum/aluminum connectors to protect connectors against corrosion caused by climatic conditions.

34.2 Installation of Cable

The TPSODL shall be fully responsible for all activities related to installation of AB cable. His responsibilities consists of Handling of the cable Pulling of the cable Stringing of the cable Jointing of the cable

Handling of AB Cable.

The TPSODL shall observe following precautions while handling the AB Cable:

The cable drums must be stored and transported in an upright position. While loading/unloading, the drums shall not be thrown from transport vehicles. Cable contact with sharp articles shall be avoided. In order to prevent damage to the insulation, the cable shall not be dragged on the ground. Pulleys shall be used for this purpose. In order to prevent

strands from spreading, always cut the cable with a cutter.

Use nylon ties or electrical tape to prevent the cable from spreading away from messenger wire after the cutting. Staple the end of the cable on to the drum in order to prevent loosening. Do not remove the protective boards from the cable drum before the cable is pulled off the drum. While moving the drum by rolling it on ground, always roll the drum in the direction indicated by the arrow on the flange. When pulling the cable, the spinning direction must be opposite. Do not store the drums on wet soil, sandy or humid places. Store the accessories in good order for quick easy and correct handling.

b) Pulling the Cable.

The principle is to pull the cable under mechanical tension so that contact with the ground or any other obstacles is avoided. The cable drum should be perfectly in alignment with line to be strung and fixed about 15-20 mts. from the holding the first pulley. Open the cover of the drum to check and ensure that the insulation is not damaged. The pulling which is sent up to the cable drum is about 15-20 mts from the pole holding to the last pulley.

The pulleys are directly hung to such hook on the poles. The pulley tandem is to be used on angle poles if the line is deviating more than 60°. Pull the guiding rope through all the pulleys. Normal care shall be taken to assume a smooth passage of whole cable through the pulleys, especially in the first pole and on angle poles. One worker should act as brakeman at the cable drum so that the cable is not loosened during the pulling. One worker should follow the cable going through the pulleys and stop the pulling if anything goes wrong.

TECHNICAL SPECIFICATION FOR 11KV AND 33KV POLYMER PIN INSULATOR

Scope : This specification cover the design, manufacturing, testing at manufacturers works, transport to site, insurance, unloading & storage of 11 KV & 33KV Polymer Pin Insulator suitable for use in 11 KV & 33KV Overhead Lines situated in any part of under jurisdiction of TPSODL Utility.

General Requirements:

- 1) The Composite insulators will be used on lines on which the conductor will be size of conductor up to 232 Sq. mm. The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind.
- 2) Insulator shall be suitable for 3 Phase, 50 Hz effectively earthed 11KV Overhead Lines and 33 KV Impedance Grounded distribution systems in a moderately/heavily polluted atmosphere.
- 3) Bidder must be an indigenous manufacturer and supplier of composite insulators of rating 11KV or above or must have developed proven

in house technology and manufacturing process for composite insulators of above rating. The Bidder shall furnish necessary evidence in support of the above along with the bid, which can be in the form of certification from the utilities concerned, or any other documents to the satisfaction of the owner.

- 4) Insulator shall be suitable for the long Rod Type.
- 5) Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the commendation of IEC- 60815/ IS: 13134.
- 6) The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with IEC 61109: $\pm (0.04d + 1.5)$ mm when $d \leq 300$ mm $\pm (0.025d+6)$ mm when $d > 300$ mm
Where, d being the dimensions in millimeters for diameter, length or creepage distance as the case may be. However, no negative tolerance shall be applicable to creepage distance.
- 7) The composite insulators including the end fitting connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.
- 8) All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

Service condition : The insulators to be supplied against this specification shall be suitable for satisfactory continuous operation under the following typical condition :

- a) Max. ambient temperature : 50 ° C
- b) Min. ambient temperature : -5 ° C
- c) Relative humidity: 10 % to 100 % d)
- d) Average number of rainy days : 100 / annum.
- e) Max. Annual Rainfall : 1500 mm
- f) Max. Wind Pressure : 150 Kg/ sq. Meter
- g) Max. Wind Velocity: 50 Km/ hour
- h) Max. Altitude above MSL : 1000 Meter.
- i) Seismic level: 0.3 g (Horizontal acceleration)
- j) Average Thunder storm : 45 Days per annum.
- k) Climatic condition: Moderately hot and humid tropical climate, conducive to rust and fungus growth. Pollution level is high. Some area with seashores having saline atmosphere.

System Parameters:

- a) Nominal system voltage : 11 KV & 33 KV.
- b) Highest system voltage : 12 KV & 36 KV.
- c) Power frequency : 50 Hz.
- d) Number of Phases : Three.
- e) System earthing : 11 KV Solidly earthed, 33 KV Impedance earth.

Standard : The following Indian / International Standards with latest revisions and amendments shall be referred while assessing conformity of insulators with this specification.

Sl.	Indian Standard	Title	International Standard

1		Definition, test methods and acceptance criteria for composite insulators for a.c. overhead lines above 1000V	IEC : 61109
2	IS : 731	Porcelain insulators for overhead power lines with a nominal voltage greater than 1000V	IEC : 60383
3	IS : 2071	Methods of High Voltage Testing	IEC : 60060-1

4	IS : 2486	Specification for insulator fittings for overhead power lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices	IEC : 60120 IEC : 60372
5		Thermal Mechanical Performance test and mechanical performance test on string insulator units	IEC : 60575
6	IS : 13134	Guide for the selection of insulators in respect of polluted conditions	IEC : 60815
7		Characteristics of string insulator units of the long rod type	IEC : 60433
8		Hydrophobicity classification guide	STRI guide 1.92/1
9		Radio interference characteristics of overhead power lines and high-voltage equipment	SPR:18-2 part2
10	IS : 8263	Methods of RI Test of HV Insulators	IEC : 60437
11		Standard for insulators—Composite-Distribution Dead-end type	ANSI C29 13- 2000
12	IS : 4759	Hot dip zinc coatings on structural steel & other allied products	ISO : 1459 ISO : 1461
13	IS : 2629	Recommended Practice for Hot, Dip Galvanization for iron and steel	ISO-1461 (E)
14	IS : 6745	Determination of weight of zinc coating on zinc coated iron and steel articles	ISO : 1460
15	IS : 3203	Methods of testing of local thickness of electroplated coatings	ISO : 2178
16	IS : 2633	Testing of Uniformity of coating of zinc coated articles	
17		Standard specification for glass fiber strands	ASTM D 578-05
18		Standard test method for compositional analysis by Thermo-gravimetric	ASTM E 1131-03
19	IS : 4699	Specification for refined secondary zinc	

Technical Requirement:

1. Composite Insulators shall be designed to meet the light quality, safety and reliability and are capable of withstanding a wide range of environmental conditions.

- a) Core : The internal insulating part
- b) Housing : The external insulating part.
- c) Metal end fittings: For attaching to hardware to support conductor.

Core: It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber or Boron free E-Glass and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP shall be manufactured through Pultrusion process. The FRP rod shall be void free.

Housing (Sheath):

The FRP rod shall be covered by a seamless sheath of a silicone elastometric compound or silicone alloy compound of a thickness of 3 mm minimum. It shall be one-piece housing using injection Moulding

Principle to cover the core. The elastomer housing shall be designed to provide the necessary creepage distance and protection against environmental influences, external pollution and humidity. Housing shall conform to the requirement of IEC

61109/92-93 with latest amendments.

It shall be extruded or directly moulded on core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing / bonding area shall be free from voids.

Manufacturer should furnish a description of its quality assurance programme including fabrication; testing and inspection for any material (i.e rubber) Components (i.e rod) or hardware (i.e. end fittings). The manufacturer has had fabricated by others should also be included. Manufacturing methods and material composition documentation will be a part of Technical Bid to be submitted along with offer.

WEATHERSHEDS:

The composite polymer Weathersheds made of silicone elastometric compound or silicon alloy shall be firmly bonded to the sheath, vulcanized to the sheath or moulded as part of the sheath and shall be free from imperfections. The weathersheds should have silicon content of minimum 30% by weight. The strength of the weathershed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids.

METAL END FITTINGS:

End fittings transmit the mechanical load to the core. Hardware of respective specified mechanical load shall be hot dip galvanized in Zinc coated with minimum 99.95 % purity of electrolytic high grade Zinc in accordance with IS 2629. The material used in fittings shall be corrosion resistant.

Metal end fittings shall be uniform and without sharp edges or corners and shall be free of cracks, flakes, silvers, slag, blow-holes shrinkages defects and localized porosity.

They shall be connected to the rod by means of a controlled compression technique. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process and should not damage the individual fibers or crack the core.

The gap between fittings and sheath shall be sealed by flexible silicone elastometric compound or silicone alloy compound sealant, system of attached of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof.

The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/IS:2486 Part-II/1989.

Nominal dimensions of the pin insulator shall be in accordance with the Specific Technical Particulars. No joints in pin will be allowed. Outer portion of Pin should be Zinc coated with minimum 99.95% purity of electrolytic high grade Zinc.

The finished surface shall be smooth and shall have a good performance. The surface

shall not crack or get chipped due to ageing effect under normal and abnormal service conditions or while handling during transit or erection.

The design of the fittings and the insulators shall be such that there is no local coronaformation or discharges likely to cause the interference to either should or vision transmission.

Bottom end metal fitting (Shank) of Pin Insulator should be as per IS: 2486.

Length of thread on shank should be minimum 110 mm for 11 K V Pin and 130 mm for 33 KV Pin insulator. Shank diameter is 20 mm for 11 KV Pin Insulator & 24 mm for 33 KV Pin Insulator. Minimum Collar diameter should be 40 mm and its minimum thickness should be of 5 mm. Two number nuts as per IS 1363 (P-III) and 4 mm thick Spring Washer shall be as per IS 3063 with latest amendments if any, Nuts and spring washer shall be hot dip galvanized.

Workmanship :

1. All the materials shall be of latest design and conform to the best engineering practices adopted in the high voltage field. Bidders shall offer only such insulators as are guaranteed by them to be satisfactory and suitable for continued good service in power transmission lines.
2. The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners.
3. The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.
4. The core shall be sound and free of cracks and voids that may adversely affect the insulators.
5. Weather sheds shall be uniform in quality. They shall be clean, sound and smooth and shall be free from defects and excessive flashing at parting lines.
6. End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively sealed to prevent moisture ingress. Effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth without projecting points or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.
7. All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 610 gm/sq.m. or 87µm thickness and shall be in accordance with the requirement of IS:4579. The zinc used for galvanizing shall be of purity 99.5% as per IS : 4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least four successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.

Drawing :

The bidder shall furnish along with the bid the outline drawing of each insulator unit including a cross sectional view of the long rod insulator unit. The drawing shall include but not be limited to the following information :

- (a) Long rod diameter with manufacturing tolerances
- (b) Minimum Creepage distance with positive tolerance
- (c) Protected creepage distance

- (d) Eccentricity of the long rod unit
 - (i) Axial run out
 - (ii) Radial run out
- (e) Unit mechanical and electrical characteristics
- (f) Weight of composite long rod units
- (g) Identification mark
- (h) Manufacturer's catalogue number

Marking: Each insulator shall be legibly and indelibly marked (embossing/engraved) to show the following:

- a) Name & Trade mark of the manufacturer
- b) Month & Year of manufacturing
- c) Voltage & Type
- d) Minimum Failing Load (in KN)
- e) "TPSODL Utility" marking

N.B. Marking with sticker/written by Ink is not acceptable.

Type Test: The following Type Test shall have to be conducted on insulator unit, components, materials or complete strings;

- a) Dry Positive & Negative Lightning Impulse voltage withstand test
- b) Dry Positive & Negative Lightning Impulse Flashover voltage test
- c) Dry & Wet Power Frequency Voltage withstand test
- d) Dry & Wet Power Frequency Voltage Flashover test
- e) Mechanical Failing Load test
- f) Radio Interference test
- g) Recovery of Hydrophobicity test
- h) Dye Penetration Test
- i) Water Diffusion Test
- j) Chemical composition test for Silicon content
- k) Brittle fracture resistance test.

Routine Test :

- a) Identification of marking
- b) Visual inspection
- c) Mechanical routine test

Acceptance Test : The following test will be carried out at manufacturers works during inspection of the offered insulators before delivery :

- a) Visual examination
- b) Verification of dimension
- c) Galvanizing test
- d) Mechanical performance test
- e) Mechanical Failing Load test

Inspection :

All Acceptance tests shall be carried out at manufacturer's works in presence of the TPSODL and manufacturers representatives. In addition to above, all routine tests are also to be carried on the insulator as per relevant IS / IEC. The entire cost of acceptance and routine test that to be carried out as per relevant IS / IEC shall be treated as included in the quoted price of Insulator.

The manufacturer shall give at least 15(Fifteen) days advance notice intimating the actual

date of inspection and details of all tests that are to be carried out from the date when the tests will be carried out. Routine tests on all insulators shall be carried out as per IEC / IS and test reports shall be submitted along with respective inspection offer to A G M (C&P), TPSODL Utility.

Sampling & Rejection during inspection:

The sampling and rejection procedure for Acceptance Test shall be as per IEC 61109.

Packing :

- 1) All insulators shall be packed in strong corrugated box of min. 7 ply duly palette or wooden crates. The gross weight of the crates along with the material shall not normally exceed 100 Kg to avoid handling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season.
- 2) The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.
- 3) Suitable cushioning, protective padding or dunnage or spacers shall be provided to prevent damage or deformation during transit and handling.
- 4) Each wooden case / crate / corrugated box shall have all the markings stenciled on it in indelible ink.
- 5) The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

Guarantee:

In the event of any defect in the equipment / materials arising out of faulty design, materials, workmanship within a period of 24 (twelve) months of commissioning or 30 (eighteen) months from the date of last despatch of any integral part of the equipment / materials whichever is earlier the supplier shall guarantee to replace or repair the same to the satisfaction of the purchaser.

If the supplier fail to do so within a reasonable time, TPSODL Utility reserves the right to effect repair or replacement by any other agency and recover charges for repair or replacement from the supplier.

Quality Assurance Plan:

1. The successful bidder shall submit following information along with the bid.
2. Test certificates of the raw materials and bought out accessories.
3. Statement giving list of important raw material, their grades along with names of sub-suppliers for raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of bidder's representative.
4. List of manufacturing facilities available.
5. Level of automation achieved and lists of areas where manual processing exists.
6. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
7. List of testing equipments available with the bidder for final testing equipment along with valid calibration reports.
8. The manufacturer shall submit Manufacturing Quality Assurance Plan (QAP) for approval & the same shall be followed during manufacture and testing.
9. The successful bidder shall submit the routine test certificates of bought out raw materials/accessories and central excise passes for raw material at the time

of inspection.

10. The Owner's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Supplier's and sub-Supplier's works, raw materials, manufacture of the material and for conducting necessary tests detailed herein.
11. The material for final inspection shall be offered by the Supplier only under packed condition. The owner shall select samples at random from the packed lot for carrying out acceptance tests. The lot offered for inspection shall be homogeneous and shall contain insulators manufactured in 3-4 consecutive weeks.
12. The Supplier shall keep the Owner informed in advance of the time of starting and the progress of manufacture of material i/n their various stages so that arrangements could be made for inspection.
13. No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the owner in writing waives off the inspection. In the later case also the material shall be dispatched only after satisfactory testing specified herein has been completed.
14. The acceptance of any quantity of material shall in no way relieve the Supplier of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such materials are later found to be defective.

Test on Insulator units

1. RIV Test (Dry): The insulator string along with complete hardware fittings shall have a radio interference voltage level below 100 micro volts at one MHz when subjected to 50 Hz voltage of 10 kV & 30 kV for 11 kV & 33 kV class insulators respectively under dry condition
. The test procedure shall be in accordance with IS: 8263/IEC: 437/CISPR 18-2.
2. Brittle Fracture Resistance Test: Brittle fracture test shall be carried out on naked rod along with end fittings by applying "1N HNO₃ acid" (63 g conc. HNO₃ added to 937 g water) to the rod. The rod should be held at 80% of SML for the duration of the test. The rod should not fail within the 96 Hour test duration. Test arrangement should ensure continuous wetting of the rod with Nitric acid.
3. Recovery of Hydrophobicity & Corona Test:
 - i) The surface of selected samples shall be cleaned with isopropyl alcohol. Allow the surface to dry and spray with water. Record the Hydrophobicity classification in line with STRI guide for Hydrophobicity classification (Extract enclosed at Annexure-D) Dry the sample surface.
 - ii) The sample shall be subjected to mechanical stress by bending the Sample over a ground electrode. Corona is continuously generated by applying 12 kV to a needle like electrode placed 1 mm above the sample surface. Tentative arrangement shall be as shown in Annexure- E. The test shall be done for 100 hrs.
 - iii) Immediately after the corona treatment, spray the surface with Water and record the HC classification. Dry the surface and repeat the corona treatment as at Clause-2 above. Note HC classification. Repeat the cycle

- iv) for 1000 Hrs. or until an HC of 6 or 7 is obtained. Dry the sample surface. Allow the sample to recover and repeat hydrophobicity Measurement at several time intervals. Silicone rubber should recover to HC 1 – HC 2 within 24 to 48 hours, depending on the Material and the intensity of the corona treatment.

4. Chemical composition test for Silicon content:

The content of silicon in the composite polymer shall be evaluated by EDX (Energy Dispersion X-ray) Analysis or Thermo-gravimetric analysis. The test may be carried out at CPRI or any other NABL accredited laboratory.

GUARANTEED TECHNICAL PARTICULARS FOR 11 KV PIN INSULATOR(POLYMER TYPE

Sl. No.	Particulars	11 KV Pin Insulator	Bidders Offer
1	Type of insulator	Polymeric composite Pin Insulator	
2	Reference Standard	IEC 61109	
3	Material of FRP Rod	Borron free ECR	
4	Material of sheds	Silicon Rubber	
5	Material of Top End Fittings	SGCI /MCI/ FORGED STEEL	
6	Material of Bottom End Fittings	FORGED STEEL	
7	Material of sealing compound	RTV Silicon	
8	Colour of sheds	Grey	
9	Rated voltage	11 KV	
10	Highest voltage	12 KV	
11	Dry Power Frequency Withstand voltage	60 KV	

12	Wet Power Frequency Withstand voltage	35 KV	
13	Dry Power Frequency Flashover Voltage	75 KV	
14	Wet Power Frequency Flashover Voltage	45 KV	
15	Dry Lightning Impulse withstand voltage	Positive : 75 KV Negative : 80 KV	
16	Dry Lightning Impulse Flashover voltage	Positive : 95 KV Negative : 100 KV	
17	RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition	< 50 microvolt	
18	Creepage distance (min)	320 mm	
19	Min Failing load	5 KN	
20	Dia of FRP Rod	20 mm	
21	Length of FRP Rod (min)	165 mm	
22	Dia of weather sheds	100 mm	
23	Thickness of housing	3 mm	
24	Dry arc distance	150 mm	
25	Method of fixing sheds to housing	Injection moulding	
26	Visible Discharge Voltage (PF)	9 KV	
27	No of weather sheds (min)	Three	
28	Type of sheds	Aerodynamic	
29	Dia of bottom end fitting	20 mm	
30	Thread length of bottom end fitting	110 mm (min)	
31	Type of packing	Wooden / Corrugated box	
32	No of insulator in each pack	Thirty	
33	Guarantee	24 months from commissioning or 30 months from the date of last despatch.	

Signature of the Bidder with Seal

Technical specification of Composite Disc Insulators (B&S) Polymer type

SCOPE :

This specification covers the design, manufacture, testing and supply of 11KV Composite Insulators. The composite insulators shall be of the following type:

- i) Long rod insulators for conductors in tension application at angle / cut points the insulators shall be of Ball & Socket type.
- ii) Line post insulators or pin insulators for straight line locations

2) SERVICE CONDITIONS :

The insulators to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Maximum ambient temperature (Degree C)	...	50
Minimum ambient temperature (Degree C)	...	5
Relative Humidity (%)	...	95
Maximum Annual Rainfall (mm)	...	1450
Maximum Wind pressure (kg/m.sq.)	...	260
Maximum wind velocity (km/hour)	...	50
Maximum altitude above mean sea level (meter)	...	1000
Isoceraunic level (days/year)	...	50
Seismic level (Horizontal acceleration)	...	0.3 g

Moderately hot and humid tropical climate

Conductive to rust and fungus growth

3) SYSTEM PARTICULARS:

a) Nominal System Voltage	11 kV	22 kV	33 kV
b) Corresponding highest system Voltage	12 k	24k	36 k
c) Frequency	50 Hz with 3% tolerance		
d) Number of phase	3	3	3
e) Neutral earthing	Effectively grounded.		

4) STANDARDS :

Unless otherwise specified elsewhere in the specifications insulators shall conform to the latest revisions of all relevant standards available at the time of placement of the order. The standards are listed in Annexure 'A'.

5) GENERAL REQUIREMENTS

- i) The composite insulators shall generally conform to latest Standards as listed in Annexure 'A'
- ii) The Composite Insulators will be used on lines on which the conductors will be AAA Conductor of size up to 232 sq. mm. and AAAC of any size up to Panther (0.2 sq. inch copper equivalent). The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind.
- iii) Supplier must be an indigenous manufacturer and manufacturer of composite insulators of rating 33 kV or above OR must have developed proven in house technology and manufacturing process for composite insulators of above rating OR possess technical collaboration /association with a manufacturer of composite insulators of rating 33kV or above. The Manufacturer shall furnish necessary evidence in support of the above, which can be in the form of certification from the utilities concerned, or any other documents to the satisfaction of the Employer.
- iv) Insulator shall be suitable for both the suspension and strain type of load & shall be of Ball & Socket type. The diameter of Composite Insulator shall be less than 200 mm. The center-to-center distance between B&S shall be max. 300 mm for 11 kV, 450 mm for 22 kV & 550 mm for 33 kV composite Insulator.
- v) Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the recommendation of **IEC-60815/IS: 13134**.
- vi) The size of Composite insulator, minimum creepage distance and mechanical strength along with hardware fittings shall be as follows:

Sr. No.	Type of Composite insulators	Nominal System Voltage kV (rms)	Highest System Voltage kV(rms)	Visible Discharge Test Voltage kV(rms)	Wet Power Frequency Withstand Voltage kV(rms)	Impulse Withstand voltage kV(rms)	Minimum Creepage Distance (mm) (Heavily Polluted 25mm/kV)	Center to Center Distance Between B&S (mm)	Min. Failing load kN	Shed Diameter (mm) (min)
i.	Long Rod insulator	11	12	9	35	75	320	300	45	100
		22	24	18	55	125	600	450	70/90	100
		33	36	27	75	170	900	550	70	100
ii.	Post/Pin Insulator	11	12	9	35	75	320		5	
		22	24	18	55	125	560		10	
		33	36	27	75	170	900		10	

vii) Dimensional Tolerance of Composite Insulators

The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with-IEC 61109:

$(0.04d+1.5)$ mm when $d \leq 300$ mm. $(0.025d+6)$ mm when $d > 300$ mm.

Where, d being the dimensions in millimeters for diameter, length or creepage distance as the case may be. However no negative tolerance shall be applicable to creepage distance.

viii) Interchange ability:

The composite insulator together with the Ball & Socket fittings shall be of standard design suitable for use with the hardware of any other indigenous make conforming to relevant standards referred above.

ix) Corona and RI Performance

All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

6) TECHNICAL DESCRIPTION OF COMPOSITE INSULATORS

Polymeric Insulators shall be designed to meet the high quality, safety and reliability and are capable of withstanding a wide range of environmental conditions.

Polymeric Insulators shall consist of THREE parts, at least two of which are insulating parts:-

- (a) Core- the internal insulating part
- (b) Housing- the external insulating part
- (c) Metal end fittings.

i) CORE

It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber or Boron free E-Glass and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free.

ii) HOUSING:

The FRP rod shall be covered by a seamless sheath of a silicone elastometric compound or silicone alloy compound of a thickness of 3mm minimum. It shall be one- piece housing using Injection Molding Principle to cover the core. The elastomer housing shall be designed to provide the necessary creepage distance and protection against environmental influences. Housing shall conform to the requirements of IEC61109/92-93 with latest amendments

iii) WEATHERSHEDS

The composite polymer weather sheds made of a silicone elastometric compound or silicone alloy compound shall be firmly bonded to the sheath, vulcanized to the sheath or molded as part of the sheath and shall be

free from imperfections It should protect the FRP rod against environmental influences, external pollution and humidity. The weather sheds should have silicon content of minimum 30% by weight. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids.

iv) METAL END FITTINGS:

End fitting transmit the mechanical load to the core. They shall be made of spheroidal graphite cast iron, malleable cast iron or forged steel or aluminum alloy. They shall be connected to the rod by means of a controlled compression technique. Metal end fittings shall be suitable for Ball & Socket hardware of respective specified mechanical load and shall be hot dip galvanized after, all fittings have been completed. The material used in fittings shall be corrosion resistant. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process & should not damage the individual fibers or crack the core. The gap between fitting and sheath shall be sealed by a flexible silicone elastomeric compound or silicone alloy compound sealant. System of attachment of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof. The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/ IS: 2486 - Part-II/1989.

7) WORKMANSHIP

- 7.1 All the materials shall be of latest design and conform to the best engineering practices adopted in the high voltage field. Manufacturers shall offer only such insulators as are guaranteed by them to be satisfactory and suitable for continued good service in power transmission lines.
- 7.2 The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners.
- 7.3 The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.
- 7.4 The core shall be sound and free of cracks and voids that may adversely affect the insulators.
- 7.5 Weather sheds shall be uniform in quality. They shall be clean, sound, smooth and shall be free from defects and excessive flashing at parting lines.
- 7.6 End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively sealed to prevent moisture ingress; effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth without projecting points or irregularities, which may cause corona.
- 7.7 All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.
- 7.8 All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 610 gm/sq.m. or 87 microm thickness and shall be in accordance with the requirement of IS:4759. the zinc used for galvanizing shall be of purity 99.5% as per IS:4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least four successive dips each lasting for one (1) minute duration under the standard pretest. The galvanizing shall be carried out only after any machining.

8) TESTS AND STANDARDS

Insulators offered shall be manufactured with the same configuration & raw materials as used in the insulators for which design & type test reports are submitted. The manufacturer shall submit a certificate for the same. The design & type test reports submitted shall not be more than five years old.

8.1 DESIGN TESTS :

For polymeric insulators it is essential to carry out design test as per clause 4.1 of IEC 61109 / 92-93 with latest amendments. The design tests are intended to verify the suitability of the design, materials and method of manufacture (technology). When a composite insulator is submitted to the design tests, the result shall be considered valid for the whole class of insulators, which are represented by the one tested and having the following characteristics:

- Same materials for the core, and sheds and same manufacturing method;
 - Same material of the fittings, the same design, the same method of attachment;
- Same or greater layer thickness of the shed material over the core (including a sheath where used);
- Same or smaller ratio of the highest system voltage to insulation length;
 - Same or smaller ratio of all mechanical loads to the smallest core diameter between fittings
 - Same or greater diameter of the core.

The tested composite insulators shall be identified by a drawing giving all the dimensions with the manufacturing tolerances.

Manufacturer should submit test reports for Design Tests as per IEC – 61109 (clause – 5). Additionally following tests shall be carried out or reports for the tests shall be submitted after award of contract:

UV test: the test shall be carried out in line with clause 7.2 of ANSI C29.13.

8.2 TYPE TESTS :

The type tests are intended to verify the main characteristics of a composite insulator.

The type tests shall be applied to composite insulators, the class of which has passed the design tests.

8.2.1 Following Type test shall be conducted on a suitable number of individual insulator units, components, materials or complete strings:

SL. No	Description of type test	Test procedure/Standard
1	Dry lightning impulse withstand voltage test	As per IEC 61109 (Clause 6.1)
2	Wet power frequency test	As per IEC 61109 (Clause 6.2)
3	Mechanical load-time test	As per IEC 61109 (Clause 6.4)

4 Radio interference test

As per IEC 61109 (Clause 6.5) Revised

5 Recovery of Hydrophobicity test

Annexure-B This test may be repeated every 3year
by the manufacturer

6 Chemical composition test for silicon
acceptable to

Annexure-B or any other test method

content

the employee

7 Brittle fracture resistance test

Annexure-B

The Manufacturer shall submit type test reports as per IEC 61109. Additional type tests required if any shall be carried out by the manufacturer, after award of contract for which no additional charges shall be payable. In case, the tests have already been carried out, the manufacturer shall submit reports for the same.

8.3 ACCEPTANCE TESTS :

The test samples after having withstood the routine test shall be subject to the following acceptance tests in order indicated below:

- (a) Verification of dimensions : Clause 7.2 IEC: 61109,
- (b) Verification of the locking system : Clause 7.3 IEC: 61109, (if applicable)
- (c) Verification of tightness of the interface : Clause 7.4 IEC: 61109 Between end fittings & Insulator housing amendment 1 of 1995
- (d) Verification of the specified: Clause 7.4 IEC: 61109, mechanical load amendment 1 of 1995
- (e) Galvanizing test : IS:2633/IS:6745

8.4 ROUTINE TESTS:

Sr.No.	Description	Standard
1	Identification of marking	As per IEC: 61109 Clause 8.1
2	Visual Inspection	As per IEC: 61109 Clause 8.2
3	Mechanical routine test	As per IEC: 61109 Clause 8.3

Every polymeric insulator shall withstand mechanical routine test at ambient temperature tensile load at RTL corresponding to at least 50 % of the SML for at least 10 sec.

8.5 TESTS DURING MANUFACTURE:

Following tests shall also be carried out on all components as applicable

- (a) Chemical analysis of zinc used for galvanizing
- (b) Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings.
- (c) Chemical analysis, hardness tests and magnetic particle inspection for forgings.

8.6 SAMPLE BATCH FOR TYPE TESTING:

The Manufacturer shall offer material for sample selection for type testing only after getting Quality Assurance Plan approved by Employer. The sample for type testing will be manufactured strictly in accordance with the approved Quality Assurance Plan.

9) QUALITY ASSURANCE PLAN :

9.1 The Manufacturer shall submit following information:

- i) Test certificates of the raw materials and bought out accessories.
- ii) Statement giving list of important raw material, their grades along with names of sub- Manufacturers for raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of Manufacturer's representative.
- iii) List of manufacturing facilities available.
- iv) Level of automation achieved and lists of areas where manual processing exists.
- v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- vi) List of testing equipments available with the Manufacturer for final testing of equipment along with valid calibration reports.
- vii) The manufacturer shall submit Manufacturing Quality Assurance Plan (QAP) for approval & the same shall be followed during manufacture and testing.

9.2 The Manufacturer shall submit the routine test certificates of bought out raw materials/accessories and central excise passes for raw material at the time of inspection.

9.3 The Employer's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Manufacturer's and sub-Manufacturer's works, raw materials, manufacture of the material and for conducting necessary test as detailed herein.

9.4 The material for final inspection shall be offered by the Manufacturer only under packed condition. The Employer shall select samples at random from the packed lot for carrying out acceptance tests. The lot offered for inspection shall be homogeneous and shall contain insulators manufactured in 3-4 consecutive weeks.

9.5 The Manufacturer shall keep the Employer informed in advance of the time of starting and the progress of manufacture of material in their various stages so that arrangements could be made for inspection.

9.6 No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the Employer in writing waives off the inspection. In the later case also the material shall be dispatched only after satisfactory testing specified herein has been completed.

9.7 The acceptance of any quantity of material shall in no way relieve the Manufacturer of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such material are later found to be defective

10) TEST CERTIFICATE :

The manufacturer shall furnish detailed type test reports of the offered composite Insulators as per clause 8.2 of the Technical Specifications at the NABL approved laboratories to prove that the composite Insulators offered meet the requirements of the specification. These Type Tests should have been carried out within five years prior to the date of opening of this manufacturer.

The Employer reserves right to demand repetition of some or all the Type Test in presence of Employer's representative. For this purpose, the manufacturer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in the Type Tests, the complete supply shall be rejected.

11) TESTING FACILITIES :

The manufacturer must clearly indicate what testing facilities are available in the works of the manufacturer and whether facilities are adequate to carry out all Routine & acceptance Tests. These facilities should be available to Employer's Engineers if deputed or carry out or witness the tests in the manufacturer works. The insulators shall be tested in accordance with the procedure detailed in IEC 61109 / 92-93 with latest amendments.

12) DRAWINGS :

- i) The Manufacturer shall furnish full description and illustration of the material offered.
- ii) The Manufacturer shall furnish the outline drawing (3 copies) of each insulator unit including a cross sectional view of the long rod insulator unit. The drawing shall include but not be limited to the following information:
 - Long rod diameter with manufacturing tolerances
 - Minimum Creepage distance with positive tolerance Protected creepage distance
 - Eccentricity of the long rod unit Axial run out
 - Radial run out
 - Unit mechanical and electrical characteristics
 - Size and weight of ball and socket
 - Weight of composite long rod units
 - Materials Identification mark Manufacturer's catalogue number
- iii) After placement of award the Manufacturer shall submit fully dimensioned insulator crate drawing for different type of insulators for approval of the Employer.

13) RETEST AND REJECTION:

13.1 Sample Procedure for testing of insulators shall be as per clause 7.1 to 7.6 of IEC 61109 for Acceptance & Routine Tests.

For the sampling tests, two samples are used, E1 and E2. The sizes of these samples are indicated in the table below.

Test Size	Sample Size	
	E ₁	E ₂
N < 300	Subject to agreement	
300 < N < 2000	4	3
2000 < N < 5000	8	4
5000 < N < 10000	12	6

If more than 10000 insulators are concerned, they shall be divided into an optimum number of lots comprising between 2000 and 10000 insulators. The results of the tests shall be evaluated separately for each lot.

The insulators shall be selected by the Employer's representative from the lot at random.

The samples shall be subjected to the applicable sampling tests.

The sampling tests are:

Verification of dimensions - (E1 + E2)

Verification of the locking system - (E2)

Verification of tightness of the interface between- (E2) end fittings & Insulator housing

Verification of the specified mechanical load SML - (E1) Galvanizing test - (E2)

In the event of a failure of the sample to satisfy a test, the retesting procedure shall be as follows :

If only one insulator or metal part fails to comply with the sampling tests, a new sample equal to twice the quantity originally submitted to the tests shall be subjected to retesting. The retesting shall comprise the test in which failure occurs. If two or more insulator or metal parts fail to comply with any of the sampling tests or if any failure occurs during the retesting, the complete lot is considered as not complying with this standard and shall be withdrawn by the manufacturer.

Provided the cause of the failure can be clearly identified, the manufacturer may sort the lot to eliminate all the insulators with these defects. The sorted lot then be resubmitted for testing. The number then selected shall be three times the first chosen quantity for tests. If any insulators fail during this retesting, the complete lot is considered as not complying with this standard and shall be withdrawn by the manufacturer.

13.2 Verification of dimensions (E1 + E2)

The dimensions given in the drawings shall be verified. The tolerances given in the drawing are valid. If no

tolerances are given in the drawings the values mentioned in this specification shall hold good.

13.3 Verification of the locking system (E2)

This test applies only to the insulators equipped with socket coupling as specified by IEC 120 and is performed according to IEC 383.

13.4 Verification of tightness of the interface between end fittings & Insulator housing (E2)One

Insulator selected randomly from the sample E2, shall be subjected to crack indication by dye penetration, in accordance with ISO 3452, on the housing in the zone embracing the complete length of the interface between the housing and metal fitting and including an additional area, sufficiently extended beyond the end of the metal part. The indication shall be performed in the following way.

- (i) The surface shall be properly pre-cleaned with the cleaner ;
- (ii) The penetrant, which shall act during 20 minutes, shall be applied on the cleaned surface;
- (iii) Within 5 minutes after the application of the penetrant, the insulator shall be subjected, at the ambient temperature, to a tensile load of 70 % of the SML, applied between the metal fittings; the tensile load shall be increased rapidly but smoothly from zero up to 70 % of the SML, and then maintained at this value for 1 minute;
- (iv) the surface shall be cleaned with the excess penetrant removed, and dried;
- (v) the developer shall be applied if necessary;
- (vi) the surface shall be inspected.

Some housing materials may be penetrated by the penetrant. In such cases evidence shall be provided to validate the interpretation of the results.

After the 1 min. test at 70 % of the SML, if any cracks occur, the housing and, if necessary, the metal fittings and the core shall be cut, perpendicularly to the crack in the middle of the widest of the indicated cracks, into two halves. The surface of the two halves shall then be investigated for the depth of the cracks.

13.5 Verification of the specified mechanical load SML

The insulators of the sample E1 shall be subjected at ambient temperature to a tensile load, applied between the couplings. The tensile load shall be increased rapidly but smoothly from zero to approximately 75 % of the SML, and then be gradually increased to the SML in a time between 30 sec. to 90 sec.

If 100 % of the SML is reached in less than 90 s, the load (100 % of the SML) shall be maintained for the remainder of the 90 s. (This test is considered to be equivalent to a 1min withstand test at the SML.)

The insulators have passed the test at 13.4 & 13.5 above if:

No failure (breakage or complete pull out of the core, or fracture of the metal fitting) occurs either during the 1 min. 70 % withstand test (a) or during the 1 min. 100 % withstand test (b).

No cracks are indicated after the dye penetration method described in 13.4 above. The investigation of the halves described in 13.4 above shows clearly that the cracks do not reach the core.

13.6 Galvanizing test

This test shall be performed according to IS: 2633/IS: 6745 on galvanized parts.

14) MARKINGS :

14.1 Each insulator shall be legibly and indelibly marked with the following details as per IEC- 61109:

- a) Name or trademark of the manufacturer.
- b) Voltage & Type
- c) Month and year of manufacturing.
- d) Min. failing load/guaranteed mechanical strength in kilo Newton followed by the word 'KN' to facilitate easy identification.
- e) Saubhagya 'Employer Name'. Marking

14.2 One 10 mm thick ring or 20 mm thick spot of suitable quality of paint shall be marked on the end fitting of each composite long rod of particular strength for easy identification. The paint shall not have any deteriorating effect on the insulator performance.

Following codes shall be used as identification mark:

For 45 KN long rod units : Blue

For 90 KN long rod units : Red

15) PACKING :

15.1 All insulators shall be packed in strong corrugated box of min. 7 ply duly palette or wooden crates. The gross weight of the crates along with the material shall not normally exceed 100 Kg to avoid hackling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season.

15.2 The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

15.3 Suitable cushioning, protective padding, or Dunn age or spacers shall be provided to prevent damage or deformation during transit and handling.

15.4 All packing cases shall be marked legibly and correctly so as to ensure safe arrival at their destination and to avoid the possibility of goods being lost or wrongly dispatched on account of faulty packing and faulty or illegible markings. Each wooden case /crate/corrugated box shall have all the markings stenciled on it in indelible ink.

15.5 The Manufacturer shall provide instructions regarding handling and storage precautions to be taken at site.

16) GUARANTEE

The Manufacturer of insulators shall guarantee overall satisfactory performance of the insulators. The manufacturer shall furnish in the form attached (Schedule 'A') all the guaranteed technical particulars.

GUARANTEED TECHNICAL PARTICULARS FOR 11 KV DISC INSULATOR

GUARANTEED TECHNICAL PARTICULARS FOR 11KV DISC INSULATOR			
Sl. No	Description No	Specified	Bidder's Offer

1	Type of insulator	Polymeric composite Disc Insulator	
2	Reference Standard	IEC 61109	

3	Material of FRP Rod	Boron free ECR	
4	Material of sheds	Silicon Rubber	
5	Type of metal end fittings	Ball & Socket	
6	Nominal Ball Pin Diameter	16 mm	
7	Material of end fittings	SGCI / MCI	
8	Material of sealing compound	RTV Silicon	
9	Colour of sheds	Grey	
10	Rated voltage	11 KV	
11	Highest voltage	12 KV	
12	Dry Power Frequency	60 KV	
13	Withstand voltage		
14	Wet Power Frequency Withstand voltage	35 KV	
15	Dry Power Frequency	75 KV	
16	Flashover Voltage		
17	Visible Discharge Voltage (PF)	9 KV	
18	Wet Power Frequency	45 KV	
19	Flashover Voltage		
20	Dry Lightning Impulse withstand voltage	Positive : 75 KV Negative :80 KV	
21	Dry Lightning Impulse Flashover voltage	Positive : 95 KV Negative : 100 KV	
22	RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition	< 50 microvolt	
23	Creepage distance (min)	320 mm	
24	Min Failing load	45 KN	
25	Dia of FRP Rod	16 mm	
26	Length of FRP Rod (min)	200 mm	
27	Dia of weather sheds	100 mm	
28	No of weather sheds (min)	Three	
29	Type of sheds	Aerodynamic	
30	Type of packing	Wooden/Corrugated	
		box	
31	No of insulator in each pack	Thirty	

32	Guarantee	24 months from commissioning or 30 months from the date of last despatch.	
33	Thickness of housing	3 mm	
34	Dry arc distance	170 mm	
35	Method of fixing sheds to housing	Injection moulding	

Signature of the Bidder with Seal

TECHNICAL SPECIFICATIONS LT XLPE AB CABLE

PART-I

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of LV overhead **ISI marked Aerial Bunched Cable (ABC)** of different sizes indicated in our Schedule of Requirements for use in the LV network of TPSODL.

The materials offered shall have been successfully type tested and the design shall have been in satisfactory operation for a period of not less than two years on the date of bid opening.

Compliance shall be demonstrated by submitting with the bid (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

However where the bidder offers similar but not identical material but higher size to that which has been type tested, the difference shall be stated in Test Certificate Schedule. The purchaser shall adjudge whether to accept or reject the offered material and type test data presented.

The scope of supply includes the provision of type tests. Rates for type tests shall be given in the appropriate price schedule of the bidding document and shall be considered for evaluation. The purchaser reserves the right to waive type tests as indicated in the section on Quality Assurance, Inspection and Testing in this specification.

The Aerial Bunched Cable shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.

1. STANDARDS:

Except where modified by this specification, the Aerial Bunched Cable shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

IES/ISO	Indian Standard	Material
IEC: 1089	IS: 398/1994	Round wire concentric lay Overhead electrical Stranded Conductors.
	IS: 398(Part-4)/1994	All Aluminum Alloy Conductors, Quality Management Systems. Conductors for insulated
ISO: 9000	IS: 8130/1984	Electric cables.
IEC: 502	IS: 10810/1984 IS: 7098/1998	Method of Tests for cables. XLPE Insulated PVC.
	IS: 14255/1995	Sheathed power cables. Aerial Bunched Cables for working voltage up to and including 1100 volts.

The Bidder may propose alternative standards, provided it is demonstrated that they

give a degree of quality and performance equivalent to or better than the referenced standards. The purchaser shall adjudge whether to accept or reject any standards.

The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard.

In case of conflict the order of the precedence shall be (1) IEC or ISO standards, (2) Indian Standards, (3) Other alternative standards. This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the TPSODL or the necessity of providing the goods complying with other relevant standards or recommendation.

3.0 SERVICE CONDITIONS:

The service conditions shall be as follows:

Maximum altitude above sea level 500m

Maximum ambient air temperature 50°C

Maximum daily average ambient air temperature 35°C

Maximum ambient air temperature 5°C Maximum temperature attainable by an object exposed to sun
60°C Maximum yearly weighted average ambient temperature 32°C Maximum
relative humidity 100%

Average number of thunderstorm days per annum 70

Average number of rainy days per annum 120

Average annual rainfall 150cm

Wind pressure as per IS: 5613(Part-I/Sec.I) 1985

Wind Zones IS:5613 Part-I/Sec-I	Light	Medium	Heavy
Terrain Category	100 Kg/m ²	150 Kg/m ²	200 Kg/m ²

Environmentally, the region 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.

Therefore, outdoor material shall be designed and protected for use in exposed, heavily polluted salty corrosive and humid coastal atmosphere.

4. SYSTEM CONDITIONS:

The materials shall be suitable for installation in supply systems of the following characteristics.

- Frequency 50Hz
- Nominal System Voltage 400/230V
- Maximum System Voltage LV System 440/250 V
- Minimum LV Voltage 370 V
- Power frequency one minute withstand 2KV (set & dry)
- Neutral Earthing arrangement LV System Solidly earthed

Part-2: TECHNICAL

5.0 GENERAL/ TECHNICAL

The design of Aerial Bunched Cable offered shall comprise a compacted, standard, hard drawn H2 / H4 grade aluminum phase conductor as applicable under IS-8130 / 84 with cross linked polyethylene (XLPE) insulation 0.65 to 1.1. KV class, having of **carbon black content 2.5% ± 0.5%.**

The sizes and number of cores required are: 3x50mm² + 1x35mm² + 1x16mm²

The type of Bunched Cables shall be three phase and street lighting insulated bundled. All Aluminum Conductors combined with a neutral and catenaries (bare) which shall be of heat treated aluminum magnesium silicon alloy wires containing approximately 0.5% each of magnesium and silicon respectively. The catenaries must have an ultimate tensile stress of not less than that specified in the table of technical requirements.

The Bidder shall specify the standard to which this bundle shall be manufactured.

The conductor bundle offered shall be designed to meet the requirements set out in this specification taking note of safety factors pertaining to conductor or catenary tensioning and TPSODL specification: General Technical Requirements for LV overhead lines.

However, a bid of Aerial Bunched Cables shall not be considered, unless it is accompanied by a list of all special tools and equipments necessary to complete the installation.

6.0 CONDUCTORS:

(a)The phase & street light conductors shall be of multi-stranded aluminum of compacted circular cross section. The aluminum shall comply with IS 8130:1984. The messenger conductor shall be of multi-stranded Aluminum Alloy conforming to IS 398 (Part 4) – 1994. In addition to meeting all requirement of relevant ISS the LT XLPE AB Cables supplied shall satisfy following general requirements.

FOR PHASE AND STREET LIGHT CONDUCTORS

Sl. No	Specified Cross Sectional Area (mm ²)	No. of Standards	Minimum m Dia Of each strand in mm	Minimum. Over all dia. Of conducting part of the Compacted conductor. (mm)	Maxm. D.C Resistance at 20 degree centigrade. (Ohm / Km)	Nominal Insulation thickness (mm)
1	16	7	1.75	5.25	As per ISS/GTP	1.2
2	25	7	2.14	6.42		1.2
3	35	7	2.54	7.6		1.2
4	50	7	3.05	9.15		1.5
5	70	19	2.18	10.9		1.5
6	95	19	2.54	12.7		1.5

FOR MESSENGER CONDUCTORS

6.0 (b) The bidder must take required precaution to ensure that the average diameter of each strand of conductor shall be ascertained through physical measurement of dimensions of finished cables at ambient temperature during pre-dispatch inspection or / and verification at TPSODL Store by consignee and the values obtained shall have a tolerance limit with reference to the nominal diameter of each strand of conductor as stated in the tables above.

Sl. No.	Phase Conductor Size of the LT AB Cable in mm ²	Specified Cross Sectional Area of the Messenger Conductor (mm ²)	No. of Strands	Nominal dia Of each strand	Appx. Over all dia. Of conducting part of the compacted conductor. (mm)	Maxm. D.C Resistance of the messenger at 20 degree centigrade.(Ohm / Km)	Appx. Mass (Kg / Km.) for the messenger
1	16	25	7	2.14	5.2	AS PER ISS/GTP	65
2	50	35	7	2.54	7.6		95
3	70	50	7	3.05	9.15		136
4	95	70	7	3.6	10.8		191.8

7.0 TOLERANCES:

The measurement of strand diameter of the finished AB Cable shall not be less 0.03mm for strands up to and including 3.00mm diameter. For strands above that size, measurement of strand diameter shall not be less than 1% of the nominal strand diameter.

For the purpose of checking compliance with the above requirement, the diameter shall be determined by two measurements at right angles taken at the same cross section. The physical measurement of strands shall be conducted after opening the strands of a finished AB Cable offered for inspection.

8.0 SPLICES IN WIRES:

Splices in Wires shall generally comply with requirements of IEC 1089.

The aluminum alloy rods may be spliced by cold pressure but welding before drawing provided the manufacturer can guarantee that the splice can develop 90% of the tensile strength of the unsliced rod. Wires which break during stranding may be sliced by cold pressure butt- welding provided that:

No two splices in the completed conductor occur within 15m of each other and no two splices in any individual wire are less than 150m apart.

The splice shall be done with high skilled workmanship. The finished splice shall be smooth and at no point shall the cross sectional area be less than that of the un sliced wire.

Splicing of the alloy wires on the stranding machine in order to utilize lengths of wires on reels shall not be

permitted.

9.0 STRANDING AND CORE LAY:

The conductor cores shall be stranded and the direction of lay must be as defined in IEC: 1089.

10.0 INSULATION:

The Aerial Bunched Cables shall be insulated for a voltage class of 0.65/1.1 KV and shall be capable of operating permanently at 1.2KV.

The insulation wall thickness shall be determined in accordance with Table-4 (Clause-7.2 and Clause 7.3) of IS: 14255/1995.

The insulating material shall be black and suitable to resist ultra violet radiation, salt laden sprays, chemical pollution, ageing effects, abrasion and mechanical shocks and mechanical and electrical stress at temperature up to 90°C in normal operation and 250°C under short circuit conditions per IEC: 502/1994.

The carbon black content in the XLPE insulation shall be **2.5% ± 0.5%**

11.0 PHASE IDENTIFICATION:

The individual insulated conductors within a bundle shall be identified by means of longitudinal projections.

The three phase conductors shall be marked by one, two or three longitudinal projections, indicating the R, Y, B phases .respectively.

The projections shall have the following dimensions.

- The distance between the tips of two adjacent projections, where there is more than one, shall be between 1.0 and 1.5.
- The width of the projection at the base shall be 1.0mm; and
- The height of the projections shall be 0.5mm.

12.0 INSULATION MARKINGS:

Each individual conductor comprising a bundle shall have the range of non-erasable distinct markings listed below legibly printed on the insulation surface at one meter intervals. The embossing should be very clear & easily visible to naked eye.

- ISI Mark, IS 14255-95, Manufacturer's B.I.S License No. legibly embossed on the insulation
- Name of the Purchaser.
- P.O No. & Date
- Manufacturer's trademark identification for example "UCXLPE50"
- Year of manufacture: last two digits are sufficient:
- Designation of conductor type
- Size: for example "3x50"

- Shape of conductor.
- Rated voltage class: 0.65/1.1KV
- Back up conductor identification: conductors with one, two and three projections shall be marked R, Y and B respectively. The conductor with no projection shall be marked N and
- The height of the printed lettering shall be not less than 20% of the overall diameter of the conductor

13.0 TWIST:

The direction of lay of the conductors comprising the bundle shall be left-handed and the lay ration shall comply with IEC: 1089.

With a bare catenaries configuration the insulated phase cables together with the street lighting cores shall be twisted round the neutral catenaries to form the ABC. This cable bundle is then strung directly onto the distribution poles supported by the catenaries with standard approved hardware.

14.0 CABLE DRUM LENGTH:

The cable shall be supplied in 500m or 1000 m Drum Lengths as the case may be for different sizes of LT XLPE AB Cable.

15.0 TESTS:

15.1 General

Where not specified, all tests and test results shall conform to the requirements of IEC 502/1994 or IS 7098 (Part-I) 1998, IS 10810/1984, IS: 398(Part-IV) and IS: 14255/1955.

Unless expressly stated otherwise, the ambient temperature for routine tests as well as voltage tests shall be $20 \pm 15^{\circ}\text{C}$ and for all other tests be $20 \pm 15^{\circ}\text{C}$.

The frequency of the alternating test voltage shall be 49 Hz to 51Hz. The voltage wave form should be sinusoidal.

15.2 Type Tests

The test sample shall be 10m to 15m in length. All cores of the bundles shall be tested.

- Insulation resistance at ambient temperature.
- Insulation resistance at operating temperature.
- AC voltage test.

The insulation resistance test at ambient temperature shall be carried out in a water bath at ambient temperature.

The insulation resistance test at a operating temperature shall be conducted in a water bath at 90°C.
The longitudinal projections used for phase identification shall be ignored. The results of this test shall

be used to calculate the volume receptivity and the results conform to the requirements of IEC: 502/1994 or IS 10810 (Part-43).

The AC voltage test shall be carried out by applying 1.95KV ($3U_0$) for four hours to the sample, which shall be submerged in a water bath at ambient temperature, having been steeped for a period not less than one hour. The test shall only be deemed to have been passed if no breakdown occurs.

Furthermore, the following non-electrical type tests shall also be carried out:

- Insulation wall thickness: the longitudinal projections used for phase 1 identifications shall be ignored as per IS 10810 (Part-6);

- Ageing test, consisting of an evaluation of the retention of the mechanical properties of the insulation after ageing.
- Wrapping test: as per IS 10810 (Part-3);
- Tests for bleeding and blooming of pigment as per IS 10810 (Part-9) Thermal expansion of insulation.
- Measurement of carbon black content as per IS 10810 (Part-32).
- Water absorption by the XLPE insulation, shrinking of the XLPE insulation.
- Tensile test: adhesion between conductor and insulation.

The adhesion test requires a tensile testing machine. A sample of at least 300mm length shall be selected and straightened out. The insulation shall be removed for a length of 150mm. The insulated end shall be held in the upper grip head and the bare conductor on the lower grip head. Tension shall be applied at a speed of 500mm/ min until the conductor first begins to slide within the insulation. The test shall have been passed if the conductor and insulation combination can stand 75N/mm² without slippage occurring.

The neutral conductor/catenaries shall be type tested in accordance with the requirements of IS-398 (Part-IV) 1994.

15.3 Routine Tests

The following measurement or tests shall be carried out on all drums and coils of Bunched cable:

- Conductor resistance
- Voltage test.

The conductor to be tested for conductor resistance shall be stored for at least 12 hours in a room at particular constant temperature. If it cannot be established that the conductors have reached the room temperature, the test should be postponed for a period of further 12 hours. Alternatively, the test can be carried out on short sample after remaining one hour in a temperature controlled water bath. The test shall be carried out and the conversion factors used to convert the resistance value to a base of 200°C and one Km. The DC resistance of each

Conductor shall not exceed the appropriate maximum values specified in IEC: 228/IS:6474.

The voltage test shall be conducted by applying to each core 3.5KV AC (2.5 U₀ plus 2 KV) or

8.4 KV DC for 5 minutes with the specimen lying in a water bath at ambient temperature. The conductor shall pass the test if no electrical breakdown occurs.

15.4 Acceptance Tests

The following sample check, measurements and test shall be carried out in addition to the Acceptance Tests as per IS 14255 – 1955, IS : 398 (Part – IV) 1994, IS 8130 / 1984

- Measurement of insulation wall thickness;
- Measurement of diameter of each strand, overall outside dia & Cross Sectional Area of the conducting Part out of the finished product during pre-dispatch inspection.

- Thermal expansion test;
- Check of physical characteristics
- Tensile strength of individual wires of conductor.
- High Voltage Test on drums immersed in water (apply voltage 3.5 KV AC for 5 min)

These tests should be carried out on one length from each production batch of the same sample.

The thickness of the insulation wall shall be measured on a piece removed from each end of the sample length. If either means or minimum values are not met, two further samples shall be removed at 0.5m from the end corresponding to the failed specimen. If these samples do not satisfy the mean and minimum thickness requirements, the test shall be deemed to have been failed.

The longitudinal projections used for phase identifications shall be ignored. The thermal expansion test need only be carried out on one core.

In relation to the tensile test, the tensile strength of the aluminum wires before stranding and that of the finished conductor shall comply with IEC: 1089.

15.5 Test on the Catenary (messenger) Conductor

Breaking load, elongation and resistance tests shall be completed on the aluminum alloy catenaries conductor in accordance with the requirements of IS: 398 (Part-IV)/1994 or IEC: 1089.

15.6 Bending Test on a complete cable

This test shall be performed on a sample of completed cable. The sample shall be bent around a test mandrel at room temperature for at least one turn. It shall then be unwound and the process shall be repeated after turning the cable sample around its axis by 180°. This process shall be repeated twice more. There shall be no signs of breaking or cracking of the cable insulation during this test.

The diameter of the mandrel shall be:

$$10 (D+d)$$

Where D = Actual diameter of the cable (mm)

d = Actual diameter of the conductor (mm)

15.7 Rejection and Retests

Should any one of the test pieces first selected fail to pass the tests, two further samples from the same batch shall be selected for testing, one of which shall be from the length from which the original test sample was taken unless the length has been withdrawn by the supplier.

Should the test pieces from both of these additional samples satisfy the requirements of the tests, the batch

represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed to have failed.

16.0 COMPLIANCE WITH SPECIFICATION:

The Aerial Bunched Cable shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of bidding in the Non-compliance Schedule of this document.

17.0 COMPLIANCE WITH REGULATIONS:

All the cables shall comply in all respects with the Indian Regulations and Acts in force. The cables and connections shall be designed and arranged to minimize the risk of fire and any damage, which might be caused in the event of fire.

18.0 NON-CONFORMING PRODUCT:

The Purchaser reserves the right for decisions regarding acceptance, modification or rejection of non-conforming items.

19.0 INSPECTION AND TESTING:

The Purchaser or his authorized representative has free entry at all times, while work on the contract is being performed, to all parts of the manufacturer's works which concerns the processing of the cables ordered. The manufacturer shall afford the purchaser or his authorized representatives without charge, all reasonable facilities to ensure that the cable being furnished is in accordance with these specifications.

The cables shall successfully pass all the routine tests & acceptance Tests referred to in the section on tests and those listed in the most recent edition of the standards given in the specification.

The Purchaser reserves the right to reject any of the cables if the test results do not comply with the values specified or with the data given in the Technical data schedule.

Type Test Certificates for the tests conducted earlier shall be submitted with the bid for evaluation. The requirements of additional type tests will be at the discretion of the Purchaser

The Purchaser shall witness routine tests. In order to facilitate this, the TPSODL shall give the purchaser of 15 days notice that the material is ready for inspection & testing. The supplier shall extend all assistance to the representative of the Purchaser during his inspection & testing of samples at his works. The materials shall be dispatched only after approval of such Test Reports and issue of Dispatch clearance by the Purchaser. However the Purchaser reserves the right to retest the materials after delivery at any NABL Accredited Testing Laboratory in case of any disputes regarding size & quality of supplied materials at a later date during guarantee period. The cost of such retesting shall be borne by the supplier.

All costs in connection with the testing, including any necessary retesting shall be borne by the TPSODL, who shall provide the Purchaser with all the test shall have the right to select the samples for test and shall also have the right to ensure that the testing apparatus is correct. Measuring apparatus for routine tests shall be calibrated at the expense of the TPSODL at an approved laboratory and shall be approved by the purchaser before testing.

The TPSODL shall be responsible for the proper testing of the materials supplied by sub- TPSODL to the same extent as if the materials were completed or supplied by the TPSODL.

Any cost incurred by the Purchaser in connection with inspection or retesting as a result of failure of the

equipment under test or damaged during transport or off loading shall be to the account of the TPSODL.

The TPSODL shall submit to the Purchaser three signed copies of the test Certificates, giving the results of the tests as required. No materials shall be dispatched until the Purchaser has received the test certificate and the TPSODL has been informed that they are acceptable.

The test certificate must show the actual values obtained from the tests, in the units used in this specification, and must merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in this specification, the TPSODL shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

No inspection or lack of inspection or passing by the Purchaser's representative of equipment or materials whether supplied by the TPSODL or sub- TPSODL, shall relieve the TPSODL from his liability to complete the contract works in accordance with contract or exonerate him from any of his guarantees.

20.0 GUARANTEE:

The TPSODL shall guarantee the following:

- Quality and strength of materials used.
- Satisfactory operation during the guarantee period of 24 months from the date of commissioning or 30 months from the date of receipt of the cables at TPSODL's store whichever is earlier.
- Performance figures as supplied by the bidder in the technical data sheet.

21.0 PACKING AND SHIPPING:

The cable shall be wound on strong drums or reels capable of withstanding all normal transportation and handling.

Each length of cable shall be durably sealed before shipment to prevent ingress of moisture. The drums reels or coils shall be lagged or covered with suitable material to provide physical protection for the cable during transit or during storage and handling operations.

In the case of steel drums adequate precautions shall be taken to prevent damage being caused by direct contact between the cable sheath and the steel. These precautions shall be subject to the approval of the Purchaser

- If wooden drums are used then the wood shall be treated to prevent deterioration from attack by termites and fungi.
- Each drum or reel shall carry or be marked with following information:
- Individual serial number
- Standard ISI Mark, 14255-95, Manufacturer B.I.S License No. Name of the Purchaser :
TPSODL

- Destination
- Purchase Order No. & Date Manufacturer's name
- Year of manufacture Cable size and type
- Length of conductor (meters)
- Net and Gross mass of conductor (Kg)
- All necessary slinging and stacking instructions Destination
- Country of origin
- The direction of rolling as indicated by an arrow shall be marked on a flange.

22.0 STORAGE:

The site selected for the storage of cable drums shall be well drained and preferably have a concrete/ firm surface which will prevent the drums sinking into the ground or being subjected to excess water thus causing flange rot.

All drums shall stand on battens, in the upright position and in such a manner to allow sufficient space between them for adequate air circulation. During storage the drums shall be rotated 90° every three months. In no instances shall be the drums be stored "flat" on

their flanges or one on top of each other.

23.0 SHIPPING:

The TPSODL shall be responsible for the shipping of all cables, drums and reels supplied from abroad to the ports of entry and for the transport of all goods to various specified destinations including customs clearance, off loading, warehousing and insurance.

The TPSODL shall inform himself fully as to all relevant transport facilities and requirements and loading gauges and ensure that the equipment as packed for transport shall conform to these limitations. The TPSODL shall also be responsible for verifying the access facilities specified.

The TPSODL shall be responsible for transportation of all the loads associated with the contract and shall take all reasonable steps to prevent damage of any highway or bridges by his vehicles by selecting routes, choosing proper vehicles for use and restricting and distributing loads to avoid the risk of damage. The TPSODL shall immediately report to the Purchaser any claims made against the TPSODL arising out of alleged damage to a highway or bridge.

All items of equipments shall be securely clamped against movement to ensure safe transit from the manufacturer's facilities to the specified destinations.

24.0 HAZARDOUS SUBSTANCES:

The TPSODL shall submit safety data sheets for all hazardous substance used with the equipment. The TPSODL shall give an assurance that there are no other substances classified as hazardous in the equipment supplied. He shall also take responsibility for the disposal of such hazardous substances that may be found for any

injuries resulting from those substances.

25.0 SUBMITTALS:

The following shall be required in duplicate along with the bid:

- Completed technical data sheets;
- Descriptive literature giving full technical details of equipment offered.
- Outline dimension drawing for each type of conductor, for each bundle showing the conductor strand, composition and the bundle twist;
- Type test certificates, where available, and sample routine test reports;
- Detailed reference list of customers already using equipment offered during the last five years with particular emphasis on units of similar design and rating;
- Performance reports from the customers for the supplied LT XLPE AB Cables.
- Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certificates;
- Deviations from this specification to be submitted as per Non-Compliance. Only deviations approved in writing before award of contract shall be accepted;
- List of recommended spare parts for five years of operation with prices and spare parts catalogue with price list for future requirements.
- Any other documents to establish qualifying & credibility requirements as specified in this Tender Document.

26.0 PERMANENT EMBOSSING:

All materials supplied under this tender shall bear distinct mark of "TPSODL Utility", and Purchase Order No. & Date, length marking in meter "by way of embossing /enamel painting etc. including other information mentioned in GTP. This should be clearly visible to naked eye.

GUARANTEED TECHNICAL PARTICULARS FOR 3X50+1X35 +1X16 MM ² LT XLPE AB CABLE.			
Sl. No	Description No	Specified	Bidder's Offer
1	Ref. ISS / IEC followed	IS 14255/95, IS 398 Part IV	
2	Phase Conductor material / Insulation type	H2 / H4 E.C grade aluminium as per IS 8130/84 / XLPE insulation (IS 14255/95)	
3	Material of Neutral Catenary	Aluminum alloy as per IS 398 Pt - IV	
4	Voltage Class	0.65/1.1 KV	

5	No. of Strands of Phase Conductor	7	
6	No. of strands/ Average /Minimum Strand Dia. In mm. (Finished Phase conductor.)	7/3.05	
7	Approximate Overall Dia. Of compacted phaseconductor after removal of insulation.(in mm.)	9.15	
8	No. of Strands / Average Strand Dia. In mm. (Neutral Catenary.)	7/2.54	
9	Minimum Overall Dia. Of compacted Bare Neutral	7.62	
11	No. of Strands / Average strand dia. / Nomunal cross sectional area of conducting part In No / mm2.	7/1.75/16mm2	
13	Minimum average thickness of insulation of phase Cond. (mm)	1.5	

14	Minimum thickness of insulation of Phase Cond. At any point (mm)	1.25	
15	Minimum thickness of insulation at any point in street light conductor (mm)	0.98	
13	Maximum DC resistance of Phase conductor at 20 o C	0.64	
14	Maximum DC resistance of street light conductor Ω / Km	1.91	
15	Maximum DC resistance of neutral cond. Ω / Km	0.986	
16	Ultimate tensile strength of neutral conductor (KN)	14	
17	Maximum temperature (Continuous)	90° C for phase and 70° C for neutral	
18	Embossing on insulation at each one meter interval	Distinct Non-erasable ISI mark, IS 14255-95, Manufacturer's B.I.S License No., name of the purchaser, Name of the manufacturer, Size of cable, Voltage grade along with sequential marking of length	
19	Cable drum length	500/1000m	
20	Volume Resistivity of insulation at 27°C	$1 \times 10^{13} \Omega$ - cm min.	
21	Volume Resistivity of insulation at 70°C	$1 \times 10^{11} \Omega$ - cm min.	

Signature of the bidder with Seal

Suspension Clamp Dead End Clamp Pole Clamp with Eye Hook

1.0 Scope

This specification covers the design, manufacture, assembly, testing and supply of Suspension Clamp, Dead end Clamp & Eye hook for making connections to Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene.

2.0 Standard

The design, performance and test requirements shall confirm to this specification and the following standards. However in case of any conflict, the requirements of this specification shall prevail.

- 1) REC Specification 32/1984
- 2) REC Specification 84/2010 (dead end & Suspension clamp)

The devices shall also be compatible with the cables of sizes & dimensions as defined in the cable Specifications for the cables with which they are intended to be used.

3.0 Type Test

For all accessories, the Type Test Report should be submitted from an Independent NABL Accredited Laboratory like CPRI

The Test report shall include the Model Number, Applicable size Range, and GA Drawing showing the principal parts and dimensions of the connector.

4.0 Acceptance Test

The Acceptance Tests & sampling plan to be conducted as per REC Spec. 83/ 2010 and as per relevant IS Specifications.

4.4 Drawings & Samples:

GA drawing and other particulars along with samples are to be submitted along with offer.

ANCHOR (DEAD END) & SUSPENSION CLAMPS

5.0 Scope

This specification covers the design, manufacture, assembly, testing and supply of Accessories for anchoring & suspending Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene and aluminum alloy bare messenger.

Sl. No	Description	Application
	Dead end Clamp (as per REC Construction standard E-35)	For fitting onto a pole for anchoring the end of a length of ABC, or for a major change in direction.
b)	Suspension Clamp (Bolted Type as per REC Construction standard E-34)	For supporting a length of ABC at an intermediate pole in a length, with small angle of deviation.

5.1 Cable Data

The standard sizes and characteristics of the phase and street lighting conductors, messenger wires shall be as specified in REC specification 32/1984 or IS: 14255-1995.

The strength of the messenger shall be not less than the Value shown in Table 1.

Table-1

Conductor Size (mm ² .)	Messenger Rating (as per IS 14255)
35	9.8 KN
70	17.5 KN

5.2. Marking / Embossing

Anchoring Clamp, Suspension clamp should bear

- Manufacturers trade mark and logo
- Name of Purchaser, P.O. No. & Date.
- Product Code or Reference
- Traceability Code/Batch Number

5.3. Type Test

For Dead End & Suspension clamps, the Type Test Report s should be submitted from an Independent NABL Accredited Laboratory / CPRI as per REC Spec-84/2010.

5.4 Acceptance Tests

The Acceptance Tests & sampling plan to be conducted as per REC Spec. 84/ 2010. & as per relevant IS Specifications.

5.5 Drawings & Samples:

GA drawing and other particulars along with samples are to be submitted along with offer.

6.0 EYE HOOKS

- a) Eye hooks shall be as per REC construction standard E-35 (Type – A)
- b) It should be made of forged hot dip galvanized steel as per IS-1570
- c) The clamp corrosion resistance should conform to standards IS 2629 & IS 2633.

d) Minimum breaking Load should be 20 KN.

6.1 Type Test

For Eye hooks, the Type Test Report s should be submitted from an Independent NABL Accredited

Laboratory / CPRI as REC Spec-32/1984 & 84/2010 and as per relevant IS Specifications.

6.2 Acceptance Tests

The Acceptance Tests & sampling plan to be conducted as per REC Spec. 32/ 1984. & 84/2010 and as per relevant IS Specifications.

6.2 Drawings & Samples:

GA drawing and other particulars along with samples are to be submitted along with offer.

<u>GUARANTEED TECHNICAL PARTICULARS FOR SUSPENSION CLAMP FOR BARE MESSENGER WIRE</u>		
Sl. No.	Description	Guaranteed particulars to be submitted by the Vendors along with offer
1	Name and address of the manufacturer	
2	Applicable standard	
3	Type of clamp	
4	Type of design	
5	Voltage Grade(kV)	
6	Loop anchor attachment(open/close)	
7	Installation (with/without dis-assembly)	
8	Type & grade (metallic/non-metallic material)	
9	Type of hot dip galvanizing & thickness	

	of Zinc coating	
10	Marking	
11	Colour of non-metallic parts	
12	Dimensions	
13	Approximate weight	
14	Minimum Breaking Load (KN)	
15	Maximum allowable load(KN)	
16	Max. angle of deviation of conductor (degrees)	
17	Method of casting	
18	Are GA drawing & samples enclosed	

Signature of the bidder with Seal

<u>GUARANTEED TECHNICAL PARTICULARS FOR DEAD END CLAMP FOR BARE MESSENGER WIRE</u> <u>(To be submitted along with offer)</u>		
Sl..	Description	Guaranteed particulars to be submitted by the Vendors
1	Name and address of the manufacturer	
2	Applicable standard	
3	Type of clamp	
4	Type of design	
5	Voltage Grade(kV)	
6	Loop anchor attachment(open/close)	
7	Installation (with/without dis-	

	assembly)	
8	Type & grade (metallic/non-metallic material)	
9	Type of hot dip galvanizing & thickness of Zinc coating	
10	Marking	
11	Colour of non-metallic parts	
12	Dimensions	
13	Approximate weight	
14	Ultimate tensile strength(KN)	
15	Maximum allowable load(KN)	
16	Slip Strength (KN)	
17	Method of casting	
18	Operating temperature (deg.cent)	
	a) Continuous Operation	
	b) Short circuit condition	
19	Are GA drawing & samples enclosed	

Sig nature of the bidder with Seal

Barbed wire

Guaranteed Technical Particulars of Eye Hook		
Sl. No.	Description	Guaranteed Technical Particulars submitted by Vendors
1	Name and Address of the Manufacturer	
2	Type of Hooks	
3	Maximum weight span for 4x95's Maximum weight span for 4x50's	
4	Horizontal pull out load	
5	Types of Facades for which it is suitable	
6	Stand off from Facade	
7	Method of fixing to Façade	
8	Installation(with/without disassembly)	
9	Type and grade of Metallic Material	
10	Type of Hot Dip Galvanizing Thickness of Zinc Coating	
11	Markings:- As specified in IEC - 947	
12	Dimensions	
13	Net Weight	
14	Ultimate tensile strength	
15	Acceptance tests	

TECHNICAL SPECIFICATION

FOR G.I. BARBED WIRE

STANDARDS:

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the G.I. Barbed wire shall conform to the latest revisions available at the time of placement of order of all the relevant standards but not limited to as listed below.

- IS:280:1978 Mild steel wire for general engineering purposes (*third revision*)
IS:1340:1977 Code of practice for chromate conversion coating of zinc and cadmium coated articles and zinc base alloys (*first revision*)
IS:1521:1972 Method for tensile testing of steel wire (*first revision*) IS:1755:1983 Method for wrapping test for metallic wire (*first revision*)
IS:2633:1986 Method for testing uniformity of coating of zinc coated articles (*second revision*) IS:4826:1979 Hot dipped galvanized coating on round steel wires (*first revision*) IS:12753:1989 Electro galvanized coatings on round steel wire – Specification

3. GENERAL TECHNICAL REQUIREMENTS:

GI Barbed wire shall be 2 PLY with a 2.5mm diameter. The barbs shall have a 2mm diameter and be 12.5mm in length. The barbs shall have four points and shall be formed by twisting two point wires, each two turns, tightly around both line wires making altogether four complete turns.

G.I Barbed wire shall be of type IOWA with size and dimensions as under:-

Line wire	-	2.5 mm
Point wire	-	2.0 mm

Distance between two bars shall be 75 mm (+ 12 mm).

SPECIFIC TECHNICAL PARTICULARS FOR 2.5 MM X 2.0 MM G.I. BARBED WIRE

Sl.No.	Particulars	Particulars Specified	Bidders Offer
1	Size of wire- mm	Line wire- 2.5 mm + 0.08 mm Point wire- 2.0 mm + 0.08 mm	
2	Type of Barbed Wire	Iowa Type	
3	Tensile strength of line wire	390 to 590 N/mm ²	
4	Minimum breaking load of completed Barbed wire	3.7 KN	
5	Mass of complete Barbed wire (minimum)	115 gms / Mtr.	
6	Distance between two Barbs	(75 + 12) mm	
7	No. of lays between the Barbs (minimum)	4	

8	Method of Galvanizing	Hot dipped according to IS:4826 /1979 with medium coating.	
9	Mass of coating (minimum)	Line wire- 110 gms/Mtr ² Point wire- 105 gms/Mtr ² (testing after barbing)	
10	No. of dips the wire is able to withstand without copper coating	(testing after barbing)	
	A) For Line Wire	2 dip in Min	
	B) For Point Wire	2 dip in Min	

Signature of the bidder with Seal

SUB-STATION FENCING WITH BARBED WIRE:

For Sub-Station fencing with Barbed wire refer attached Drawing

MATERIALS HANDLING AND INSURANCE

The TPSODL shall deliver all equipment/materials against this contract to his site stores under cover of Transit Insurance to be taken in his name. Cost of such insurance is to be borne by the TPSODL.

Cost of transportation of all materials from TPSODL's store to the site of work as well as department supply items like Conductors, AB cables, Power cables, etc shall be borne by the TPSODL irrespective of mode of transportation and site condition. The TPSODL has to bear the cost of premiums on insurance for all materials, tower accessories and total erection cost of the line including cement, rods for foundation.

It will be the responsibility of the TPSODL to report to the concerned Police Station about all incidents of thefts and lodge, pursue and settle all claims with Insurance Company in case of damage/loss due to theft, pilferage, flood and fire etc. and the employer of the work shall be kept informed promptly in writing about all such incidents. The loss, if any, on this account shall be recoverable from the TPSODL if the claims are not lodged and properly pursued in time or if the claims are not settled by the insurance company due to lapses on the part of the TPSODL. The TPSODL shall have to replenish promptly damaged, stolen tower members and accessories conductors, earth wire, hardware"s etc. and repair/re-erect the damaged lines, free of cost to the employer so as to maintain the programme of work. The employer will not be responsible in any way for such loss of materials.

TECHNICAL SPECIFICATIONS FOR 11 KV COVERED CONDUCTORS

INTRODUCTION:

These Specifications lay down the Constructional, Dimensional and Performance Requirements for Covered Conductors which consist of a Conductor surrounded by a Covering made of Insulating Material (as described

hereunder) as protection against Accidental temporary Contacts with Grounded Parts such as Tree Branches and with other Covered Conductors and etc.

CONSTRUCTION REQUIREMENTS:

1) CONDUCTOR:

CONDUCTOR MATERIAL: Aluminium Alloy (AAAC)

NOMINAL CROSS SECTION: 99 sq mm for AAAC

CONDUCTOR DESIGN: The Conductor shall be stranded, round and should be Non Compacted.

Non Compacted Conductors shall comply with all the requirements of EN 50397- 1-2006.

The D.C. Resistance of the conductor shall not exceed that given in EN 50397-1- 2006 by more than 5%.

2) FILLING (WATER BLOCKING):

The Stranded Conductor shall be longitudinally water blocked by means of a water blocking material incorporated during the extrusion process. The use of

grease / water swellable tape / water swellable powder etc is not permitted. The water blocking material shall be stable at maximum operating conductor temperature of 90 Deg. Centigrade.

The water blocking compound shall be compatible with the conductor material aswell as the semi conducting polymer screen layer above it and not adversely affect its electrical or mechanical properties.

3) SEMICONDUCTING SCREEN:

A semi conductive polymeric screen should be applied over the filled stranded conductor to ensure a lower voltage stress on the Insulation applied over the screen.

The thickness of the semi conductive polymeric screen should be between 0.2 mm and 0.4 mm.

4) INSULATION:

The Insulation should be dual layered with the Inner Layer being XLPE with a nominal thickness of 1.2 mm for voltage 11KV and the Outer Layer being a suitable Polymer which is UV Resistant, Non Tracking and Erosion Resistant with a nominal wall thickness of 1.1 mm for Voltage 11KV. The nominal combined Insulation Thickness of both Layers should be 2.3 mm for 11 KV.

The conductor manufacturing and stranding process shall incorporate the longitudinal water blocking also.

The Semi Conducting Screen, Inner Insulation and Outer Insulation should be extruded in one step i.e. triple extrusion to ensure a good, permanent bond between the three layers and also with the conductor.

It shall be possible to remove the Semi Conducting Screen, Inner and Outer Insulation Layers without damage to the conductor, but there shall be no slippage between the layers.

The Cross Section of a Covered Conductor with AAAC Conductor as shown in the figure.

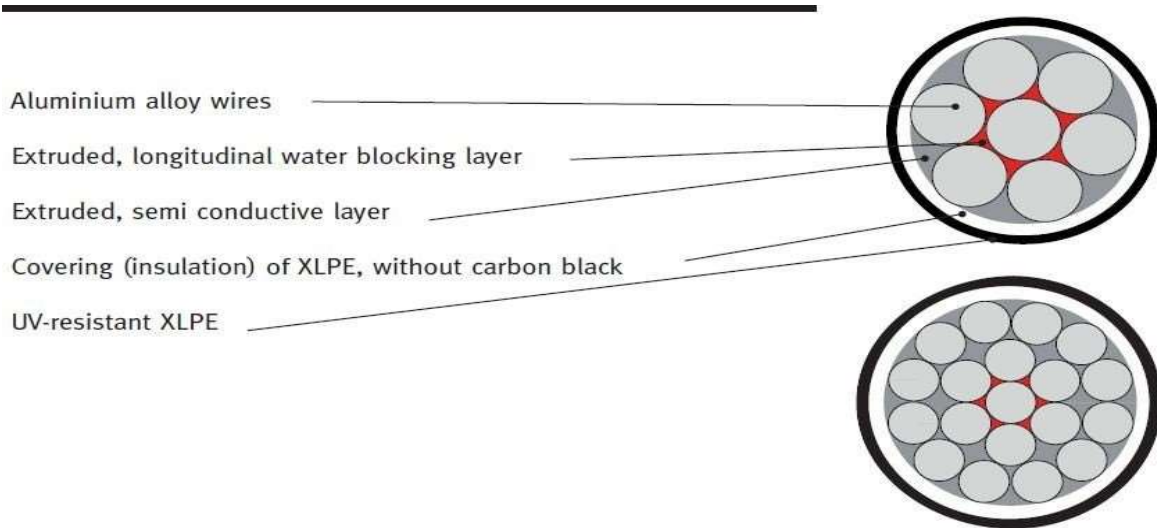


FIGURE (AAAC)

5) INSULATION MARKING / EMBOSSING :

Each individual cable shall have the markings on insulation at 1 mtr intervals listed below :-

- Purchaser's Name : TPSODL Utility
- Manufacturer's trademark :
- Year of manufacture :
- Designation of Cable Type :
- Size of Cable :

The height of printed lettering shall be not less than 20% of the overall diameter of the conductor.

6) TYPE TESTS:

TEST FOR COVERED CONDUCTORS as per EN 50397-1-2006

- Conductor Resistance Test
- Thickness of Insulation & Covering
- Tensile strength
- Percentage Elongation at break of Insulation before ageing, after ageing &

Completed

- v. Cable ageing Carbon black content test on outer covering (If applicable) Shrinkage test on outer covering.
- vi. Shrinkage test on Insulation
- vii. Hot set test on Insulation
- viii. Water Absorption test on Insulation
- ix. Test for longitudinal watertightness
- x. AC High Voltage test
- xi. Leakage Current Measurement
- xii. Tracking Resistance test
- xiii. Slippage Test
- xiv. Marking :

ELECTRICAL TESTS:

A) Conductor Resistance Test: To be done as a Routine as well as Type Test as per EN 50397-1-2006.

B) High Voltage Test as per EN 50397-1-2006. – Type test

Test Voltage --- Phase to Phase Voltage of the System for which the Covered Conductor is used. No. of Specimens --- One

Length of Specimen (minimum) 5 metres

Duration of Immersion in Water (minimum)----- 1 Hour

Temperature of Water (20 +/- 5) Degrees Centigrade Test

Duration ----- 4 Hours for Routine Test

48 Hours for Type Test Requirement: No Breakdown

C) Spark Test on Covering: Routine test

Test Voltage 0.7 X Phase to Phase Voltage of System (A, C,) or Phase to Phase Voltage of System (D. C.)

Requirement: No Breakdown

D) Leakage Current Test - Type test

Test Voltage 0.7 X Phase to Phase Voltage of System (A. C.) Requirement: Maximum Leakage Current 1mA

E) Tracking Resistance: - Type test

NON – ELECTRICAL TESTS ON COVERING: Type tests

A) Mechanical Properties :

a) Before Ageing of Sample: As per Table 1 (as per EN 50397-1-2006)

b) After Ageing of Sample: As per Table 1 (as per EN 50397-1-2006)

c) Ageing of Complete Product Sample: As per Table 1 (as per EN 50397-1-2006)

d) Hot-Set-Test: As per Table 1 and in accordance to (as per EN 50397-1-2006)

e) Pressure Test at High Temperature: As per Table 1 and in accordance with EN 60811- 3-1, Sub Clause 6.1.

h) Water Absorption: As per Table 1 and in accordance with EN 50397-1-2006

TEST FOR LONGITUDINAL WATER TIGHTNESS

a) As Type Test with Heat Cycle and in accordance with 50397-1-2006.

No of Specimen – 1

Length of Specimen – 3 metres

Test Duration -- 24 hours

Bending Radius – 20 X Diameter of Covered Conductor Requirement – No Leakage

b) As Routine Test without Heat Cycle and in accordance with IEC 60502 -2

No of Specimen – 1

Length of Specimen – 1 metre

Test Duration – 1 Hour

7) MARKING:

The packed cable drum having length of 500 mtr. -1000 mtr. shall carry the following information, clearly painted or stenciled

- a) The letters TPSODL Utility
- b) Reference to Standard and ISI mark
- c) Manufacturer's Name or trade mark.
- d) Type of cable & voltage grade
- e) Number of cores
- f) Nominal cross-sectional area of conductor.
- g) Cable code
- h) Length of cable on the drum
- i) Gross weight
- j) Country of Manufacture
- k) Year of Manufacture
- l) Purchase order and date
- m) Address of consignee

8) Guaranteed Technical Particulars (GTP)

Bidder shall confirm by signing with stamp on the GTP

GUARANTEED TECHNICAL PARTICULARS OF 11KV INSULATED CONDUCTOR		
SI No.	Parameters	offered Values for specified covered conductor
1	Cable Size	
2	Manufacturer & Address	
3	Trade Name	
4	Conductor type	
5	Applicable specification & Standards	
6	Voltage Class	
7	Lay up of Conductors (mm)	
8	Conductor Dia (mm)	

9	Inner Semiconducting Layer thickness (mm)	
10	Inner XLPE Layer thickness (mm)	
11	Outer UV Resistance - XLPE Thickness (mm)	
12	Over all diameter (Min-Max) (mm)	
13	Weight (Kg/Km)	
14	Rated Operated Voltage (KV)	
15	DC-resistance at 20 Degree C, Maximum (Ohm/KM)	
16	Resistance Temperature coefficient (/OC)	
17	Lightening Impulse withstand strength of XLPE Layer (KV)	
18	Maximum Continuos Operating temperature (OC)	
19	Max load(IEC 61597), cond.temp 80 °C, air temp. 40 °C, wind speed 0.5 m/s, Solar radiation 1045W/m ² , Approximate value (A)	
20	Max short circuit current, 1 sec (KA)	
21	Tensile Strength of Conductors (kN)	
22	Conductor/ Insulation Screening	
i)	Type	
ii)	Material	
iii)	Nominal thickness	
iv)	Continuous working temperature	
23	Drum length	

Name & Signature of Bidder with Seal

Other Requirements

The offered triple extruded AAAC (AlMgSi alloy) conductor shall be suitable for use under operating condition as specified below:

1. Ambient air temperature : 40 deg C
2. Maximum temperature of conductor at rated current : 80 deg C
3. Wind condition at site : 0.5 meter / sec
4. Solar radiation at site : 1045 watts / sq m
5. Maximum allowable temperature under Short circuit condition : 250 deg C

TECHNICAL SPECIFICATION OF ALL ALUMINIUM ALLOY CONDUCTOR (AAAC)

1. SCOPE

This specification covers design, Engineering, Manufacture, Testing, Inspection before dispatch, forwarding, packing, transportation to sites, Insurance (both during transit & storage), storage, erection, supervision testing & commissioning of all sizes of All Aluminum Alloy Conductors of the aluminum – magnesium- silicon type for use in the distribution overhead power lines of TPSODL of Orissa.

The material offered shall have been successfully type testes and the design shall have been satisfactory operation for a period not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type test, Rates of type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation. The Purchaser reserves the right to waive type tests as indicated in the section on Quality Assurance, Inspection and Testing in the specification.

The Aluminum Alloy Conductor shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or materials, which, in his judgment, is not in full accordance therewith.

2. STANDARDS

Except where modified by the specification, the Aluminum Alloy Conductor shall be designed, manufactured and tested in accordance with latest editions of the following standards.

IEC/ISO/ Other International Standard	IS	Subject
IEC :1089		Round wire concentric lay overhead electrical standard conductors
	IS 398	Aluminum Alloy Stranded Conductors
	IS 9997	Aluminum Alloy redraw rods for electrical purposes
IEC 502 : 1994		Extruded solid dielectric insulated power cables for rated voltages 1.0 KV up to 30 KV
IEC 104		Aluminum Magnesium Silicon alloy wire for overhead line conductors
	IS 1778	Reels and drums of bare conductor.
BS : 6485-1971		PVC covered conductors for overhead power lines.

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the TPSODL of the necessity of providing the goods complying with other relevant standards or recommendations.

3. GENERAL

The wires shall be of heat treated aluminum, magnesium silicon alloy containing approximately silicon-0.5 to 0.9 %. magnesium-0.6 % to 0.9%, Fe-0.5% (maximum) , Copper- 0.1% (max) , Mn- 0.03% , Cr-0.03%, Zn- 0.1%, B-0.06%, and having the mechanical and electrical properties specified in the table and be smooth and free from all imperfections, such as, spills, splits and scratches.

Neutral grease shall be applied between the layers of wires. The drop point temperature of the grease shall not be less than 120⁰ C.

3.1 Mechanical and Electrical Characteristics of Aluminium Alloy Wires used in the Construction of Stranded Aluminium Alloy Conductors

Nominal Diameter	Minimum Diameter	Max. Diameter	Cross Sectional Area	Mass	Minimum Breaking Load		Maximum Resistance at 20 ⁰ C
					Before stranding	After stranding	
1	2	3	4	5	6	7	8
Mm	mm	mm	mm ²	Kg/km	KN	KN	ohms/km
3.81	3.77	3.85	11.40	30.78	3.52	3.34	2.938
3.94	3.90	3.98	12.19	32.92	3.77	3.58	2.746
4.26	4.22	4.30	14.25	38.48	4.40	4.18	2.345
2.5	2.47	2.53	4.909	13.25	1.52	1.44	6.845
3.15	3.12	3.18	7.793	21.04	2.41	2.29	4.290

Maximum resistance values given in column 8 have been calculated from the maximum values of the resistivity as specified and the cross sectional area based on the minimum diameter.

The minimum breaking load is calculated on nominal diameter at ultimate tensile strength of 0.309 KN / mm² for wire before stranding and 95% of the ultimate tensile strength after stranding.

4. PHYSICAL CONSTANTS FOR ALUMINIUM ALLOY WIRES

4.1 Resistivity :

For the purpose of this specification, the standard value of resistivity of aluminum alloy wire which shall be used for calculation is to be taken as 0.0325 ohm mm² /m at 20⁰ C. the maximum value of resistivity of any single wire shall not , however, exceed 0.0328 ohm. mm²/m at 20⁰ C

4.2 Density :

At a temperature of 20° C, the density of aluminum alloy wire is to be taken as 2700 kg/m³.

4.3 Temperature Coefficient of Linear Expansion :

The temperature coefficient of linear expansion of aluminium alloy wire is to be taken as $23 \times 10^{-6} / ^\circ \text{C}$

4.4 Constant – Mass Temperature Coefficient

At a Temperature of 20° C, the constant – mass temperature coefficient of resistance of aluminum alloy wires, measured between two potential points rigidly fixed to the wire, is taken as 0.00360/° C

5. STANDARD SIZES

5.1 Nominal Sizes of Wires

The aluminum alloy wires for standard constructions covered by this specification shall have the diameters as specified in the table and a tolerance of $\pm 1\%$ shall be permitted on the nominal diameter.

5.2 Standard Conductors

The sizes, resistance and masses (excluding the mass of grease) of stranded aluminum alloy conductors shall be as given in table.

5.3 Mechanical and Electrical Characteristics of Aluminum Alloy Stranded Conductors

Sl. No.	Actual Area	Stranding and Wire Dia	Approx. Overall Dia	Approx. Mass	Calculated Maximum Resistance at 20° C	Approx Calculated Breaking Load
1	2	3	4	5	6	7
	Mm ²	mm	mm	kg/km	ohms/km	KN
1	34	7/2.50	7.5	94	0.990	10.11
2	55	7/3.15	9.45	149.2	0.621	16.03
3	80	7/3.81	11.43	218.26	0.4250	23.41
4	100	7/4.26	12.78	272.86	0.3390	29.26
5	232	19/3.94	19.70	636.67	0.1471	68.05

5.3.1 Increase in Length due to Stranding

When straightened out, each wire in any particular layer of a stranded conductor, except the central wire, is longer than the stranded conductor by an amount depending on the lay ratio of

that layer. Resistance and Mass of Conductor

The resistance of any length of stranded conductor is the resistance of the same length of any one wire multiplied by a constant as set out in the table below.

The mass of each wire in any particular layer of the stranded conductor, except the central wire, will be greater than that of an equal length of straight wire by an amount depending on the lay ratio of that layer. The total mass of any length of an aluminum stranded conductor is, therefore, obtained by multiplying the mass of an equal length of straight wire by an appropriate constant as mentioned below. In calculating the stranding constants as mentioned in the table below, the mean lay ratio, that is the arithmetic mean of the relevant minimum and maximum values in table for lay ratio has been assumed for each layer.

5.3.2 Calculated Breaking Load of Conductor

- For a conductor containing not more than 37 wires, 95% of the sum of strength of the individual wires calculated from the values of the minimum breaking load given in this specification.
- For a conductor containing more than 37 wires, 90% of the sum of the strengths of the individual wire calculated from the values of the minimum breaking load given in this specification.

5.3.3 Calculated Area and Maximum Resistance of Conductor

The actual area of a stranded conductor has been taken as the sum of the cross-sectional areas of the individual wires of nominal diameter.

Maximum resistance values of stranded conductor have been calculated on the basis of maximum resistivity and the cross-sectional area based on the minimum diameter of wires.

5.4 Stranding Constants

Number of Wires in Conductor	Stranding Constants	
	Mass	Electrical Resistance
(1)	(2)	(3)
7	7.091	0.1447
19	19.34	0.05357

6.0 JOINTS IN WIRES

6.1 Conductor containing seven wires

There shall be no joint in any wire of a stranded conductor containing seven wires, except those made in the base rod or wire before final drawing.

6.2 Conductors containing more than seven wires

In stranded conductors containing more than seven wires, joints in individual wires are permitted in any layer except the outermost layer (in addition to those made in the base rod or wire before final drawing) but no two such joints shall be less than 15 m apart in the complete stranded conductor. Such joints shall be made by cold pressure butt welding. They are not required to fulfill the mechanical requirements for unjointed wires.

7. STRANDING

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfy all the relevant requirements of this standard.

The lay ratio of the different layers shall be within the limits given in the table for lay ratio.

In all constructions, the successive layers shall have opposite directions of lay, the outermost layer being right-handed. The wires in each layer shall be evenly and closely stranded.

In aluminium alloy stranded conductors having multiple layers of wires, the lay ratio of any layer shall not be greater than the lay ratio of the layer immediately beneath it.

7.1 Lay Ratios for Aluminum Alloy Stranded Conductors

Number of Wires in Conductor	LAY RATIOS							
	3/6 Wire Layer		12 Wire Layer		18 Wire Layer		24 Wire Layer	
	Min	Max	Min	Max	Min	Max	Min	Max
7	10	14	---	---	---	---	---	---
19	10	16	10	14	---	---	---	---

NOTE: For the purpose of calculation the mean lay ratio shall be taken as the arithmetic mean of the relevant minimum and maximum values given in this table

LENGTHS AND VARIATIONS IN LENGTHS:

8.

Unless otherwise agreed between the Employer and the TPSODL, stranded aluminum alloy conductors shall be supplied in the manufacturer's usual production lengths to be indicated in the bid Schedule. The Employer reserves the right to specify particular lengths of conductor such that certain drum lengths will be shorter than others. There will in both cases be a permitted variation of $-0 + 5\%$ in the length of any one conductor length.

TESTS

9.

Type Tests

9.1

The test sample shall be drawn from the 1st lot of conductor offered for inspection & shall be sent to CPRI/NABL Accredited Laboratory for testing .The following tests shall be carried out as per relevant ISS :

9.1.1 **Ultimate Tensile Strength Test**

This test is intended to confirm not only the breaking strength of the finished conductor but also that the conductor has been uniformly stranded.

A conductor sample of minimum 5 m length fitted with compression dead end clamps at either end shall be mounted in a suitable tensile test machine. Circles perpendicular to the axis of the conductor shall be marked at two places on its surface. Tension on the conductor sample shall be increased at a steady rate up to 50% of the minimum UTS specified and held for one minute. The circles drawn shall not be distorted due to relative movement of the individual strands. Thereafter the load shall be increased at a steady rate to the specified minimum UTS and held at that load for one minute. The conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

9.1.2 **D.C Resistance Test**

On a conductor sample of minimum 5 m length two contact clamps shall be fitted with a pre-determined bolt torque. The resistance between the clamps shall be measured using a Kelvin double bridge by initially placing the clamps at zero separation and subsequently one meter apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20⁰ C, which shall conform to the requirements of this specification.

Routine Tests

9.2 **Measurement of Physical Dimensions:** The samples should meet the desired dimensional requirements before conducting following Routine Tests as per relevant ISS.

9.2.1 Selection of Test Samples

Samples for the tests specified in this specification shall be taken by the manufacturer before stranding, from not less than 10% of the individual lengths of aluminium alloy wire included in anyone final heat-treatment batch and which will be included in any one consignment of the stranded conductors to be supplied.

Alternatively, if desired by the TPSODL at the time of placing an order, that the tests be made in the presence of his representative, samples of wire shall be taken from length of stranded conductor. Samples shall then be obtained by cutting 1.2 meters from the outer end of the finished conductor from not more than 10% of the finished reels or drums.

Tests for electrical and mechanical properties of aluminum alloy wire shall ordinarily be made before stranding since wires unlaidd from conductors may have different physical properties from those of the wire prior to stranding because of the deformation brought about by stranding and by straightening for test.

Spools offered for inspection shall be divided into equal lots, the number of lots being equal to the number of samples to be selected, a fraction of a lot being counted as s complete lot. One sample spool shall be selected at random from each lot.

9.2.2 Breaking Load Test

The breaking load of one specimen, cut from each of the samples taken shall be determined by means of a suitable tensile testing machine. The load shall be applied gradually and the rate of separation of the jaws of the testing machine shall be not less than 25 mm / min and not greater than 100mm/min.

9.2.3 Elongation Test

The elongation of one specimen cut from each of the samples taken shall be determined as follows:

The specimen shall be straightened by hand and an original gauge length of 200 mm shall be marked on the wire. A tensile load shall be applied as described above and the elongation shall be measured after the fractured ends have been fitted together. If the fracture occurs outside the gauge marks, or within 25 mm of either mark, and the required elongation is not obtained, the test shall be disregarded and another test should be made.

When tested before and after stranding, the elongation shall not be less than 4% on a gauge length of 200 mm.

9.2.4 D.C Resistance Test

The electrical resistance test of one specimen cut from each of the samples taken shall be measured at ambient temperature. The measured resistance shall be corrected to the value at 20⁰ C by means of the formula:

$$R_{20} = R_T \left[1 + \alpha (T - 20) \right]$$

where ,

R_{20} = resistance corrected at 20° C

R_T = resistance measured T°C

α = constant – mass temperature coefficient of resistance, 0.0036, and

T = ambient temperature during measurement.

The resistance corrected at 20° C shall not be more than the maximum values specified.

9.2.5 Chemical Analysis of Aluminum Alloy

Samples taken from the alloy coils / strands shall be chemically / spectrographically analyzed. The results shall conform to the requirements stated in this specification. The TPSODL shall make available material analyses, control documents and certificates from each batch as and when required by the **Purchaser**.

Test should be conducted at the independent test house by the purchaser in the case of absence

Of facility at manufacturer. However the cost of such testing shall be borne by the manufacturer.

9.2.6 Dimensional and Lay Length Check

The individual strands of the conductors shall be dimensionally checked and the lay lengths checked to ensure that they conform to the requirements of this specification.

Ten percent drums from each lot shall be rewound in the presence of the Purchaser or his representative to allow visual checking of the conductor for joints, scratches or other surface imperfections and to ensure that the conductor generally conforms to the requirements this specification. The length of conductor wound on the drum shall be re-measured by means of an approved counter / meter during the rewinding process.

9.2.7 Visual and dimensional Checks on the Conductor Drums.

9.2.8 The drums shall be visually and dimensionally checked to ensure that they conform to the requirements of this specification and of IS 1778: Specification for reels and drums of bare conductors. For wooden drums, a suitable barrel batten strength test procedure is required. The Bidder shall state in his bid the tests to be carried out on the drums and shall include those tests in the Quality Assurance Programme.

Acceptance Tests :

All tests required to confirm enclosed Guaranteed Technical Particulars (GTP) requirements of this specification needs to be conducted as Acceptance Tests.

10. REJECTION AND RETESTS

10.1 Type Tests

Should the conductor fail any of the type tests specified above, the Purchaser will not accept any conductor manufactured from the material, nor conductor made by the manufacturing methods used for the conductor which failed the test.

10.2 Routine Tests

Should any one of the test pieces first selected fail the requirements of the tests, two further samples from the same batch shall be selected for testings, one of which shall be from the length from which the original test sample was taken unless that length has been withdrawn by the manufacturer.

Should the test pieces from both these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed not to comply with the standard.

If checks on individual strand diameters, conductor lay lengths and conductor surface condition indicate non-compliance with the requirements of the specification, the particular drum will be rejected. Inspection will then be carried out on two further drums within the same batch. If the conductor on either of the drums is non-complaint, the complete batch will be rejected.

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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 TPSODL, 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 TPSODL and through printed declarations in all concerned documents where external stakeholders are involved.
3. Ensure proper framework of policies as preventive measures against any ethics violation recorded by them.
4. Prepare and submit MIS of all issues and concerns, corrective and preventive actions on monthly basis to the top management for their information.
5. All Associates and Stakeholders are requested to register any grievance on ethics violation on TPSODL website www.tpsouthernodisha.com

3.0 CONTRACT PARAMETERS

3.1 Issue/Award of Contract

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TPSODL awards the contract to the Associate in writing in the form of Purchase order or Rate Contract (RC) hereafter referred as Contract, through in any or all of following modes- physical handover / post / e-mail / web document / fax with all the attachments/enclosures which shall be part of the contract document

On receipt of the contract, the associate shall return to TPSODL 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 TPSODL.

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:

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- NIT/Tender Enquiry, QR, Instruction to Bidders, Special Condition of Contract (SCC) of tender, GCC, Technical & Commercial Specifications including relevant annexure and attachments).
- Bids & Proposals Received from Associate including relevant annexure/attachments.
- Letter of Intent (LOI/RC/PO) with agreed deviations from the tender/bid documents.
- All the Inspection and Test reports, Detailed Engineering Drawings.
- Material Dispatch Clearance Certificate (MDCC).
- Minutes of Meeting (MoM)

3.9 Contract Language

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

The Contract documents and all correspondence between the TPSODL, 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

TPSODL reserves the right to conduct the reverse auction (instead of public opening of price bids) for the products / services being asked for in the tender. The terms and conditions for such reverse auction events shall be as per the Acceptance Form attached in Annexure J. The bidders along with the tender document shall mandatorily submit a duly signed copy of the Acceptance Form as mentioned in the Annexure J as a token of acceptance for the same.

Bid validity will stand get automatically extended from the date of latest Negotiation event i.e. Reverse Auction or Manual Negotiation and accordingly bid shall be valid further

- i. For minimum 45 days if original bid validity duration is lesser than 45 days at latest negotiation date.
- ii. For actual bid validity duration if original bid validity is more than 45 days at latest negotiation date.

4.0 SCOPE OF WORK

All the activities that are to be undertaken by the Associate to realize the contractual deliverables in completeness form Scope of Work. Following clauses list, but not limited to, major requirements of the scope of work.

The associate shall satisfy himself and undertake fully the technical/commercial requirements of items to be supplied as listed in the Schedule of Quantities together with the tests to be performed /test reports to be furnished before dispatch, arrangement of stage and final inspections during manufacturing as per terms and conditions of contract, technical parameters & delivery terms and conditions including transit insurance to be met in order to fully meet TPSODL's requirements.

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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.

TPSODL have the right, during the performance of the Contract, to change the scope and/or technical character of the Project and/or of the supplies and services stipulated in the Contract by submitting a request in writing to the Associate. The Associate shall, within fifteen days of receipt of such request from the TPSODL, provide Purchaser with a reasonably detailed estimate of the cost of the change outlined in the request.

In the event, TPSODL 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 TPSODL.

4.1 Indemnity

Associates shall undertake to fully indemnify TPSODL (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 TPSODL, arising due to reasons attributable to any, act, omission or negligence of the Associate the Associates, for the entire period of contract including period of guarantee.

Within 7 days of award of work, the Associates shall submit Indemnity Bond in the format as per Annexure-E to Order Issuing Authority.

Contract having value more than Rs 2 Cr per Annum, Associates shall submit Indemnity Bond on Rs 100/- Non Judicial Stamp Paper in the format as per Annexure- E to Order Issuing Authority.

4.2 Display of Notice Boards at Work Sites

The Associate shall put up display notice board at each project site where the works are in progress indicating the information given below:

- Name of the Project.
- Estimated Cost of Project.
- Date of Commencement.
- Expected date of completion.
- Name of Associate and his telephone number.
- Name of Engineer-in-Charge and his telephone number.

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4.3 Disposal of Waste at Site

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

The associates shall follow the below criteria for disposal of waste at site during the execution of project.

- Associate shall ensure that the detailed project plan include the waste management, segregation of all designated waste material (Recyclable/ Non-Recyclable), collecting, storing, disposing and transferring the same to pre-arranged facility/destination in timely and safe manner as per environmental legislations during the execution of project. The project plan shall also include the innovative construction practice to eliminate or minimize waste, protect surface/ground water, control dust and other emissions to air and control noise during the execution of project. The copy of same shall be given to EIC before the commencement of project.
- The purchase policy of BA shall encourage the procurement of material with recycled and minimum packaging of goods during delivery. Associate shall provide the appropriate means for site to site transportation of materials to avoid damage and litter generation.
- Associate shall educate and inform to its project team about the requirement and responsibilities for waste minimization and disposal in general and provide training of practices that support this. Waste management should be treated like a safety program.
- In the event that area of contaminated or biological hazard is identified, Associate shall ensure that plant, equipment, personnel and any activity associated with the work is carried out in consultation with EIC of TPSODL.
- Associate shall ensure that the residents living near the site are kept informed about proposed working schedule and shall informed timings and duration of any abnormal noise full activity that is likely to happen.
- Associate shall ensure the regular maintenance and monitoring of vehicles and equipment for efficient fuel use so that emissions and noise are within acceptable limits to avoid air pollution.

4.4 Deployment of Work Force

Associate shall deploy adequate labour as considered necessary by TPSODL for execution of the contract including Sundays and Holidays whenever required to do so with no extra cost to TPSODL. 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

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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.

TPSODL shall have the right to instruct the Associate to change the Sub- Associates or skilled /unskilled workers in case the conduct, the workmanship or speed of the work is not satisfactory.

Associates shall submit duly signed undertaking regarding engagement of competent staff / employee commensurate to the nature of job to Engineer-in-charge in the format attached as Annexure – H.

4.5 Damages to Properties

The Associates shall take necessary steps to ensure that the equipment and installations of the Company, third parties, including other utility services like water supply pipelines; open drains telephone cables etc. are not damaged during execution of the works. The Associates shall be responsible for all such damages and shall have to repair/ replace and/or compensate for the entire claims in respect of such damages at its own cost.

4.6 Issuance of Material

The material issued to the Associate shall be in the custody of the Associates who shall be fully responsible for the same. After completion of the works, the Associates will reconcile the material. Any cost of material which is short or damaged/lost will be deducted from Associate bill/ deposits.

4.7 Company's Right To Use Works

If Taking Over Certificate is delayed for any reason, for which TPSODL's decision shall be final and binding upon the Associate, the Company shall be entitled to use the works or portion thereof without affecting Associate's responsibility and liability to complete the balance works as per company's directives from time to time, though Associate shall be afforded reasonable opportunity by the company to enable Associates to complete all balance works required for issuance of 'Taking Over Certificate' by the company.

4.8 Rights of TPSODL to vary the scope work

TPSODL 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 TPSODL with a reasonably detailed estimate of the cost of the change in scope outlined in the TPSODL 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 TPSODL.

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Any change in the Scope of Work and/or Terms & Conditions of the order shall be intimated by TPSODL through an amendment to the contract. The amendment shall be treated valid only if signed by the authorized signatory of the original contract.

5.0 PRICES/ RATES/ TAXES

5.1 For Supply part of Contract

Unless specified elsewhere in the contract document, the prices/rates are inclusive of cost of finished product for which MDCC will be issued by TPSODL, packaging and forwarding charges, freight and transit insurance charges covering loading at Associate's works, transportation to TPSODL store/site & unloading & delivery at TPSODL stores/TPSODL 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 TPSODL 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 TPSODL 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 TPSODL 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 TPSODL 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 TPSODL.

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6.0 TERMS OF PAYMENT

- A. 5% of the Release Order/ Purchase Order price shall be paid as initial interest free advance on fulfillment of the following by the Associate:
 - a) Acceptance of PO/ LOI.
 - b) Submission of advance payment BG of 15% of the Release Order/ Purchase Order price which shall remain valid till the advance is fully adjusted.
 - c) Submission of Contract Performance Bank Guarantee of 5/10% of the RC/ PO price valid till 30 days after taking over of the works.
- B. 10% of the Release Order/ Purchase Order price shall be paid as interest free advance against approval of drawings under Category-1 of major drawings, Quality Plans, Pert Chart, Field Quality Plan, posting of Project Manager and commencement of the first mile stone of the work mutually agreed including C-3 Form, and submission of a true copy of 'Erection All Risk Insurance Policy' taken for the awarded jobs. The drawing list shall be mutually agreed at the time of award of work.
- C. 50% on account payment of the total of item wise cost of material Release Order/ Purchase Order shall be paid against receipt of material at site in good condition and certification by TPSODL 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 TPSODL, 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 TPSODL.
- 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 TPSODL, 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 TPSODL.

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.

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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 TPSODL'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 TPSODL's Engineer-in-charge
- Associate's bills/invoices submitted have been certified by Engineer-In-Charge.

6.2 Bills & Invoices

Unless specified otherwise in the special conditions of contract, Associate shall raise not more than one invoice/contract per month for the services rendered in the prescribed Tax Format and the invoice shall be submitted within 15 days of the following month at Bill Inward Receipt Desk (BIRD) Receipt Desk / Invoice Desk / Office of CFO, TPSODL located at TPSODL Corporate Office, Kamapally, Courtpetta, Berhampur, District Ganjam, Odisha, India – 760 004

All Bills shall be supported by joint measurement of work done, quality test report and a copy of wage sheet, if applicable (showing proof of having disbursed wages as per applicable law) and a copy of statement substantiating that statutory payments having been affected.

Bills/ invoices shall mention Associate's 'Sales, Service, WCT Tax Registration Number, PAN number as applicable.

Final bill submission after completion of project or execution of job must be within 30 days from the actual date of completion/execution of work awarded.

6.3 Payment & Statutory Deductions

Payment shall be released within 30 days from the submission of the bills. The associate shall submit "No Demand Certificate" in the format as per Annexure-D at the time of receipt of full and final payment. In case any non-compliance to contract conditions comes to TPSODL's notice, TPSODL will be entitled to deduct 30% of estimated wages plus 20% of wages as TPSODL's overheads. Associates would be obliged to provide the copy of monthly wage sheet in any case, failing which no payment shall be made. TPSODL at their sole discretion may deposit the PF etc. with statutory authorities. TPSODL 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

TPSODL 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 TPSODL'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

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triplicate at Bill Inward Receipt Desk (BIRD) / Invoice Desk / Office of CFO, TPSODL located at TPSODL Corporate Office, Kamapally, Courtpeta, Berhampur, District Ganjam ,Odisha, India – 760 004

6.4 Guidelines for Raising Running/Final Bills

Contract Value Up to 5 Lakhs	One Final Bill
Contract Value More than 5 lakhs	Monthly Running Bill & One Final Bill

All Bills shall be processed only when all bank Guarantees are in place and before payments of Final Bill Associate have to furnish NDC.

6.5 Quantity Variation

Payment will be made on the basis of actual quantity of supplies/actual measurement of works accepted by TPSODL 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, TPSODL 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 TPSODL Engineer-in-Charge before raising any bill of work done. In the event Associate fails to do so, TPSODL 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 TPSODL 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.

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- 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 TPSODL 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 TPSODL. Alternatively, Associate may extend the validity of original SPBG only till the requisite period, i.e. Guarantee Period plus one month.

9.0 STATUTORY COMPLIANCE

9.1 Compliance to Various Acts

Associate should ensure adherence to all applicable laws, rules and regulation applicable under this contract from time to time. In case of violation any risk, costs etc shall be in associates account and keep TPSODL indemnified always till completion of contracts.

9.2 Social Accountability

TPSODL 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

TPSODL 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**

TPSODL 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.

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Under the same pre-text, and to promote entrepreneurship among SC/ST community TPSODL has taken initiative by proposing relaxations in contract clauses as per below:

S. No.	Initiative	for SC/ ST BA's	Guideline Document
1	Tender Fees	100% waiver for SC/ST community	All Open Tenders
2	Earnest Money Deposit	50 % relaxation of estimated EMD value	All limited and Open Tenders
3	Performance Bank Guarantee	25% relaxation in PBG for order value above 50 lacs else 50% relaxation	All limited and Open tenders
4	Turnover	25% relaxation in company turnover under qualifying requirement criteria	All Open Tenders

****Classification of BAs under SC/ST shall be governed under following guidelines:**

- Proprietorship/ Single Ownership Firm: Proprietor of the firm should be from SC/ST community. Governing document shall be duly audited balance Sheet for the last FY bearing the name of proprietor.
- Partnership Firm: Only such firms shall qualify which have SC/ST partners holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Partnership Deed and audited balance sheet/ ITR for last FY.
- Private limited company: Only such firms shall qualify which have SC/ST directors holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Memorandum of Understanding (MoU) and/or Article of Association (AoA).

Certification from SC/ST commission shall be required for deciding upon SC/ST status of a person.

9.4 MSME Development ACT 2006

Provisions for Firms falling in The Micro, Small and Medium Enterprise Development Act 2006:-

- i. Business Associate is requested to inform the TPSODL if they fall under provisions of the Micro, Small and Medium Enterprises Development Act, 2006 legislation, and provide necessary documents to TPSODL. The Associate also needs to mention the relevant details on their invoice / bill.
- iii. Business Associate shall submit the self-undertaking of registration in MSME category at the time of bidding as well as on an annual basis to TPSODL, enabling them to avail the consequent benefits, failing which TPSODL may take appropriate action against such defaults.
- iv. Business Associates falling in MSME category are exempted from submitting the Tender Fee when participating in TPSODL tenders. Also they are eligible to submit concessional EMD at 50% of the EMD otherwise applicable.

9.5 Compliance to Labour Laws

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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 TPSODL shall pay the wages to BA employees on behalf of BA. Apart from deducting the amount of wages paid, TPSODL shall deduct an additional service charge equivalent to 25% of the wages paid from the payment due to BA.

9.6 Compliance to Construction and Demolition Waste Management Rules & Environment (Protection) Amendment Rules

BA is liable to follow the Construction and Demolition Waste Management Rules- 2016, Environment (Protection) Amendment Rules- 2018 and Guidelines on dust mitigation measures in handling construction material and C&D wastes issued by CPCB.

Following are some main points of above Rules/Guidelines for Construction work, cable laying jobs etc.

1. Barricading to be provided at site to cover complete area.
2. Construction material and waste should be inside the closed area made by using barricading.
3. Water sprinkling/fine spray from nozzles to be done to suppress the dust.
4. The board of Dust mitigation measures shall be displayed at site for public viewing with required details.
5. Loose sand or soil and construction material that causes dust shall be covered.
6. Transport material that are easily wind borne need to be covered by a sheet made of either jute, tarpaulin, plastic or any other effective material.
7. All areas for storing C&D waste/construction material to be demarcated and preferably barricaded particularly those materials that have potential to be dust borne.
8. Grinding and cutting of building materials in open area shall be prohibited.
9. Construction material and waste should be stored only within earmarked area and roadside storage of construction material and waste shall be prohibited.
10. No uncovered vehicles carrying construction material and waste shall be permitted.
11. Construction and demolition waste processing and disposal site shall be identified and required dust mitigation measures to be notified at the site.

10.0 QUALITY

10.1 Knowledge of Requirements

The Associate shall be deemed to have carefully examined and to have knowledge of the equipment, the general and other conditions, specifications, schedules, drawings, etc. forming part of the Contract and also to have satisfied himself as to the nature and character of the work to be executed and the type of the equipment and duties required including wherever necessary of the site conditions and relevant matters and details. Any information thus procured or otherwise obtained from TPSODL/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

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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 TPSODL.

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 TPSODL 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 TPSODL. 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 TPSODL, 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 TPSODL. All such products and equipment shall be used or installed in strict accordance with original manufacturer's recommendations, unless otherwise directed by the TPSODL. In any circumstances the codes, specimen and standards prescribed by any government agency should not be violated.

11.0 SAFETY

All Associates shall strictly abide by the guidelines provided in TPSODL'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

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TPSODL 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 TPSODL during contract execution time.

All inspections and participations shall be carried out within maximum of two weeks of TPSODL 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 TPSODL'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 TPSODL's Engineers.

The Associate shall provide free of charge office accommodation, office facilities, secretarial services, communication facilities, general and drawing office stationery, etc. as may be reasonably required by the TPSODL's engineers. Similarly, facilities shall also be provided by Associate's outsource agencies/partners/authorized dealers (collectively termed as sub-associates) if such basic and detail engineering activities are carried out in the design offices of sub-Associates.

The Associate shall be responsible for the safety of employees of TPSODL/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 TPSODL inspectors are not satisfied with the safety arrangements at the plant, TPSODL 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 TPSODL along with the inspection call, for scrutiny of TPSODL.

The Associate and TPSODL shall jointly document all the observations, comments and action points after completion of inspection and it shall be binding on the Associate to

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provide compliance on all the points requiring compliance and furnish the compliance report to the designated authority of TPSODL for receiving clearance for dispatch of materials.

12.3 Third Party Nomination

TPSODL 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 TPSODL as far as conducting the inspection.

12.4 Waiver of Inspections

TPSODL 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 TPSODL 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 TPSODL. Material delivered at TPSODL stores or at project site without a valid MDCC issued by the designated official of TPSODL 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 TPSODL, then, MDCC shall be issued on receiving all the test reports-routine& type-from the Associate and finding them in order.

The associate shall include and provide for securely protecting and packing the materials so as to avoid loss or damage during handling and transport by air, sea, rail and road or any other means.

All such packing shall allow to the extent possible for easy removal and checking at Site. The associate shall take special precautions to prevent rusting of steel and iron parts during transit by sea. Gas seals or other materials shall be utilized by the associate for protection against moisture during transit of all Plant and Equipment.

Each Equipment or parts of Equipment shall be tagged with reference to the assembly drawings and corresponding part numbers. Each bale or package shall contain a packing note quoting specifically the name of the associate, item description, quantity, item / package identification.

All packing cases, containers, packing and other similar materials shall be new and supplied free by the associate and it shall not be required to be returned to the associate.

Notwithstanding anything stated in this clause, the associate shall be entirely responsible for loss, damage or depreciation or deterioration to the materials and supplies due to faulty

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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 Berhampur	12 days
2	Within Berhampur	5 days
3	Waiver*	3 working days

* Associate is expected to raise the inspection call assuming that Inspection shall be carried out by TPSODL. The decision for waiver of inspection shall be on sole discretion of TPSODL.

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 TPSODL and have to supply back the material within next 30 days or within the timeframe mutually decided by Associate and TPSODL.

If delivery of the material is beyond the agreed time, Liquidated damage clause, mentioned in this GCC separately shall be applicable; but the period for levy of LD shall be considered as per the original delivery schedule and not from the agreed timelines for material rectification.

13.3 Consignee

Unless otherwise specified in the Contract Document / Purchase Order/ Release Order, Materials/Goods/Equipment shall be consigned to "Stores-In-Charge", TPSODL Berhampur

13.4 Submission of mandatory documents on Delivery

Following documents shall be mandatorily submitted by BA along with supply of material to TPSODL 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

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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	TPSODL material code and material description shall be mentioned in invoice and on material.
3	"Property of TPSODL" 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 TPSODL, Berhampur", Guarantee period and Associate's name.
8	In case of manual unloading, supplier / transporter shall deploy sufficient Labour for unloading the material at TPSODL Southern store. For heavy item(s), crane will be provided by TPSODL [unloading cost will be recovered from the associate].
9	The driver should have valid License and one helper in truck. All the documents of truck like registration papers, PUC etc. should be available in Truck.
10	BA representative should accompany the material and get it unloaded / stacked in his presence wherever possible.

14.0 GUARANTEE

14.1 Guarantee of Performance

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

14.2 Guarantee Period

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Standard Specifications of TPSODL 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

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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, TPSODL will be at liberty to get the same done at Associate's risks and costs and recover all such expenses plus the TPSODL'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 TPSODL. However, if replacement of the Equipment is required, Associate shall notify the same to TPSODL within 7 days of reporting the issue by TPSODL. Thereafter, the total time for supply of new equipment/ material shall be equal to the original delivery period of that equipment/ material as specified in the Contract. In case the Associate is not able to rectify/ replace the faulty equipment/ material within the stipulated timelines as mentioned above, penalty shall be levied as per the Liquidated Damages clause mentioned in this document. The penalty amount shall be recovered from the payment due to the vendor or by encashment of the SPBG as the case may be.

14.4 Cost of repairs on failure in GP

The cost of repairs/rectification /replacement, apart from the actual cost of repairs/rectification/replacement is also inclusive of all associate costs of required transportation, site inspection /mobilization/dismantling and re-installation costs as applicable, to be borne by the Associate. The Associate has to ensure that the interruption in the usage of intended purpose of the equipment is minimized to the maximum extent In lieu of the time taken for repairs/rectification/replacement.

14.5 Guarantee period for Goods Outsourced

If the Associate outsources partly equipment/materials/services from third party as mutually agreed upon at the pre award stage of contract, TPSODL 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

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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 TPSODL. 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, TPSODL 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 TPSODL 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 TPSODL and not reconciled by BA or for services claimed and paid in excess at the time of running bills), the total cost which shall be recovered from the BA, shall be the gross amount of material or services (i.e. including taxes) plus applicable taxes as prevailing at the time of such recoveries.

16.0 ASSIGNMENT OR SUBCONTRACTING

Associates shall not assign/subcontract/outsource the schedule of activities of contract TPSODL enters with the associate, in part or full, without TPSODL's prior written approval. However, outsourcing of materials/equipment/services by Associate to make the integrated product for which TPSODL'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 TPSODL 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 TPSODL

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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 TPSODL's interest failing which appropriate action (legal or otherwise) may be taken against the Associate by the TPSODL, 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 TPSODL in connection with the performance of the contract shall be held confidential by the Associate and shall remain the property of the TPSODL 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 TPSODL.

18.2 Geographical Data

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

18.3 Associate's Processes

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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. TPSODL 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 TPSODL. 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 TPSODL under the Contract shall be passed on to the TPSODL. The TPSODL 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 TPSODL.

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 TPSODL. All rights, with respect to, or arising from such intellectual property, as afore mentioned, shall solely vest in TPSODL.

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

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The Associate shall at all times indemnify, keep indemnified and hold harmless the TPSODL 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 TPSODL is held liable for by any court judgement. In this connection, the TPSODL 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 TPSODL 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 TPSODL 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 TPSODL.

The TPSODL 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.***

TPSODL shall have no liability or any special, incidental, indirect or consequential Damages for any loss of Business Contracts, revenues or other financial loss arising out of this Contract.

21.2 Limitation of Liability

The total liability of Associate against any contract shall be limited to the Total All Inclusive Contract Value.

22.0 FORCE MAJEURE

Force Majeure applies if the performance by either Party ("the Affected Party") of its obligations under Contract is materially and adversely affected.

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“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

TPSODL 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 be executed by Associate under the contract by providing to the Associate at least two business days written notice for contracts having contract completion period less than sixty days and at least seven business days' notice for all other contracts.

Upon receipt of any such notice, the Associate shall respond as follows as applicable as per contract construction.

- Immediately discontinue further supply of material/goods specified in the suspension notice for supply contracts

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- 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 TPSODL, 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 TPSODL, 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.

TPSODL 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 TPSODL and not due to any breach of contract conditions by the associate, TPSODL 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 TPSODL.

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 TPSODL 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 TPSODL in case of breach of the contract by the Associate which shall include but not be limited to the following:

- a. Withdrawal or intimation by the Associate of its intent to withdraw or surrender the execution / completion of the contracted work /PO or failure in ensuring adherence to any delivery schedules, in deviation of the contract/ PO.

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- b. Refusal or neglect on the part of the Associate to supply material/equipment of quantity or quality as specified by TPSODL 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 TPSODL 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 TPSODL.

If the default or breach as specified under clause 24 (except sub clause g thereof) be committed by the associate for the first time, TPSODL 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 TPSODL then TPSODL 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, TPSODL shall have the right to terminate all the contracts TPSODL is having with the Associate by issuing termination notice which shall be without prejudice to the other rights of TPSODL available to it under law.

Without prejudice to its right to terminate for breach of contract, TPSODL 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 TPSODL having proceeded with termination of the contract the associate shall comply and proceed further in the following manner:

- i) Associate shall discontinue the supply, on the expiry of the said period of two weeks.
- ii) Associate shall ensure that no further steps are being taken towards discharge of the obligations, terms and conditions as contained in the contract/PO. This shall include initiation of actions not limited to discontinuation of other allied and associated arrangements which

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the associate might have entered with third parties for due discharge of its obligations under the contract with TPSODL.

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 TPSODL 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 TPSODL 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 TPSODL to seek invocation of the performance bank guarantee or any other guarantee or other security deposit by whatever name called submitted by the associate, which shall not be objected to or protested by the associate.

In case of termination of the contract the parties agree to be governed inter alia by the following:

a) In case TPSODL 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 TPSODL 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, TPSODL 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 TPSODL 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 TPSODL 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 TPSODL against the amount recoverable from him on this ground. The same shall be without prejudice to other rights available to TPSODL 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 , TPSODL shall be entitled to bar the associates its agents , affiliates from undertaking any negotiation / tendering, bidding, participation activities concerning TPSODL for a period of two years from date of such termination. The same shall be without prejudice to other rights available to TPSODL.

24.2 Termination for convenience of Associate

Associate at its convenience may request for termination of contract, clearly assigning the reason for such request. TPSODL 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

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TPSODL, Associate will have to pay TPSODL a 'termination convenience fee' equivalent to 5% of unexecuted contract value.

24.3 Termination for Convenience of TPSODL

TPSODL at its sole discretion may terminate the contract by giving 30 days prior notice in writing or through email to the Associate. TPSODL 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 Berhampur. 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 TPSODL or suspended by the arbitrator. Further, TPSODL 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 Berhampur and any matter arising here from shall be subject to applicable law in force in India.

26.0 ATTRIBUTES OF GCC

26.1 Cancellation

The Company reserves the right to cancel, add, delete at its sole discretion, all or any terms of this GCC or any contract, order or terms agreed between the parties in pursuance without assigning any reasons and without any compensation to the Associates.

26.2 Severability

If any portion of this GCC is held to be void, invalid, or otherwise unenforceable, in whole or part, the remaining portions of this GCC shall remain in effect.

26.3 Order of Priority

In case of any discrepancies between the stipulations in General Conditions of the Contract (GCC) and Special Conditions of Contract (SCC), the GCC shall stand superseded by the SCC to the extent stipulated hereinabove while balance portion of respective clauses of GCC shall continue to be applicable.

27.0 INSURANCE

The Associate shall arrange accident insurance policy for his foreign experts/specialists/personnel deputed to Site and Associate's/his sub-Associates' manufacturing works as well as for his Indian engineers and supervisory staff. The Associate

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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 TPSODL 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 TPSODL 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. TPSODL shall stand fully indemnified in this respect.

BA will also ensure purchase of Special Covid Insurance policy of ₹ 5 lacs for the legal heir(s) of deceased BA employees (in case of death due to Covid- 19)

- i. BA to take appropriate Special Covid Insurance policy from a reputed insurance agency prevailing in the market so that all the BA employees are covered under the purview of ₹ 5,00,000/- compensation, in case of death due to Covid -19.

BA shall be required to purchase the policy immediately post receipt of LOI / Work Order.

- ii. If it is found that the BA employee(s) is/are not covered under the purview of Special Covid Insurance Policy, the concerned BA shall be liable to pay the entire sum of ₹ 5,00,000/-.
- iii. Cost of the Covid Insurance policy shall be borne @50% each by the BA and TPSODL. BA will be reimbursed @50% of the Annual Premium based on the original money receipt and policy copy.

28.0 ERRORS AND OMISSIONS

The Associate shall be responsible for all discrepancies, errors and omissions in the drawings, documents or other information submitted by him, irrespective of whether these have been approved, reviewed or otherwise accepted by the TPSODL or not. However, any error in design/drawing arising out of any incorrect data/written information from TPSODL 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 TPSODL after Commissioning and complete handing over-taking over.

However, such passing of title of ownership and property to the TPSODL 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.

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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 TPSODL.

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 TPSODL; 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.tpsouthernodisha.com to provide your feedback according to the guidelines mentioned below:

31.0 CONTACT POINTS

In case Business Associate needs information with respect to payments or has any grievances, same may be lodged by log on to our website www.tpsouthernodisha.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 Southern Odisha Distribution Limited

Berhampur

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 Southern Odisha Distribution Limited (TPSODL) in the sum of _____ for which payment well and truly to be made to the TPSODL 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 TPSODL 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 TPSODL up to the above amount upon receipt of its first written demand, provided that in its demand the TPSODL will note that amount claimed by it is due to it owing to the occurrence of one or both conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date (No of days as mentioned in tender enquiry) days after the closing date of submission of bids as stated in the Invitation to Bid or as extended by you at any time prior to this date, notice of which extension to the Bank being hereby waived, and any demand in respect thereof should reach the Bank not later than the above date.

DATE.....

SIGNATURE

OF

THE

BANK.....

WITNESS.....

SEAL.....

(Signature, Name & Address)

(At least 2 witnesses)

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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 Southern Odisha Distribution Limited

Berhampur

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 Berhampur branch and claim will also be payable at Berhampur Branch **(to be confirmed by Berhampur Branch by a letter to that effect)**
9. Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs. _____
(Rupees _____ only) and the guarantee will remain in force up to and including _____ (Date) and shall be extended from time to time for such period or period as may be desired by "the Vendor".
10. Unless a demand or claim under this guarantee is received by us in writing within one month from _____ (expiry date) i.e. on or before _____ (claim period end date), we shall be discharged from all liabilities under this guarantee thereafter.

Dated at _____ this _____ day of _____ 200_____

Witness

1. _____

Bank's rubber stamp

Banks full address

2. _____

Designation of Signatory

Bank official number

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ANNEXURE- C

PROFORMA FOR PERFORMANCE BANK GUARANTEE (CP cum EP)

(On Rs.100/- Stamp Paper)

Note:

- (a) Format shall be followed in toto
- (b) Claim period of one month must be kept up
- (c) The guarantee to be accompanied by the covering letter from the bank confirming the signature to the guarantee

TP Southern Odisha Distribution Limited

Berhampur

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 Berhampur branch and claim will also be payable at Berhampur Branch (to be confirmed by Berhampur Branch by a letter to that effect in case BG is from the branch outside Berhampur)
9. Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs. _____ (Rupees _____) only and the guarantee will remain in force up to and including _____ (Date) and shall be extended from time to time for such period or period as may be desired by "the Vendor".
10. Unless a demand or claim under this guarantee is received by us in writing within one months from _____ (expiry date) i.e. on or before _____ (claim period end date), we shall be discharged from all liabilities under this guarantee thereafter.

Dated at _____ this _____ day of _____ 200__

Witness

1. _____

Bank's rubber stamp

Banks full address

2. _____

Designation of Signatory

Bank official number

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ANNEXURE-D

PROFORMA FOR “NO DEMAND CERTIFICATE” BY ASSOCIATE

(On Company's Letter head or with Company Seal)

(To be submitted by the Associate to TPSODL 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 TPSODL, in respect of our aforesaid Order No _____ dated _____ including amendments, if any, issued by TPSODL to our entire satisfaction and we further confirm that we have no claim whatsoever pending with TPSODL under the said contract / W.O.

Notwithstanding any protest recorded by us in any correspondence, documents, measurement books and / or final bills etc., we waive all our rights to lodge any claim or protest in future under this contract.

We are issuing this “NO DEMAND CERTIFICATE” in favor of TPSODL, 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. TPSODL 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. TPSODL.

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. TPSODL against all losses from the acts or default of the said Associate in respect of compliance of the Provident Fund Act.

Similarly, we hereby confirm that we have complied with all statutory and local laws and nothing is outstanding with regard to Local Sales Tax, Labor Laws, Local Municipal dues, Electricity dues etc. We have entered into the above written bond for the indemnity to M/s. TPSODL against all losses from the acts or default of the said Associate in respect of compliance of the Local Sales Tax Laws, Local Laws, Labor Laws, Local Municipal Dues, Electricity dues etc.

NOW THE CONDITION, of the above written bond is as such that if the Associate during the period of this contract commits any default or fails to make payment of Contributions in respect of his employees to the Employees Provident Fund Organization, he shall indemnify the Principal Employer M/s. TPSODL 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

Place

Signature

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 Southern Odisha Distribution Limited,

Berhampur

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 TPSODL on Human Resource Issues)

1.0 The following shall be adhered to by the Business Associates during his / its association with TPSODL:

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 TPSODL would also ensure adherence of these values by his employees / persons deployed by him in connection with his works undertaken in TPSODL.

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 TPSODL.
- b) Minimum wages along with other statutory dues like PF, ESI, etc. as applicable to the workers shall be made within the prescribed period of 7th / 10th day of the following month.
- c) Deduction / deposit / record keeping and all other requirements under Employees PF Act 1952, Employees State Insurance Act 1948 and other applicable acts (if any) shall be adhered to.
- d) Only statutorily authorized deductions (if any) shall be made in accordance with the relevant statutes.
- e) All the provisions of Contract Labour (R&A) Act 1970 shall be complied with in respect of the workers engaged for TPSODL 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 / TPSODL authorities.
- g) Payment of wages shall be made only in presence of and with certification of authorized representative of TPSODL 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 TPSODL 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 TPSODL 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 TPSODL 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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TPSODL 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 TPSODL business.

5.0 The 'Statutory Compliance Enforcement System' in TPSODL 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 TPSODL Code of Conduct, the concerned Engineer / Officer in charges are requested to adhere to the provisions and advise respective Business Associates in their domain to comply in letter and spirit.
- b) Immediately after issuance of letter of intent, the authorized representative of the Business Associate will report to BA Cell for completion of statutory requirements.
- c) Normally, the work will be started only after 'Clearance for Commencement of Work (CCW)' is issued by BA Cell to the Business associate. However, in exceptional exigencies in engineer I/c / Officer I/c may direct the Business Associate to start the work and inform BA Cell about the same. Statutory requirements in this case may be completed in parallel.
- d) First monthly bill will be released only after producing CCW to the finance department. Similarly closure of work and final settlement will be affected after issuance of no objection certificate from BA Cell group.

6.0 Requirements for 'Clearance for Commencement of Work' (CCW):

- a) Submission of filled up Form 'A' for database (Annexure-1).
- b) Copy of PF Code allocation letter.
- c) Copy of ESI Code allocation letter.
- d) Submission of duly filled up Form IV CL(R&A) act (In case more than or equals to 20 workers during the period of contract).
- e) Submission of duly filled up Form VI A (Notice of Commencement).
- f) Copy of insurance cover note under WC Act 1923 (if applicable).
- g) Copy of Contract Agreement.
- h) Copy of indemnity bond (if applicable).
- i) Affidavit with regard to payment of wages through cheque / bank transfer only.

7.0 Requirements during execution of work:

- a) Copy of receipt of application for license / license (if applicable).
- b) Copy of PF Challan (latest by 26th day of every Month).
- c) Copy of ESI Challan (latest by 26th day of every Month).
- d) Copy of Wage disbursement sheet / Bank statement.
- e) Filing / Maintenance of all statutory registers / reports / returns for inspection by Statutory/ TPSODL authorities.
- f) Certification of wage disbursement by authorized representative of TPSODL.
- g) Copy of 'Labour Welfare Fund' deposit certificate / Challan.
- h) Insuring safe working practices at the workplace.

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 TPSODL : Yes/No
If yes, furnish details:

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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 TPSODL 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 TPSODL Premises on my behalf.

Date:

**(Signature of the Business Associate
or his Authorized Representative)**

This Business Associate is / will be engaged in TPSODL.

(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 Southern 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, Berhampur Labour Fund

iii. All other statutory obligation

has been paid /settled in full and no amount/ compliance is due/ pending.

2. That in case any dispute / claim is raised by the concerned workers i.r.o. any dues / payments, M/s _____ will settle the same on its own and such liability will be borne by M/s _____

3. That M/s _____ hereby indemnify M/s TPSODL 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

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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 "TPSODL 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

☐ Berhampur
 ☐ Within 200 kms from Berhampur
 ☐ More than 200 kms from Berhampur

Your nearly turnover with TPSODL

☐ Less than 25 Lacs
 ☐ 25 Lacs to 1 Crore
 ☐ More than 1 Cr.

Additional information

Your Name	
Your Designation	
Your Organization	
Contact Nos.	
Email	

We once again thank you for your participation in this survey. Please spare 10 minutes to give your feedback on following pages (Section A to E)

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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	TPSODL demonstrate willingness to be flexible in administration of Contract / Purchase Order						
7	We provide timely responses / clarifications to your queries						
8	TPSODL representative you interact / coordinate with is adequately empowered to support you in meeting contractual obligations						
9	TPSODL provide you all necessary infrastructure support for timely and quality completion of work (including AMC)						
10	TPSODL Engineer-in-Charge timely certifies the jobs executed/						

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S. No.	Parameters	1	2	3	4	5	Remarks/ Suggestion
		Do Not Agree	Slightly in Agreement	In Fair Agreement	Mostly in Agreement	Fully Agree	
	material supplied						
11	TPSODL Engineer-in-Charge efficiently supervises the job execution for timely completion of job						
12	BIRD (Bill Inward Receipt Desk)* initiative has improved payment disbursement process (under development)						
13	Our approach for Inspection and Quality Assurance effective to expedite project completion?						
14	TPSODL never defaults on contractual terms						
15	In TPSODL 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	TPSODL Employees follow Ethical behavior						

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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 TPSODL 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 TPSODL in comparison to your other clients in terms of fairness of treatment and transparency with its Business Associates?						
3	How would you rate TPSODL in comparison to your other clients in terms of processes and systems to manage partnership with its Business Associates						
4	How would you rate TPSODL in comparison to your other clients in terms of building long term & mutually relationship with its Business Associates						

SECTION-C

Please ✓ mark in the relevant box and give your remarks / suggestions / information for our improvement.

SNo	Parameters	Certainly NO	Probably NO	Probably YES	Certainly YES	Remarks/ Suggestion
1	Based on your experience with TPSODL, would you like to continue your relationship with TPSODL?					
2	If someone asks you about TPSODL, would you talk "positively" about TPSODL?					
3	Would you refer TPSODL 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 TPSODL, 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 TPSODL'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 TPSODL to adopt. Please give your valuable salient recommendations.

Please spare your thoughts for TPSODL's improvement in particular areas of major concerns for you. We also welcome your suggestions to adopt any best practices, attitudes that you have observed / experienced elsewhere in Indian/ International organization.

Recommendation	<i>Please tick (✓) your top 5 expectations out of the following 10 points listed below -</i>	
(Please list down improvement you expect from TPSODL)	<i>Timely payment</i>	
1	<i>Flexibility in Contracts/PO</i>	
	<i>Clarity in PO,s & Contracts</i>	
2	<i>Timely response to quarries</i>	
	<i>Timely certification of works executed</i>	
3	<i>Clarity in Specs, drawings, other docs etc.</i>	
	<i>Adequate information provided on website for tender notification, parties qualified etc.</i>	
4	<i>Timely receipt of material at site for execution</i>	
	<i>Performance Guarantee/EMD released in time</i>	
5	<i>Inspection & quality assurance support for timely job completion</i>	

We thank you for your time and courtesy!!

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ANNEXURE-J

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder prior to participation in the auction event)

In a bid to make our entire procurement process fair and transparent, TPSODL 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. TPSODL 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. TPSODL will make every effort to make the bid process transparent. However, the award decision by TPSODL would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPSODL, 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 TPSODL.
6. In case of intranet medium, TPSODL shall provide the infrastructure to bidders. Further, TPSODL 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 TPSODL.
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 TPSODL 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 TPSODL.
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 TPSODL well in time at our own. Further, we kept TPSODL 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, TPSODL 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, AMI, MRG, etc. – *Annex3.6*
 - 4.7 Maintenance and Operation of Street Light. – *Annexure 3.7*
1. Please note that hydra cranes used by any dept should be ACE Model No. FX 150 ACE SX 150, Escorts Model No. TRX 1550 or contemporary. Use of old generation hydra cranes like ACE 14XW or ACE 12 XW, etc are prohibited.

(Details as per Annexure attached)

Note: For minor contracts, the BA shall assign the duties of Safety Representative to the Work Supervisor. Work Supervisor will deliver all duties and responsibilities of Safety Supervisor as detailed in this document.

The Business Associate (BA) having major contract will appointing Safety supervisor, engineer / manager for the TPSODL work. The BA shall make all necessary arrangements for getting their workforce safety trained and competency checked from the concerned official of TPSODL 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 TPSODL. After getting the clearance from concerned official, BA cell and receiving temporary I-card issued by TPSODL, Business Associate shall commence the working.

Safety Representative of Business Associates will formally become the nodal point for safety concerns for TPSODL. **BA shall not frequently transfer or terminate the services of any of the safety representatives appointed for TPSODL 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.** TPSODL 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 TPSODL. 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 TPSODL. 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 TPSODL 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 Southern 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

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TPSODL shall be allowed to perform the High Risk / High Hazard activities (refer page 1). The skill / qualification required for the electrician and electrical supervisor are given in *annexure 5*. The contracts related to maintenance of Distribution Network, Distribution Projects, EHV Projects, maintenance of Sub-Transmission Network, MMG & EAG, maintenance and operation of streetlights, shall preferably have at least 20 per cent of ITI qualified electricians in the first year of the contract. This figure shall preferably be incremented by 15 per cent every subsequent year.

Note: For the competency assessment may please refer the work instructions. An employee shall have to necessarily undergo the competency assessment check once in every eighteen months.

5.5 Requirements from the Safety Representative(s) of the Business Associate:

- 5.5.1 Safety training of 2 hrs/employee/month and one day of safety induction training to all new employees joining the BA will be conducted by the BA as per Safety training modules of TPSODL.
- 5.5.2 Safety Talk / toolbox talk before start of shift to BA employees.
- 5.5.3 Ensuring the availability & proper usage of the standard safety equipment (PPE)
- 5.5.4 Periodic inspection of PPE to ensure their serviceability and maintaining the 10% buffer stock of standard PPEs.
- 5.5.5 Ensuring the adherence to standard operating procedures of TPSODL as mentioned in TPSODL Safety standard and O & M and concerned function's manual.
- 5.5.6 Safety inspections / audits as per the process of TPSODL
- 5.5.7 Working in close coordination SAFETY Group of TPSODL.
- 5.5.8 Reporting of unsafe acts, unsafe conditions, near miss, incident or accident to Engineer In-Charge and SAFETY Group of TPSODL immediately after its occurrence.
- 5.5.9 Regular HIRA at site and comply the control measures as stated in the detailed HIRA as per the *annexure 2*. Also, deployment of JSA based checklist shall be ensured.
- 5.5.10 Ensuring compliance with safety and other laws as may be applicable and providing for safety assurance.

5.6 Training and Syllabus: The BA shall not deploy any person at workplace / site or send newly recruited personnel directly to concerned official for competency assessment without Safety Induction Training.

5.6.1 All new BA employees have to necessarily undergo one and half days Safety training and Competency assessment at training centre of BA cell. This training will be conducted once in a week. After the completion of Safety training & Competency assessment I-card will be issued to all competent BA employees

5.6.2 BA is expected to initially train and judge the capability of the workman at his own end before further recommending the workmen for Competency assessment. If any BA workman sent for competency assessment. In case any BA workman fails in the Competency test at concerned official, it will be deemed that BA has not imparted sufficient training at his end and actual cost of training ₹ 7500/ BA employee/ failed attempt will be recovered.

5.6.3 The workers who have imparted Safety Training and issued I-Cards of TPSODL, are not deployed at TPSODL worksites/ voluntarily left the job by workers/ used somewhere else other than TPSODL 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 TPSODL*)

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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 TPSODL 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 TPSODL finds that BA has not provided the adequate / appropriate PPE to their staff, TPSODL 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 TPSODL 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 TPSODL.

- 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 TPSODL this shall be part of monthly bill along with training details. Performance 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 TPSODL 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 TPSODL.
- 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 TPSODL 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

if any.	
↓	
HoG (Safety – II) & HoG (Safety & Quality – Commercial) and CAPS to generate the MIS of the violations and the amount deducted.	SAFETY Group
↓	
The pool of the amount generated after the deduction to be utilized in safety welfare of BA employees.	SAFETY Group with approval of CFO/Chief (O & S) /CEO&MD

The safety violations have been rated from 1 to 5 (figure 6.3) as per the gravity of the violation. If the same violation is repeated it may escalate into a higher penalty. If a particular Business Associate employee violates safety norms three times, he shall not be allowed to work in TPSODL for a period of one year from the date of the 3rd violation.

6.3 Safety Violation Escalation Matrix

6.3.1

Consequence of Safety Violation Observed (Not related to Incident/ Accident)		Violation				
S.No.	Safety Violation	1st	2nd	3rd	4th	Subsequent Violations
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	A	B	C	D	Will attract the same 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)						

Figure 6.3 (1a)-Penalty Matrix for Safety violation (Applicable for Minor Contracts)

Consequence of Safety Violation Observed (Not related to Incident/ Accident)		Violation				
S.No.	Safety Violation	1st	2nd	3rd	4th	Subsequent Violations
1	Working without PPE (Helmet/Gloves/Safety Harness/ Safety Shoes etc.)	B	C	D	D	Will attract the same 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)						

Figure 6.3 (1b)-Penalty Matrix for Safety violation (Applicable for Major Contracts)

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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.

TPSODL encourages the reportage of the safety violation during the contract work by BA. Any TPSODL 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 TPSODL and send the top portion of the Safety Violation Form to SAFETY group for the further necessary action against the BA. **The cumulative nos. of Safety Violations pertaining to any particular BA shall be calculated on yearly basis.**

Safety violations resulting in incident / accident will be treated as per gravity of the injury / fatality and its impact as well as type i.e. minor or Major. Consequences of incident / accident are shown in the matrix (figure 6.3(2) for major and 6.3(3) for minor) below. In case of any accident, findings and recommendations of Accident Enquiry Committee will be final and binding and will supersede the arbitration clause of GCC.

Consequence Of an Incident / Accident (In case of MAJOR contract)		Incident / Accident				Action Required
Sl. No	Type of the injury	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	F (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less then 48 Hrs)	F	G	G	H	
3	Major injury (Bone injury or burn or Hospitalization more then 48 Hrs)	G	G	H	I	
4	Single fatality	J	K			Intolerable
5	Multiple fatalities (Two or more fatalities during one event)	K				
Legend	Action to be taken	Responsibility		Penalty (in Rs.)		The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.
F	Memo to BA and levy of penalty	Engineer Incharge		5,000/-		
G	Memo to BA and levy of penalty	Head of Group		20,000/-		
H	Memo to BA and levy of penalty	Head of Group		50,000/-		
I	Memo to BA and levy of penalty	Head of Department		2,00,000/-		
J	Memo to BA and levy of penalty	Head of Department		5,00,000/-.		
K	Memo to BA, levy of penalty, termination of contract and black listing of BA	Functional Head		10,00,000/-		
Figure 6.3 (2) - Penalty Matrix for Incident / Accident in Major Contracts						

Figure 6.3 (2) - Penalty Matrix for Incident / Accident in Major Contracts

(For example: In major contracts, if there is first incidence of major injury say bone injury (Cat. 3) where worker was hospitalized for more than 48 hrs then a penalty of amount Rs.20000/- will be deducted from the current bill produced for the payment. This penalty will be similar for first two incidents. However, it will increment to next higher category i.e. Rs. 50,000/- on subsequent incidents as per the above matrix)

Consequence Of an Incident / Accident (In case of <u>MINOR</u> contract)		Incident / Accident				Action Required
Sl. No	Type of the injury	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	L (Strengthening of process through continuous improvement in the work procedure)				Take risk reduction measures
2	Minor injury (No or Hospitalization less then 48 Hrs)	L	M	M	N	
3	Major injury (Bone injury or burn or Hospitalization more then 48 Hrs)	M	M	N	O	
4	Single fatality	P	Q			Intolerable
5	Multiple fatalities (Two or more fatalities during one event)	Q				

Legend	Action to be taken	Responsibility	Penalty (in Rs.)	The number of violations are to be calculated cumulatively over the contract period and not on monthly basis.
L	Memo to BA and levy of penalty	Engineer Incharge	5,000/-	
M	Memo to BA and levy of penalty	Engineer Incharge	10,000/-	
N	Memo to BA and levy of penalty	Head of Group	25,000/-	
O	Memo to BA and levy of penalty	Head of Department	1,00,000/-	
P	Memo to BA and levy of penalty	Head of Department	3,00,000/-	
Q	Memo to BA, levy of penalty, termination of contract and black listing of the BA	Functional Head	5,00,000/-	

Figure 6.3 (3) - Penalty Matrix for Incident / Accident in Minor Contracts

(For example: In minor contracts, if a worker meets with a non-fatal accident say bone injury (Cat. 3) where he was hospitalized for more than 48 hrs then a penalty of amount Rs. 10,000/-, will be charged from the current bill produced for the payment. This penalty will be similar for first two incidents. However, it will increment to next higher category i.e. Rs. 25,000/- on subsequent incidents as per the above matrix.)

In case of single or multiple fatalities described under legends J&K of 6.3(2) and P&Q of 6.3(3), the concerned BA may be debarred from extension of contract or participate in new contract. In such event the approval of Chief (O & S) will be necessary for extension or award of new contract to concerned BA.

6.3.2 COMPENSATION FOR BA PERSONNEL

In the event of any untoward incident/ accident, the Business Associate shall ensure prompt medical assistance such as treatment, sickness benefit, etc. is provided to the victim(s) as per the Employees' Compensation Act, 1923 or Employees' State Insurance Act, 1948, as applicable. Also, the BA will be required to take adequate measures for compensating the victim(s) or his/her/their kin as follows:

Group Personal Accident (GPA) policy coverage of ₹ 15 Lacs to be taken by the respective BAs.

i. It is mandatorily required to take the GPA policy coverage of ₹ 15 Lacs by the BA for his employees from a reputed insurance agency.

ii. TPSODL HR department will be the overall process owner and BA shall be required to coordinate with TPSODL HR department for policy implementation immediately post receipt of LOI / Work Order.

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I. For Death or Permanent / Total Disablement

The BA shall take an insurance coverage of at least Rs. 15 lakhs for each engaged employee, to cover any incidence of Death or Permanent / Total Disablement (Permanent/Total Disability shall be considered as defined under Employees' Compensation Act, 1923). In the event of any such unfortunate incident, the BA would ensure that adequate compensation is paid immediately to the family of the victim(s) from his own resources. This compensation shall be covered under the insurance policy subscribed by the BA mentioned earlier and the arrangement should be such that it would get reimbursed to the BA by the insurance agency subsequently.

II. For Permanent Partial Disablement and Temporary Total Disablement

The compensation in this case will be as per provisions of the Employees' Compensation Act, 1923 or Employees' State Insurance Act, 1948, as applicable.

Accordingly, the BA shall obtain a suitable Insurance Policy on award of Contract and submit documentary evidence of the policy to the BA Cell before commencement of work. The BA shall ensure that the Insurance policy is active at all times and all employees are covered in all respects till the conclusion of contract period or till working with TPSODL. The BA shall submit a copy of the policy after periodic renewals to the BA Cell.

However, on occurrence of such unfortunate incident, if it is found that the victim(s) is/are not covered under any insurance policy, the BA shall be liable to pay the entire sum of Rs. 15 lakhs from his own resources.

Further, in case of an accident resulting in Death or Permanent / Total Disablement while on duty, the appointed BA Nodal Officer will ensure that the BA complies with all statutory provisions and benefits i.e. PF, Compensation, Gratuity etc., and that all these are made available to the employees' nominee(s) as per the stipulated timelines.

6.3.3 TPSODL 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 TPSODL. 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

TPSODL	TP Southern 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

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	Management
MMG	Meter Management Group
EAG	Energy Audit Group
PPE	Personal Protective Equipment
SOP	Standard Operating Procedures
CSI/SI	Circle Safety In-charge / Safety In-charge
ASO	Area Safety Officer
NSO	Nodal Safety Officer
SC	Safety Coordinator
HoG / HoD	Head of Group / Head of Department
AGM / GM / VP	Assistant General Manager / General Manager / Vice President
CFO / Chief (O & S)/ CEO & MD	Chief Finance Officer / Chief (Operating & Safety) / Chief Executive Officer & Managing Director
COS	Corporate Operation Services
CAP	Centralized Account Payable System
PTW	Permit To Work
GCC	General Conditions of Contract.

- END -

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Annexure 1 (Refer Para 3.1)

Business Associate Safety Management System Questionnaire

Certification				
The information provided in this questionnaire is a summary of the company's occupational health and safety management system.				
Company Name:				
Turnover and experience:		Name of top officer:		
Date:		Position		
Contract Details				
Contract Name			Contract Number:	
Business Associates Safety Management System Questionnaire		Marks	Yes	No
				Score achieved
<i>Safety Policy and Management</i>				
- Is there a written company Safety policy? - If yes provide a copy of the policy, if No please refer Note 1.		1		
- Does the company have an Safety Management system - If yes provide details, if No please refer Note 1.		1		
- Is there a company Safety Management System manual or plan? - If yes provide a copy of the content page(s), if No please refer Note 1.		2		
- Are Safety and occupational health responsibilities clearly identified for all levels of Management and staff? - If yes provide details, if No please refer Note 1.		2		
<i>Safe Work Practices and Procedures</i>				
- Has the company prepared safe operating procedures or specific safety instructions relevant to its operations and relevant work as per contract? - If yes provide a summary listing of procedures or instructions, if No please refer Note 2.		1		

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

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Certification				
- If yes provide details				
<i>Safety Performance Monitoring</i>				
- Are employees regularly provided with information on company health and safety performance?	1			
- If yes provide details				
- Has the company ever been convicted of an occupational health and safety offence?	NO Marks (Negative mark ONE for each case)			
- If yes provide details				
- Has there been any major accident of employee at TPSODL site in past	NO Marks (Negative mark ONE for each case)			
- Has there been any fatal accident of employee at TPSODL 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 TPSODL 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.

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Annexure 2 (Refer Para 3.2 and 5.8)

Risk Assessment Form

Business Associate:
Scope of the work:
BA's Representative:
Telephone:
Signature:
Date:

Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
Working at Height	Fall from height	2	1. Mandatory usage of JSA checklist prior to start of work 2. Use appropriate ladder 3. Use full body safety harness having double lanyard. 4. Use Electrical Safety Shoes if working on electrical network otherwise use safety shoes. 5. Use Safety helmet. 6. Use PPE as per the annexure 7 of this CSM document 7. Refer Work instruction related to Working at Height for other details 8. Use of metal scaffold to be ensured in height work (cup lock type) 9. Deploy competent workforce who are medically fit

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Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures
Working on electrical equipment / network	Electric flash / electrocution	3	1. Mandatory usage of JSA checklist prior to start of work 2. Use Electrical Safety Shoes while working on electrical network. 3. Use Electrical Safety gloves of appropriate voltage rating. 4. Use face shield / visor attached with helmet. 5. Use Safety helmet. 6. Use PPE as per the annexure 7 of this CSM document 7. Mandatory usage of Insulated tools & tackles on electrical system 8. Mandatory compliance for Lock Out & Tag out system. Refer Work instruction related to Working on electrical equipment / network for other details
Excavation / Civil work	Collapse of soil, fall in excavated pit leading to Injury	2	1. Use safety shoes. 2. Use Safety helmet. 3. Use PPE as per the annexure 7 of this CSM document 4. Hard Barricading of the worksite. 5. Refer Work instruction related to excavation / civil work for other details
Material lifting & Mechanical Erection work	Fall of material/object, Topple of crane,	2	1. Mandatory compliance of crane checklist 2. Visual condition check of lifting tools and tackles such as wire rope sling, belt sling, chain, pulley block, D-shackles, etc. shall be ensured. 3. The operator's physical fitness and alertness should be judged by sup. / EIC. 4. Use PPE as per the annexure 7 of this CSM document 5. Refer Work instruction related to Material lifting & Mechanical Erection work
Road Safety	Road Accidents	3	1. Mandatory compliance of TPSODL Road Safety policy

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Specific Task/Activity	Potential Hazards/Consequences	Class of Risk	Control Measures

Note: This information for the general indication purpose. The detailed risk assessment shall be conducted before start of the work by the authorized representative of the BA. The report of same shall be submitted to engineer in-charge along with annexure 4 of the CSM document.

Guidelines for filling the Risk Assessment Form

- *Specific Task/Activity* - The documentation of each major task associated with the contract.
- *Potential Hazards* - The identification of hazards associated with each activity or task to be carried out.
- *Class of Risk* - Each hazard should be evaluated as a level of risk, described as Risk Class 1, 2 or 3 defined above.
- *Control Measure* - The identification and documentation of actions required to eliminate or reduce the hazards that could lead to accident or injury.

Hazard / Risks shall be classified according to the following schedule:

- Class 1: Potential to cause injury treatable with first aid
- Class 2: Potential to cause death or permanent injury
- Class 3: Potential to cause more than one or more lost time injuries.

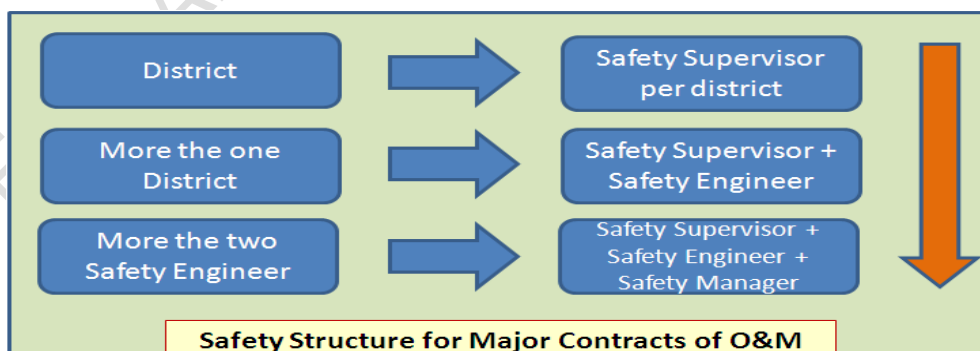
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Annexure 3.1 (Refer Para 4.0)

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 TPSODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPSODL.
- 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 TPSODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPSODL approved list in *annexure 7*.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPSODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPSODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPSODL.
- 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.



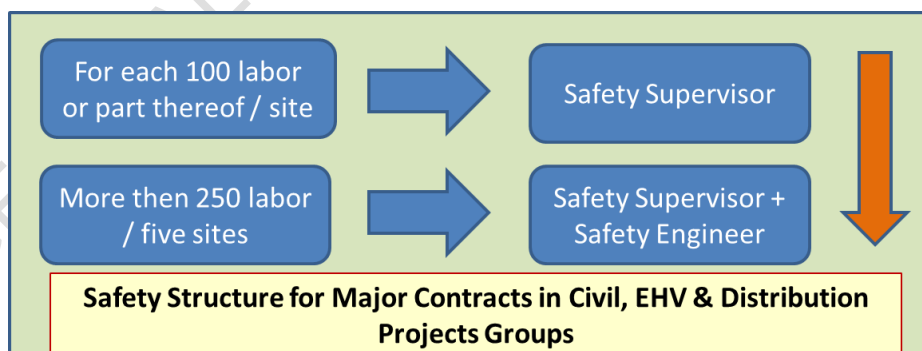
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Annexure 3.2 (Refer Para 4.0)

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 TPSODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPSODL.
- 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 TPSODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPSODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPSODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPSODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPSODL.
- 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.



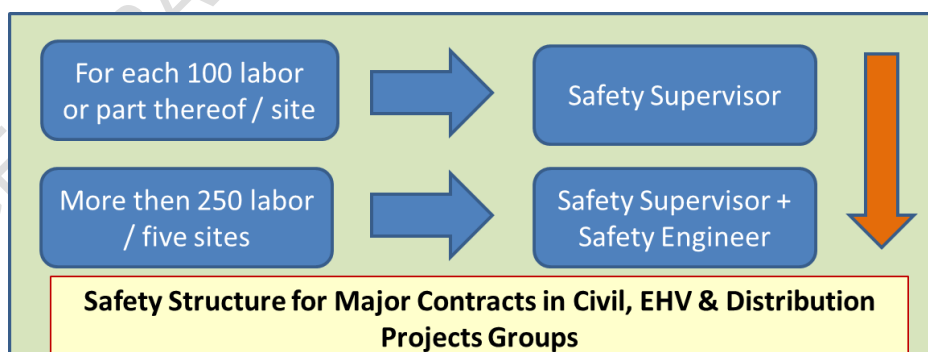
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Annexure 3.3 (Refer Para 4.0)

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 TPSODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPSODL.
- 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 TPSODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPSODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPSODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPSODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPSODL.
- 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 TPSODL Safety Manual for details.



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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 TPSODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPSODL.
- 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 TPSODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPSODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPSODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPSODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPSODL.
- 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.



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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 TPSODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPSODL.
- 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 TPSODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPSODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPSODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPSODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPSODL.
- BA shall provide safety performance and Safety MIS (*annexure 9*) to engineer in-charge and SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA shall ensure to depute a Safety Supervisor (for workforce up to 100 at site) / a safety engineer (for workforce up to 250 at site) / safety manager (for more than two safety engineers) for managing a complete safety management system at the project site. In case the BA has been awarded more than one major contracts, then the following safety structure will be adopted.
- BA shall refer Construction Safety Manual in TPSODL Safety Manual for details.



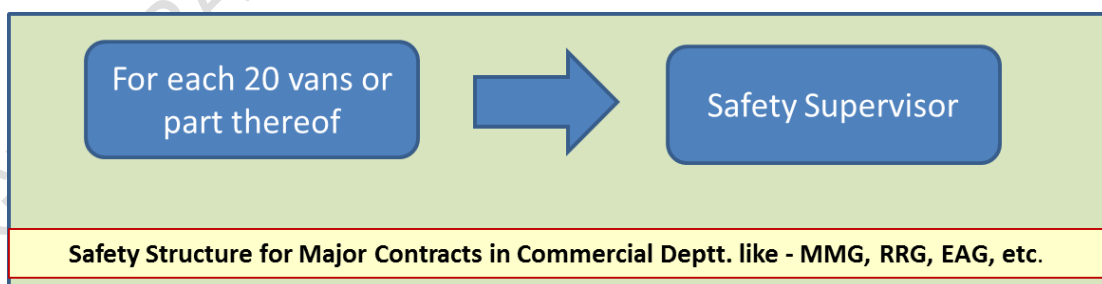
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Annexure 3.6 (Refer Para 4.0)

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 TPSODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPSODL.
- 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 TPSODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment (PPE) as per the TPSODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPSODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPSODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPSODL.
- 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.



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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 TPSODL.
- BA shall provide its organisation structure & responsibilities in terms of Safety Management to TPSODL.
- 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 TPSODL procedures provided by SAFETY group.
- BA shall provide and ensure the proper usage of the safety equipment PPE as per the TPSODL approved list in annexure 7.
- BA shall ensure periodic inspection of PPE to ensure its serviceability as per the specification given by TPSODL.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by TPSODL.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident or accident to engineer in-charge and SAFETY team of TPSODL.
- 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 TPSODL 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 Southern Odisha Distribution Limited (TPSODL) so as enable TPSODL 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 TPSODL specifically. , failing which TPSODL 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 TPSODL .
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 TPSODL 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 TPSODL / 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 TPSODL or to which TPSODL 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 TPSODL for any near miss or safety violations, accidents, which are attributable to fault of Contractor.

DEPONENT VERIFICATION

Verified at Berhampur 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 TPSODL
 - Identification of Risks associated with the maintenance work and planning for controlling measures by TPSODL supervisor
 - Creation of safety zone by TPSODL 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 TPSODL 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 TPSODL.

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Annexure 7 (Refer Para 5.7)

LIST OF PERSONAL PROTECTIVE EQUIPMENT AND TESTING FREQUENCY

Sl. No.	Name of PPE	IS / EN Standard	Testing Frequency	Remarks	Ref Brand & Model
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298 (Part-2)	Monthly and visual check every day for any crack or damage in the leather or sole.		BATA (Model No.- Endura L/C) Liberty (Model No. – 7198-01 HT Barton Black – Warrior)
02	HDPE Safety helmet with chin strap and ratchet type for adjustment.	IS:2925-1984	Monthly and visual check every day for any crack in shell.		Karam (PN Safetech) Joseph Leslie Accent Industries Honeywell
03	Full body harness (Safety belt)	EN 361	Monthly and visual check every day of the bends and the harness.		Karam (PN Safetech) Joseph Leslie Accent Industries
04	Electrical Safety Gloves	EN: 60903 CE marked	Weekly and visual check for any crack and blow test before every work.	Manufactured not beyond 12 months.	Make Sparian / Sumitech / CATU supplied with inner cotton glove with over glove of split leather.
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	Monthly and visual check every day for any crack in shell.	Clear acrylic visor attached with safety helmet.	Karam (PN Safetech) Joseph Leslie Accent Industries Honeywell
06	Fireproof jacket for chest protection		Monthly and visual check every day.		
07	Safety Chain for shorting cum earthing.	As per TPSODL standard	Weekly and visual check before every work.	Made of brass, Total length – 5.5 meters and made of 12 SWG.	

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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 TPSODL.
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. TPSODL 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	

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04	Electrical Safety Gloves – Composite type Soft electrical gloves as per size of individual.	EN: 60903 CE marked	
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	
06	Fireproof jacket for chest protection		
07	Safety Chain for shorting cum earthing.	As per TPSODL standard	
08	Reflective jacket to each workman	As per TPSODL standard	

Note: Picture shown are for indicative purpose only. Actual product may differ.

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Annexure 8 (Refer Para 5.8) LIST OF AUDITS TO BE CONDUCTED

Audits	Responsibility	Freq.	Ref. Doc.
Permit to Work & Field Audit	BA Safety Representative	Weekly	F04 (COR P - 12)
Tool Bag & PPE's Audit		Weekly	F06 (COR P - 12)
First Aid Box Maintenance Record		Fortnightly	F08 (COR P - 12)
Fire Extinguisher Record (Applicable for the BA involved in major construction works and have storage of flammable material at worksite)		Monthly	F09 (COR P - 12)
Safety Talk Register		Weekly	F18 (COR P - 12)
Site Safety Audit		Daily	F29A (COR P - 12)

Note:

1. (BA Safety Representative has to use the formats as per Safety process COR – P – 12 of TPSODL)

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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 TPSODL) (both in numbers and in Rs.)	No.	No.	No. of violation letter received and compliance report for the TPSODL.	
	Rs.	Rs.		

Note: Cumulative means total from date of commencement of work according to the contract.

Detail of the Accident / Near Miss Incidents:

Date and Time	Type of the incident	Name of Employee	Brief Description	Corrective and Preventive actions recommended

Details of the Safety Violations:

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Date and Location	Brief Description	Name of employee involved	Action Taken

Detail of the Safety Talk / Toolbox Talk / Safety Training

Date and Location	Topic (s)	Total Number of employees (Worker / Supervisor)	Number of participants (Worker / Supervisor)

Detail of the Safety Meeting

Date and Location	Number of participants	Topics discussed	Major Observations / Innovation

Detail of the Safety Inspection /Audit: (as per TPSODL site audit checklist F29A(COR-P-12)

Date	Area / Location	Major Observations	Recommendations	Action Taken

Any other Safety, Occupational Health, Environment & Disaster Management Promotional Activity (During this month):

Date	Location	Activity	Level of Participation	Number of participations

Signature of the BA Safety Representative
HoG

Signature of ZM /

Name, E. No. and Date

Name, E. No. Date.

Note: The original form to be deposited with Engineer in-charge and a copy to SAFETY group on or before 5th of every month along with bill. List of training of the current month and status of PPE to be also mentioned individual wise.

BA may include additional lines if required. The TPSODL may revise the format as and when deemed required.

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ANNEXURE-M
VENDOR APPRAISAL FORM

TO BE SUBMITTED BY VENDOR (To be filled as applicable)			
VENDOR:			
1.0	DETAILS OF THE FIRM		
	1.1	NAME (IN CAPITAL LETTERS)	:
	1.2	TYPE OF CONCERN (PROPRIETORY) Partnership, Pvt. Ltd., Public Ltd. etc.	:
	1.3	YEAR OF ESTABLISHMENT	:
	1.4	LOCATION OF OFFICE POSTAL ADDRESS TELEGRAPHIC ADDRESSES, TELEX NO. FAX NO.	:
	1.5	LOCATION OF MANUFACTURING UNITS	:
		i) UNITS 1	:
		ii) OTHER UNITS	:
2.0	PRODUCTS MANUFACTURED		:
3.0	TURNOVER DURING THE LAST 3 YEARS (TO BE VERIFIED WITH THE LATEST PROFIT & LOSS STATEMENT).		:
4.0	VALUE OF FIXED ASSETS		:
5.0	NAME & ADDRESS OF THE BANKERS		:
6.0	BANK GUARANTEE LIMIT		:
7.0	CREDIT LIMIT		:
8.0	TECHNICAL		
	8.1	NO. OF DESIGN ENGINEERS (INDICATE NO. OF YEARS EXPERIENCE IN RELATED FIELDS)	:
	8.2	NO. OF DRAUGHTSMEN	:
	8.3	COLLABORATION DETAILS (IF ANY)	:
		8.3.1 DATE OF COLLABORATION	:
		8.3.2 NAME OF COLLABORATOR	:
		8.3.3 RBI APPROVAL DETAILS	:

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		8.3.4 EXPERIENCE LIST OF COLLABORATORS	:
		8.3.5 DURATION OF AGREEMENT	:
	8.4	AVAILABILITY OF STANDARDS / DESIGN PROCEDURES / COLLABORATOR'S / DOCUMENTS (CHECK WHETHER THESE ARE LATEST/CURRENT)	:
	8.5	TECHNICAL SUPPORT, BACK-UP GUARANTEE, SUPERVISION, QUALITY CONTROL BY COLLABORATOR (WHEREVER ESSENTIAL). (THIS CLAUSE IS RELEVANT WHEN VENDOR'S EXPERIENCE IS INADEQUATE)	:
	8.6	QUALITY OF DRAWINGS	:
9.0	MANUFACTURE		
	9.1	SHOP SPACE, LAYOUT LIGHTING, VENTILATION, ETC.	:
	9.2	POWER (KVA)	:
		MAINS INSTALLED	:
		UTILISED	:
		STANDBY POWER SOURCE	:
	9.3	MANUFACTURING FACILITIES (ATTACH LIST OF EQUIPMENT AS APPLICABLE)	:
		9.3.1 MATERIAL HANDLING	:
		9.3.2 MACHINING	:
		9.3.3 FABRICATION	:
		9.3.4 HEAT TREATMENT	:
		9.3.5 BALANCING FACILITY	:
		9.3.6 SURFACE TREATMENT PRIOR TO PAINTING/ COATING, POLISHING, PICKLING, PASSIVATION, PAINTING, ETC.	:
	9.4	SUPERVISORY STAFF	:
	9.5	ADEQUACY OF SKILLED LABOURS (MACHINISTS, WELDERS, ETC.)	:
	9.6	NO. OF SHIFTS	:
	9.7	TYPE OF MATERIAL HANDLED (SUCH AS CS, SS, ETC.)	:
	9.8	WORKMANSHIP	:

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	9.9	MATERIAL IN STOCK AND VALUE	:	
	9.10	TRANSPORT FACILITIES	:	
	9.11	CARE IN HANDLING	:	
10.0	INSPECTION / QC / QA / TESTING			
	10.1	NUMBER OF PERSONNEL (INDICATE NO. OF YEARS OF EXPERIENCE)	:	
	10.2	INDEPENDENCE FROM PRODUCTION	:	
	10.3	AVAILABILITY OF PROCEDURAL WRITE UP/QUALITY PLAN	:	
	10.4	INCOMING MATERIAL CONTROL AND DOCUMENTATION	:	
	10.5	RELIABILITY/REPUTATION OF SUPPLY SOURCES	:	
	10.6	STAGE INSPECTION AND DOCUMENTATION	:	
	10.7	SUB-ASSEMBLY & DOCUMENTATION	:	
	10.8	FINAL INSPECTION AND DOCUMENTATION	:	
	10.9	PREPARATION OF FINAL DOCUMENTATION PACKAGE	:	
	10.10	TYPE TEST FACILITIES	:	
	10.11	ACCEPTANCE TEST FACILITIES	:	
	10.12	CALIBRATION OF INSTRUMENTS AND GAUGES (WITH TRACEABILITY TO NATIONAL STANDARDS) (ATTACH LIST)	:	
	10.13	STATUTORY APPROVALS LIKE BIS, IBR, ETC. (AS APPLICABLE)	:	
	10.14	SUB-VENDOR APPROVAL SYSTEM AND QUALITY CONTROL	:	
	10.15	DETAILS OF TESTS CARRIED OUT AT INDEPENDENT RECOGNISED LABORATORIES	:	
		i) FURNISH LIST OF TESTS CARRIED OUT AND THE NAME OF THE LABORATORY WHERE THE TESTS WERE CONDUCTED	:	
		ii) CHECK AVAILABILITY OF CERTIFICATES AND REVIEW THESE WHEREVER POSSIBLE	:	
11.0	EXPERIENCE (INCLUDING CONSTRUCTION / ERECTION / COMMISSIONING) TO BE FURNISHED IN THE FORMAT INDICATED IN APPENDIX)			:
12.0	SALES, SERVICE AND SITE ORANISATIONAL DETAILS			:
13.0	CERTIFICATE FROM CUSTOMERS (ATTACH COPIES OF DOCUMENTS)			:

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14.0	POWER SITUATION	:
15.0	LABOUR SITUATION	:
16.0 *	APPLICABILITY OF SC/ST RELAXATION (Y/N) IF YES, SUPPORTING DOCUMENTS TO BE ATTACHED	
17.0	ORGANIZATIONAL DETAILS 1. PF NO 2. ESI NO 3. INSURANCE FOR WORK MAN COMPENSATION ACT NO 4. ELECTRICAL CONTRACT LIC NO 5. ITCC / PAN NO 6. SALES TAX NO 7. WC TAX REG. NO	:
18.0	DOCUMENTS TO BE ENCLOSED: 1. FACTORY LICENSE 2. ANNUAL REPORT FOR LAST THREE YEARS 3. TYPE TEST REPORT FOR THE ITEM 4. PAST EXPERIENCE REPORTS 5. ISO CERTIFICATE –QMS, EMS, OHAS, SA 6. REGISTRATION OF SALES TAX 7. COPY OF TIN NO. 8. COPY OF SERVICE TAX NO. 9. REGISTRATION OF CENTRAL EXCISE 10. COPY OF INCOME TAX CLEARANCE. 11. COPY OF PF REGISTRATION 12. COPY OF ESI REGISTRATION 13. COPY OF INSURANCE FOR WORK MAN COMPENSATION ACT NO 14. COPY OF ELECTRICAL CONTRACT LIC NO 15. COPY OF PAN NO 16. COPY OF WC TAX REGISTRATION 17. DOCUMENTS IN SUPPORT OF SC/ST RELAXATION AT S.NO.16.0 18. GST Registration No	

* Classification of BA s under SC/ST shall be governed under following guidelines:

- **Proprietorship/ Single Ownership Firm:** Proprietor of the firm should be from SC/ST community. Governing document shall be Proprietorship Deed.
- **Partnership Firm:** Only such firms shall qualify which have SC/ST partners holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Partnership Deed.
- **Private Limited Company:** Only such firms shall qualify which have SC/ST directors holding equal to or more than 50% of the total ownership pattern of the firm. Governing document shall be Memorandum of Understanding (MoU) and/or Article of Association (AoA).

NOTE: Certification from SC/ST Commission shall be required for deciding upon SC/ST status of a person.

ANNEXURE-N

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MANUFACTURER AUTHORIZATION FORM

(To be submitted on OEM's Letter Head)

Date:

Tender Enquiry No.:

To,

Chief (Procurement & Stores)

TP Southern Odisha Distribution Limited,

Berhampur

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

The Tata Power Company Ltd	 TATA TATA POWER	<i>Safety Terms and Conditions</i>
<i>Document No.</i> TPSMS/GSR/STC/009 REV 02		<i>Date of Issue:</i> 19/01/2019

Safety Terms and Conditions

The Tata Power Company Ltd		<i>Safety Terms and Condition</i>
<i>Document No. TPSMS/GSR/STC/009 REV 02</i>		<i>Date of Issue: 19/09/2019</i>

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1. Definitions

- 1.1 **Order Manager:** Order Manager is the Tata Power representative, who has the ownership of the given job under the signed contract.
- 1.2 **Service Provider/Contractor/vendor:** An individual or an organization that provides services to Tata Power under a signed contract.
- 1.3 **Site Safety Management Plan:** It is the safety plan agreed between Contractor /service provider & Tata Power. It will contain the entire job specific safety requirement and will be signed by the service provider.
- 1.4 **High Risk Job:** Any job which has significant health and safety risk associated to it. The list of high risk jobs has been identified at Tata Power level.
- 1.5 **Emergency:** a serious, unexpected, business discontinuity and often dangerous situation resulting loss of revenue/property and requiring immediate action.

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2. Safety Policy



HEALTH AND SAFETY POLICY

Tata Power is committed to provide safe and healthy working environment for the prevention of work related injuries and ill-health. Safety is one of our core values. We strive to be a leader in safety excellence in the global power and energy business. In pursuit of this, we are committed to the following:

- Maintain and continually improve our management systems to eliminate hazards and reduce health & safety risks to all our stakeholders.
- Incorporate appropriate health & safety criteria into business decisions for selection of plant and technology, performance appraisal of individuals and appointments in key positions.
- Comply and endeavour to exceed all applicable health & safety legal and other requirements
- Integrate health & safety procedures and best practices into every operational activity with assigned line-functional responsibilities at all levels.
- Involve our employees and business associates in maintaining a safe and healthy work environment through consultation and participation
- Inculcate safety culture by visible leadership and empowerment.
- Ensure required competency to enable our employees and business associates for working safely.
- ▶ Promptly report incidents, investigate, share crucial learnings and prevent recurrences.
- Influence our business associates in enhancing their health and safety standards and align with Tata Power's health & safety codes and practices.
- Set safety & health metrics as indicators of excellence, monitor progress and continually improve health and safety performance.

We shall ensure the availability of appropriate resources at all times to fully implement and communicate this policy to all stakeholders by suitable means and periodically review its relevance in continuously changing business environment.

Date: 11th March, 2019

 Lighting up Lives!


 (Praveer Sinha)
 CEO & Managing Director



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3. Safety Organization & Responsibilities

4.1 Contractor Site Management and Supervision

Each Contractor will be responsible for fulfilling all statutory and safety requirements as per the laws of the land and not limited to Factory Act, Electricity Act, Electricity Rules and Regulations, Shop and Establishment Act etc.

Each Contractor shall provide at least one competent full time safety supervisor for workforce of less than 100 numbers. When workforce ranges from 100 to 1000, the contractor has to provide at least one qualified safety officer and safety supervisors (reporting to the safety officer) in the ratio 1:100. For every 1000 addition in workforce, the contractor has to add 1 safety officer. The Tata Power Project Safety Manager will review and approve the appointment of all safety supervisors. Contractor/Subcontractor safety supervisors/officers will work with Tata Power Safety Managers and align themselves with Tata Power safety requirements.

Each Contractors'/Subcontractors' Site Manager is responsible, and will be held accountable, for the safety of their sub contractors and workforce and for ensuring that all equipment, materials, tools and procedures remain in safety compliance at job site, including:

- 4.1.1 Holding officer/supervisors accountable for safety and actively promote safe work performance.
- 4.1.2 Participate in and cooperate with all safety program requirements to be implemented in order to meet Tata Power safety objectives.
- 4.1.3 Ensure timely reporting of safety incidents, near misses, unsafe acts and conditions.
- 4.1.4 Identify the training needs of its employees and maintain all safety training documents.
- 4.1.5 Provide safety performance report at an agreed frequency.
- 4.1.6 Stopping of unsafe work (acts and/or conditions) immediately, until corrective action be taken.

4.2 Contractor Supervisors and General Staff

Contractors' site supervisors and general staff members in charge of job site functions such as field engineering, warehousing, purchasing, cost and scheduling, etc. are responsible for the safe performance of the work of those they supervise. They must set an example for their fellow employees by being familiar with applicable sections of the Site Safety program and ensuring that all site activities are performed with SAFETY as the primary objective.

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Each site supervisor is responsible and will be held accountable for identifying, analyzing and eliminating or controlling all hazards through implementation of an aggressive, pro-active Health, Safety and Environmental Program from project inception through project completion. Each supervisor will proactively participate in the SHE program by observing, correcting unsafe acts, and recording these observations.

4.3 Contractor Workforce

Contractor workforce must make safety a part of their job by following safety rules and regulations and by using all safeguards and safety equipments. They must take an active part in the Site Safety program to ensure their own safety and injury-free employment as well as being alert to unsafe practices of their fellow employees.

Every member of the workforce is expected to report for work without influence of any Drug/Alcohol. All employees are expected to report any hazardous conditions practices and behaviors in their work areas and correct where ever possible.

Workforce is responsible for active participation in safety and health programs, suggestion systems, trainings and in immediate reporting of all injuries, any unsafe practices, conditions or incidents to their supervisors.

4.4 Vendor/Contractor

Vendors/Contractor shall at all times comply with, and ensure that their workforce comply with all site safety rules and regulations. Specifically, with applicable provisions of the Tata Power Site Safety Management Plan, and all statutory safety rules and regulations.

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4. Site Safety Rules and Procedures:

The work in the safest possible manner can only happen when it has been carefully planned and all applicable procedures are followed. The Tata Power Safety Procedures are derived from Tata Power best practices and the applicable Government acts regulations. In each case, the most stringent regulation is used.

Following is the list of Tata Power's critical Safety Rules and Procedures. Contractor shall refer to approved Rules and Procedures for detailed requirements and ensure conformance.

5.1 Lock Out and Tag Out Procedure

This procedure is intended to be used for the protection of Personnel while servicing or performing maintenance on equipment / pipeline / vessel / process systems. This is a general procedure that shall be used as the minimum requirements for isolation of equipment, pipelines, machines, system from all possible sources of hazardous energy and / or material such as Steam, Hot Water, Compressed Air, any other process fluid / chemical energy / Mechanical energy or Electrical energy. For complete procedure kindly refer Procedure Document No. TPSMS/CSP/LOTO/001 REV 01 available on official website of Tata Power (www.tatapower.com)

5.2 Excavation Safety (Shoring and Sloping) Procedure

This procedure is developed to cover the safe practices required for shoring and sloping in excavation and trenching jobs. This procedure is developed to establish mandatory requirements for practices to protect personnel, property and equipment from hazards associated with above activities. For complete procedure kindly refer Procedure Document No TPSMS/CSP/EXS/002 REV 01 available on official website of Tata Power (www.tatapower.com)

5.3 Confined Space Entry Procedure

This procedure outlines the steps required to perform the confined space entry and to protect personnel from the hazards of entering and conducting operations in confined spaces. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/CSE/003 REV 01 available on official website of Tata Power (www.tatapower.com)

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5.4 Working at Height Procedure

This procedure describes the rules and procedures to protect employees from the hazards of working at heights.

This procedure is developed to cover the safe practices required for Working at Heights. This procedure is developed to establish mandatory requirements for practices to protect personnel from hazards associated in this area. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/WAH/004 REV 01 available on official website of Tata Power (www.tatapower.com)

5.5 Heavy Equipment Movement Safety Procedure

Heavy equipment lifting and movement is an activity involving loading, unloading, storage and movement from one place to another including lifting and erection or repairing of equipment with cranes or hoists. Material, machinery and equipment handling operations are being carried out by large capacity cranes and hoists, which make the job safer and faster. This procedure addresses the hazards and precautions associated with such equipment and their use. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/HEMS/005 REV 01 available on official website of Tata Power (www.tatapower.com)

5.6 Mobile Crane Safety Procedure

Mobile cranes are responsible for many incidents, injuries. Falling loads from mobile cranes pose a severe hazard to operators and nearby workers and property. Many types of cranes, hoists, and rigging devices are used for lifting and moving materials. To maintain safe, appropriate standards has to be adhered to and only qualified and licensed individuals shall operate these devices. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/MCS/006 REV 01.

5.7 Scaffold Safety Procedure

This procedure is developed to provide information on the safe erection, use, dismantling and maintenance of access scaffolding in the workplace. It is developed to establish mandatory requirements for practices to protect personnel from hazards associated with erection, use and dismantling of scaffolds. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/SCAF/007 REV 01 available on official website of Tata Power (www.tatapower.com)

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5.8 Electrical Safety Procedure

The objective of these standards is to specify minimum mandatory requirements and advisory guidance for identifying and controlling hazards to ensure 'Zero Harm' with regard to operation maintenance and testing of electrical equipment. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/ELEC/010 REV 01 available on official website of Tata Power (www.tatapower.com)

5.9 Job Safety Analysis (JSA) Procedure

This objective of this procedure is to have a task based risk assessment process in place that identifies, evaluates and controls the risks associated with work activities, and as a result, prevents those involved in the task or those potentially affected by the task, from being harmed. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/JSA/009 REV 01 available on official website of Tata Power (www.tatapower.com)

5.10 Fire Safety Management Procedure

Objective of This standard is to specify the minimum mandatory requirements and advisory guidelines to ensure prevention of fire related incidents and managing / controlling their impacts if they do occur. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/FSM/011 REV 01

5.11 Permit To Work Procedure

Given the inherent hazards of the power generation and distribution industry, a significant number of TATA POWER operations and installations are critical. Work Permit (WP) System is an essential element in controlling the workplace risks in an effective manner. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/PTW/008 REV 01 available on official website of Tata Power (www.tatapower.com)

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5.12 Lift (Elevator) Safety Procedure

To provide safe operating procedure for taking control of lift car before entering and existing the pit of OTIS make elevators. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/LIFT/001 REV 01 available on official website of Tata Power (www.tatapower.com)

5.13 Working on conveyor belt Procedure

This procedure is developed to cover the safe practices required for Working on live equipment and to protect personnel from hazards associated with it. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/CONV/002 REV 01 available on official website of Tata Power (www.tatapower.com)

5.14 Handling Hazardous Materials Procedure

This Procedure is developed to provide procedure for recycling and / or safe disposal of used / waste batteries in compliance with all legislation. For complete procedure kindly refer Procedure Document No-TPSMS/GSP/HAZM/003 REV 01 available on official website of Tata Power (www.tatapower.com)

5.15 Material Handling and Storage Procedure

The purpose of this document is to provide procedures to assist the safe handling of materials (manual handling and mechanical handling). For complete procedure kindly refer Procedure Document No – TPSMS/GSP/MATL/004 REV 01 available on official website of Tata Power (www.tatapower.com)

5.16 Contractor Safety Management Procedure

The purpose of this document is to engage with contractors in a way to create safe work environment for everyone working for Tata Power. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/CSM/015 REV 01 available on official website of Tata Power (www.tatapower.com)

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The above procedures will be updated periodically and the updated version of the procedures as well as any additional critical procedure will be available on official website of Tata Power (www.tatapower.com) for your reference.

5. Training and Capability Building

Safety Training and capability building of workforce is a major component of safety management program. All training required must be provided and documented as specified by Tata Power and Indian Regulations. Tata Power Safety Manager will audit contractors training and related documentation to assure its adequacy.

6.1 Tata Power Site Safety Orientation

All Tata Power contractor and subcontractor workforce is required to attend Tata Power Site Safety Orientation Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry.

This Safety Orientation Course will be for duration of minimum half day. The information provided during the orientation will include, but is not limited to following:

1. Job rules, personal safety and conduct
2. Hazards reporting
3. Reporting of injuries
4. Emergency procedures
5. Safety Activities and Program including disciplinary measure and incentives.
6. Critical safety procedure relevant to the job

6.2 Capability Building

Appropriate training such as L1, L2 & L3 is given to ensure that a jobholder, either supervisor or worker, is competent to do his/her job safely. The skill training is provided through TPSDI and other agencies authorized by Tata Power on the list of 15 procedures mentioned under safety procedure.

Contractor shall ensure that concerned workmen are provided with adequate training before he/she is allowed to execute the work.

An evaluation test will be conducted after the completion of the training. Those workmen employee who meet the minimum required competency will be provided with Gold Card which is valid for 3 years, post which the workmen has to reappear for the assessment. If the workman is not able to qualify the assessment, he/she will be given 3 additional attempts to clear in 3 month timeframe failing which he/she will not be allowed to work on high risk jobs.

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6. Pre Employment and Periodic Medical check up

Contractor shall arrange to conduct a pre employment and periodic medical check-up for its entire workforce by Tata Power medical officer or Tata Power authorized medical officer. The contractor shall be able to produce the certificate prior to the employment. The contractor shall also organize to conduct periodical medical checkup (six monthly) for the following category of employees:

- Drivers (Check for Vision & Hearing)
- Equipment Operators (Check for Vision & Hearing)
- Workforce working at Height (Check for Vision, Hearing, Vertigo & Height Phobia)
- Workforce Handling the hazardous substances (Coal, ash and chemicals)
- Workforce in high decibel area (> 90 Decibel, Check for Hearing)
- Workforce, working in specific areas requiring specific medical attention should conduct the medical test as laid down in the respective Site Safety Management Plan.

7. Safety Performance Evaluation and Penalties

8.1 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 based on "Safety Performance score" attached in CSM-F-3 of CSM procedure. The amount is based on following table

Contract Value	Retention Amount(%)
Upto 10 Lakhs	2.5
10 – 50 lakhs	2
0.5 to 10 Cr	1.5
>10 Cr	1

8.2 Safety performance Score will be monitored by the Order Manager every month.

8.3 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.

8.4 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.

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8.5 In case of fatality, limb loss or loss of property, vendor has to 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.

8.6 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.

8.7 Safety performance bonus 1% (limiting to 50 lakhs) of the invoice value will be considered at the end of the job if the contractual safety performance score is 100%.

8.8 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.

8.9 Order Manager, divisional chief and SBU head have the authority to terminate the contract in case of three consecutive serious violations.

Safety Performance Evaluation - CSM-F-3

	<u>Lead Indicators</u>	Unit Of measurement	Target	weight age
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 for Critical Equipments, lifting Tools & Tackles and hand tools used at site	%	80	5
4	Condition of tools, tackles and equipments	%	100	15
	<u>Lag Indicators</u>			
1	Number of Fatalities	No.	0	30
2	Number of Lost work day case (LWDC)	No.	0	10
3	Man-days Lost	No.	0	10

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In addition to above evaluation criteria, for specific violations penalty shall be imposed on the contractors under following circumstances:

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 Earthing 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 Three-wheeler at the work site.	5	5000/-
16.	Starting the job without Tool Box 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 equipments.	5	5000/-
21.	Using damaged slings.	5	5000/-
22.	Unstable scaffolding/non standard 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 life line not used for working at height	5	5000/-
27.	No rubber mat in DB room	4	2000/-
28.	Water found accumulated in DB 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 D.B Room./ welding areas.	4	2000/-
32.	Loose material falling into excavated pit	4	2000/-
33.	Water logging into excavated pit	4	2000/-
34.	No / inadequate Barricade	4	2000/-

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Sr No	Description of violation	Severity	Penalty /
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 HMTV/Mobile Crane operator does not having a valid HMTV 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 body 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 etc.	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 passengers cars.	3	500/
56.	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/ starch 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/

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Sr No	Description of violation	Severity	Penalty /
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.	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 provide 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 Work Place	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.	Non functional Head light/ tail light 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/-

The Tata Power Company Ltd		<i>Safety Terms and Condition</i>
<i>Document No. TPSMS/GSR/STC/009 REV 02</i>		<i>Date of Issue: 19/09/2019</i>

Sr No	Description of violation	Severity	Penalty /
95.	Without Flash back arrestor on Industrial Acetylene & Oxygen cylinders.	5	5000/-
96.	Spillage of hazardous material/chemicals during transportation	4	2000/-
97.	Electrical equipment without Earthing/ ELCB/ Double Insulation Cable.	5	5000/-
98.	Lifting Tools & Tackles used without/ expired Test Certificates.	5	5000/-
99.	Housekeeping repeatedly not maintained		
100.	• First Time	3	Warning
101.	• Second Time	4	1000/-
102.	• Third Time	5	5000/-
103.	Serious Violation Of House Keeping (after 1 st or 2 nd warning to be decided by Project Manager depending on the severity)		Rs.10000/- and above
104.	Repeat Violation of same nature	5	5X Violation

HEALTH AND SAFETY POLICY

We, at Tata Power, reaffirm our belief that the health and safety of our stakeholders is of the utmost importance and takes precedence in all our business decisions. In pursuit of this belief and commitment, we strive to:

- Maintain and proactively improve our management systems to minimize health and safety hazards to our stakeholders and all others influenced by our activities.
- Comply and endeavour to exceed all applicable occupational health & safety legal and other requirements by setting the highest standards.
- Integrate health & safety procedures and best practices into every operational activity with assigned line-functional responsibilities at all levels, for improving and sustaining health & safety performance.
- Involve our employees in maintaining a safe and healthy work environment through risk assessments, periodic reviews of operational procedures, safe work methods and adoption of new technology.
- Develop a culture of safety through active leadership and provide appropriate training at all levels to enable employees developing their skills to work safely.
- Incorporate appropriate health & safety criteria into business decisions for selection of plant and technology, performance appraisal of individuals and appointments in key positions.
- Ensure availability at all times of appropriate resources to fully implement the health & safety policy of the company.
- Promptly report incidents, investigate for root causes and ensure lessons learnt shared and deployed across the company.
- Ensure service providers and their workmen align with company's safety codes and practices for the health and safety of personnel working with us.
- Set safety & health metrics as indicators of excellence, monitor progress and continually improve performance.

We shall actively communicate this policy to all stakeholders by suitable means and periodically review its relevance in continuously changing business environment.

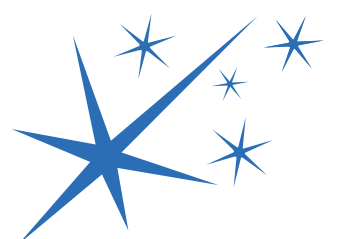


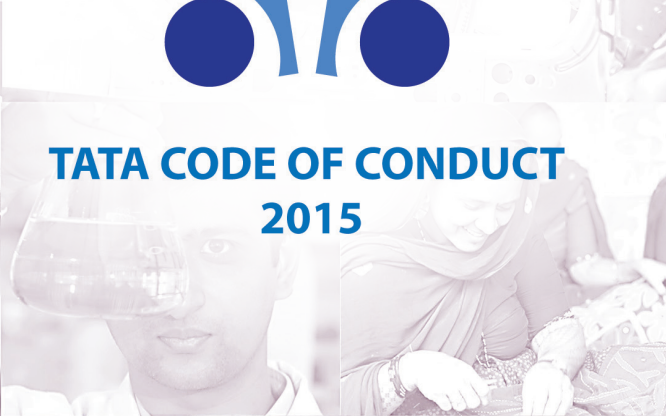
(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER

Lighting up Lives!





**TATA CODE OF CONDUCT
2015**



LEADERSHIP THAT INSPIRES

For over 100 years, the Tata group has been led by visionaries who have stayed true to the vision of the founder, Jamsetji Tata.

A vision that placed the greater good of society at par with business growth.

A vision that put into practice pioneering social initiatives that changed the way responsible business was run.

And a vision that brought into the group a strong social conscience.



We do not claim to be more unselfish, more generous or more philanthropic than other people. But we think we started on sound and straightforward business principles, considering the interests of the shareholders our own, and the health and welfare of the employees, the sure foundation of our success.

Jamsetji Tata
Founder of the Tata group
Chairman (1868 – 1904)

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FOREWORD

Tata companies have consistently adhered to the values and ideals articulated by the Founder for over 150 years. The Tata Code of Conduct was first formalized by Mr Ratan Tata. It articulates the Group's values and ideals that guide and govern the conduct of our companies as well as our colleagues in all matters relating to business. Today, the Code is a bedrock on which we base our individual, as well as leadership commitments to core Tata values.

The Tata Code of Conduct outlines our commitment to each of our stakeholders, including the communities in which we operate, and is our guiding light when we are sometimes faced with business dilemmas that leave us at ethical crossroads. The Code is also dynamic in that it has been periodically refreshed in order to remain contemporary and contextual to the changes in law and regulations. However it remains unaltered at its core.

Our stellar reputation and success as a business entity has been defined by the powerful commitment and adherence to the core values and principles expressed in this Code, by all our employees, directors and partners. I trust every Tata colleague and Tata company will continue to not only comply with the laws and regulations that govern our business interests around the world, but will continue to set new standards of ethical conduct that will generate deep respect and inspire emulation by others.

N. Chandrasekaran

21st February, 2017



A. OUR VALUES

TATA has always been values-driven. The five core values that underpin the way we conduct our business activities are:



These universal values serve as the foundation for the Tata Code of Conduct. They find expression within the value system of every Tata company.

B. SCOPE AND PURPOSE OF THIS CODE

1. This Code sets out how we behave with:
 - our employees, or those who work with us;
 - our customers;
 - the communities and the environment in which we operate;
 - our value-chain partners, including suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents;
 - our joint-venture partners or other business associates;
 - our financial stakeholders;
 - the governments of the countries in which we operate; and
 - our group companies.
2. In this Code, “we or us” means our company, our executive directors, officers, employees and those who work with us, as the context may require.
3. The term “our group companies” in this Code typically means companies Tata Sons intends for this Code to apply to, and / or to whom Tata Sons has issued this Code.
4. This Code sets out our expectations of all those who work with us. We also expect those who deal with us to be aware that this Code underpins everything we do, and in order to work with us they need to act in a manner consistent with it.

REMEMBER...

It is our commitment to protect our reputation and our brand equity by adhering to the values and principles set out in this Code. By doing so, we strengthen our unique culture and identity.

OUR CORE PRINCIPLES



The Tata philosophy of management has always been, and is today more than ever, that corporate enterprises must be managed not merely in the interests of their owners, but equally in those of their employees, of the consumers of their products, of the local community and finally of the country as a whole.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

C. OUR CORE PRINCIPLES

1. We are committed to operating our businesses conforming to the highest moral and ethical standards. We do not tolerate bribery or corruption in any form. This commitment underpins everything that we do.
2. We are committed to good corporate citizenship. We treat social development activities which benefit the communities in which we operate as an integral part of our business plan.
3. We seek to contribute to the economic development of the communities of the countries and regions we operate in, while respecting their culture, norms and heritage. We seek to avoid any project or activity that is detrimental to the wider interests of the communities in which we operate.
4. We shall not compromise safety in the pursuit of commercial advantage. We shall strive to provide a safe, healthy and clean working environment for our employees and all those who work with us.
5. When representing our company, we shall act with professionalism, honesty and integrity, and conform to the highest moral and ethical standards. In the countries we operate in, we shall exhibit culturally appropriate behaviour. Our conduct shall be fair and transparent and be perceived as fair and transparent by third parties.
6. We shall respect the human rights and dignity of all our stakeholders.
7. We shall strive to balance the interests of our stakeholders, treating each of them fairly and avoiding unfair discrimination of any kind.
8. The statements that we make to our stakeholders shall be truthful and made in good faith.
9. We shall not engage in any restrictive or unfair trade practices.
10. We shall provide avenues for our stakeholders to raise concerns or queries in good faith, or report instances of actual or perceived violations of our Code.
11. We shall strive to create an environment free from fear of retribution to deal with concerns that are raised or cases reported in good faith. No one shall be punished or made to suffer for raising concerns or making disclosures in good faith or in the public interest.
12. We expect the leaders of our businesses to demonstrate their commitment to the ethical standards set out in this Code through their own behaviour and by establishing appropriate processes within their companies.
13. We shall comply with the laws of the countries in which we operate and any other laws which apply to us. With regard to those provisions of the Code that are explicitly dealt with under an applicable law or employment terms, the law and those terms shall take precedence. In the event that the standards prescribed under any applicable law are lower than that of the Code, we shall conduct ourselves as per the provisions of the Code.

REMEMBER...

"Good faith" means having a reasonable belief that the information you have provided is truthful. It does not mean having 'all the evidence' about the potential violation or case reported.

OUR EMPLOYEES



Once you got the best people, the people who shared our values and ideals, we left them free to act on their own. We do not fetter them. We encourage them and give them opportunities for leadership.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

D. OUR EMPLOYEES

Equal opportunity employer

1. We provide equal opportunities to all our employees and to all eligible applicants for employment in our company. We do not unfairly discriminate on any ground, including race, caste, religion, colour, ancestry, marital status, gender, sexual orientation, age, nationality, ethnic origin, disability or any other category protected by applicable law.
2. When recruiting, developing and promoting our employees, our decisions will be based solely on performance, merit, competence and potential.
3. We shall have fair, transparent and clear employee policies which promote diversity and equality, in accordance with applicable law and other provisions of this Code. These policies shall provide for clear terms of employment, training, development and performance management.

Q&A

A job requirement entails extensive travel. One of the candidates has excellent relevant experience and qualifications. However, this candidate is a single parent. As a result, I feel such a situation would significantly hinder this candidate's ability to cope with the job requirement. What should I do?

In accordance with the Code, the decision to recruit an employee should be based upon merit. We cannot make a presumption that the candidate would not be able to meet the travel requirements of the job. All eligible candidates should be provided with equal opportunity to demonstrate or justify that they can cope with the travel requirements of the job. Being a single parent cannot be a ground to be discriminated against at any stage of recruitment or ongoing employment in our company.

REMEMBER...

We do not tolerate harassment in any form and therefore we expect every employee to discourage such misdemeanours in the workplace.

Dignity and respect

4. Our leaders shall be responsible for creating a conducive work environment built on tolerance, understanding, mutual cooperation and respect for individual privacy.
5. Everyone in our work environment must be treated with dignity and respect. We do not tolerate any form of harassment, whether sexual, physical, verbal or psychological.
6. We have clear and fair disciplinary procedures, which necessarily include an employee's right to be heard.
7. We respect our employees' right to privacy. We have no concern with their conduct outside our work environment, unless such conduct impairs their work performance, creates conflicts of interest or adversely affects our reputation or business interests.

Human rights

8. We do not employ children at our workplaces.
9. We do not use forced labour in any form. We do not confiscate personal documents of our employees, or force them to make any payment to us or to anyone else in order to secure employment with us, or to work with us.

Bribery and corruption

10. Our employees and those representing us, including agents and intermediaries, shall not, directly or indirectly, offer or receive any illegal or improper payments or comparable benefits that are intended or perceived to obtain undue favours for the conduct of our business.

REMEMBER...

Violation by even a single employee of any law relating to anti-bribery, anti-corruption, anti-competition, data privacy, etc. could result in severe financial penalties and cause irreparable reputational damage to the company.

Gifts and hospitality

11. Business gifts and hospitality are sometimes used in the normal course of business activity. However, if offers of gifts or hospitality (including entertainment or travel) are frequent or of substantial value, they may create the perception of, or an actual conflict of interest or an 'illicit payment'. Therefore, gifts and hospitality given or received should be modest in value and appropriate, and in compliance with our company's gifts and hospitality policy.

Freedom of association

12. We recognise that employees may be interested in joining associations or involving themselves in civic or public affairs in their personal capacities, provided such activities do not create an actual or potential conflict with the interests of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

REMEMBER...

As a general rule, we may accept gifts or hospitality from a business associate, only if such a gift:

- has modest value and does not create a perception (or an implied obligation) that the giver is entitled to preferential treatment of any kind;
- would not influence, or appear to influence, our ability to act in the best interest of our company;
- would not embarrass our company or the giver if disclosed publicly.

The following gifts are never appropriate and should never be given or accepted:

- gifts of cash or gold or other precious metals, gems or stones;
- gifts that are prohibited under applicable law;
- gifts in the nature of a bribe, payoff, kickback or facilitation payment*;
- gifts that are prohibited by the gift giver's or recipient's organisation; and
- gifts in the form of services or other non-cash benefits (e.g. a promise of employment).

(*'Facilitation' payment is a payment made to secure or speed up routine legal government actions, such as issuing permits or releasing goods held in customs.)

Working outside employment with us

13. Taking employment, accepting a position of responsibility or running a business outside employment with our company, in your own time, with or without remuneration, could interfere with your ability to work effectively at our company or create conflicts of interest. Any such activity must not be with any customer, supplier, distributor or competitor of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

Integrity of information and assets

14. Our employees shall not make any wilful omissions or material misrepresentation that would compromise the integrity of our records, internal or external communications and reports, including the financial statements.
15. Our employees and directors shall seek proper authorisation prior to disclosing company or business-related information, and such disclosures shall be made in accordance with our company's media and communication policy. This includes disclosures through any forum or media, including through social media.
16. Our employees shall ensure the integrity of personal data or information provided by them to our company. We shall safeguard the privacy of all such data or information given to us in accordance with applicable company policies or law.
17. Our employees shall respect and protect all confidential information and intellectual property of our company.
18. Our employees shall safeguard the confidentiality of all third party intellectual property and data. Our employees shall not misuse such intellectual property and data that comes into their possession and shall not share it with anyone, except in accordance with applicable company policies or law.
19. Our employees shall promptly report the loss, theft or destruction of any confidential information or intellectual property and data of our company or that of any third party.

Q&A

I am an accountant in the finance department of my company. Due to my artistic skills, I received an offer to pen cartoons for a children's publication for which I would receive compensation. I plan to undertake this activity during week-ends. What should I do before accepting this offer?

Before accepting the offer, you should ascertain whether the company policies and rules require you to make a disclosure to your supervisor so that the company may determine whether your undertaking this activity adversely affects our company's interests. On confirmation from the company that it does not do so, you would be free to take up the activity. It is also your duty to bring to the attention of the company whenever there is any change in the situation you have disclosed.

20. Our employees shall use all company assets, tangible and intangible, including computer and communication equipment, for the purpose for which they are provided and in order to conduct our business. Such assets shall not be misused. We shall establish processes to minimise the risk of fraud, and misappropriation or misuse of our assets.
21. We shall comply with all applicable anti-money laundering, anti-fraud and anti-corruption laws and we shall establish processes to check for and prevent any breaches of such laws.

Insider trading

22. Our employees must not indulge in any form of insider trading nor assist others, including immediate family, friends or business associates, to derive any benefit from access to and possession of price sensitive information that is not in the public domain. Such information would include information about our company, our group companies, our clients and our suppliers.

Q&A

Our company has recently announced the launch of a new business initiative. In connection with this, your friend who is a journalist with a leading business newspaper has asked you to provide some information that he could cover in his forthcoming article. He has promised not to quote you, or reveal your identity. Should you be giving him this information?

No. You should not be sharing information of this nature with the media, even if it is assured that the source would remain anonymous. Only authorised personnel in the company are permitted to speak to the media and provide information of this nature.

Our company has a “Use of Social Media” policy that lays down the “dos and don’ts” for use of social media even if you may access such media on your own time. Why is there such a policy?

External communication is a serious matter. It must be carefully managed because information put out with reference to our company or its businesses needs to be clear, truthful and not violate any undertakings we have given to other parties. In each business there are managers nominated to authorise and make different types of statements to the outside world. These managers should be consulted about any request for information you may receive or information you think we should give out.

In using social media, in particular blogs or social networking sites, you should exercise great caution while talking about our company or the business we do. It may feel like you are chatting with friends or expressing a personal opinion but even while doing so you cannot share any confidential information of our company.

REMEMBER...

We must respect the property rights of others by never misusing their assets, intellectual property or trade secrets, including the copying or downloading of unauthorised software, trademarks, copyrighted material or logos. We should never make unauthorised copies of computer software programs or use unlicensed personal software on company computers.

Prohibited drugs and substances

23. Use of prohibited drugs and substances creates genuine safety and other risks at our workplaces. We do not tolerate prohibited drugs and substances from being possessed, consumed or distributed at our workplaces, or in the course of company duties.

Conflicts of interest

24. Our employees and executive directors shall always act in the interest of our company and ensure that any business or personal association *including close personal relationships* which they may have, does not create a conflict of interest with their roles and duties in our company or the operations of our company. Further, our employees and executive directors shall not engage in any business, relationship or activity, which might conflict with the interest of our company or our group companies.

25. Should any actual or potential conflicts of interest arise, the concerned person must immediately report such conflicts and seek approvals as required by applicable law and company policy. The competent authority shall revert to the employee within a reasonable time as defined in our company's policy, so as to enable the concerned employee to take necessary action as advised to resolve or avoid the conflict in an expeditious manner.
26. In the case of all employees other than executive directors, the Chief Executive Officer / Managing Director shall be the competent authority, who in turn shall report such cases to the Board of Directors on a quarterly basis. In case of the Chief Executive Officer / Managing Director and executive directors, the Board of Directors of our company shall be the competent authority.

Q&A

You are responsible for maintaining our company's customer database. One of your friends is starting a business venture and requests you to share a few particulars from this database for marketing purposes of his business. He assures you that he would keep the data as well as his source confidential. Should you do so?

No. You should respect the confidentiality of customer information and not share any part of the database with any person without due authorisation.

You have access to revenue numbers of different business units of our company. While having a conversation with you over evening drinks, your friend enquires about the financial performance of our company. You do not share detailed information with your friend, but share approximate revenue figures. Is this conduct of yours correct?

No, it is not. You are not permitted to share financial information of our company with others who do not need to know this information. Financial information should always be safeguarded and disclosed only on a need-to-know basis after obtaining requisite approvals. Sharing of any price sensitive information that is not generally available with the public could also lead to violation of applicable insider trading laws.

27. Notwithstanding such or any other instance of conflict of interest that exists due to historical reasons, adequate and full disclosure by interested employees shall be made to our company's management. At the time of appointment in our company, our employees and executive directors shall make full disclosure to the competent authority, of any interest leading to an

actual or potential conflict that such persons or their immediate family (including parents, siblings, spouse, partner, children) or persons with whom they enjoy close personal relationships, may have in a family business or a company or firm that is a competitor, supplier, customer or distributor of, or has other business dealings with, our company.

REMEMBER...

A conflict of interest could be any known activity, transaction, relationship or service engaged in by an employee, his/her immediate family (including parents, siblings, spouse, partner, and children), relatives or a close personal relationship, which may cause concern (based upon an objective determination) that the employee could not or might not be able to fairly perform his/her duties to our company.

Examples of Potential Conflicts of Interest

A conflict of interest, actual or potential, arises where, directly or indirectly, an employee or executive director:

- (a) engages in a business, activity or relationship with anyone who is party to a transaction with our company;
- (b) is in a position to derive an improper benefit, personally or for any family member or for any person in a close personal relationship, by making or influencing decisions relating to any transaction;
- (c) conducts business on behalf of our company or is in a position to influence a decision with regard to our company's business with a supplier or customer where a relative of, or a person in close personal relationship with, an employee or executive director is a principal officer or representative, resulting in a personal benefit or a benefit to the relative;
- (d) is in a position to influence decisions with regard to award of benefits such as increase in salary or other remuneration, posting, promotion or recruitment of a relative or a person in close personal relationship employed in our company or any of our group companies;
- (e) undertakes an activity by which the interest of our company or our group companies can be compromised or defeated; or
- (f) does anything by which an independent judgement of our company's or our group companies' best interest cannot be exercised.

28. If there is a failure to make the required disclosure and our management becomes aware of an instance of conflict of interest that ought to have been disclosed by an employee or executive director, our management shall take a serious view of the

matter and consider suitable disciplinary action as per the terms of employment. In all such matters, we shall follow clear and fair disciplinary procedures, respecting the employee's right to be heard.

Examples of activities normally approved (post-disclosure) as per applicable company policy

Acceptance of a position of responsibility (whether for remuneration or otherwise) in the following cases would typically be permitted, provided the time commitments these demand do not disturb or distract from the employee's primary duties and responsibilities in our company, and are promptly disclosed to the relevant competent authority:

- (a) Directorships on the Boards of any of our group companies, joint ventures or associate companies.
- (b) Memberships/positions of responsibility in educational/professional bodies, where such association will promote the interests of our company.
- (c) Memberships or participation in government committees/bodies or organisations.

Q&A

You are in a relationship with a colleague who has been recently moved into your team and would now be reporting to you. What should you do?

Romantic or close personal relationships with another employee where a reporting relationship exists and one is responsible for evaluating the other's performance, is likely to create a conflict of interest. In such a situation, you would need to report the potential conflict to your supervisor.

Your company is submitting a proposal to a company in which you were previously employed. You have confidential information pertaining to your previous employer, which you believe will help your present employer in winning the contract. Should you share this information?

No. You should not share this information with your company since it relates to confidential information of a third party. Your company respects its employees' duty to protect confidential information that they may have relating to their previous employers.

You are the purchasing manager in the procurement department of your company. You receive an invitation from a supplier to attend a premier sporting event as her guest. This particular supplier is one of the vendors who has submitted a proposal for an open tender issued by your company. Should you accept the invitation?

No. You should not accept the invitation in this instance. Since you are in a key decision-making role for the tender, any unusual benefit that you receive could be perceived as an inducement that could compromise your objectivity.

OUR CUSTOMERS



We have continued to enjoy prosperity, even with adverse times to fight against. Our relations with all concerned are the most friendly. We have maintained the same character for straight-forward dealing with our constituents and customers. Our productions have continued to be of the same high quality, and therefore command the best reputation and realise the highest prices. ... I mention these facts only to point out that with honest and straight-forward business principles, close and careful attention to details, and the ability to take advantage of favourable opportunities and circumstances, there is a scope for success.

Jamsetji Tata

Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

E. OUR CUSTOMERS

Products and services

1. We are committed to supplying products and services of world-class quality that meet all applicable standards.
2. The products and services we offer shall comply with applicable laws, including product packaging, labelling and after-sales service obligations.
3. We shall market our products and services on their own merits and not make unfair or misleading statements about the products and services of our competitors.

Export controls and trade sanctions

4. We shall comply with all relevant export controls or trade sanctions in the course of our business.

Fair competition

5. We support the development and operation of competitive open markets and the liberalisation of trade and investment in each country and market in which we operate.
6. We shall not enter into any activity constituting anti-competitive behaviour such as abuse of market dominance, collusion, participation in cartels or inappropriate exchange of information with competitors.
7. We collect competitive information only in the normal course of business and obtain the same through legally permitted sources and means.

Dealings with customers

8. Our dealings with our customers shall be professional, fair and transparent.
9. We respect our customers' right to privacy in relation to their personal data. We shall safeguard our customers' personal data, in accordance with applicable law.

Q&A

You are the Regional Sales Manager of our company. You have become a member of an “informal group”, on an instant messaging service, whose members are the regional sales heads of our company’s competitors. The administrator of the group has requested an in-person meeting to informally discuss market conditions and brainstorm on “pricing strategy” from an industry perspective. What should you do?

Any meeting with competitors, especially to discuss “pricing strategy”, could be an attempt to promote an anti-competitive practice or manipulate prices. You should respond by declining this invitation and exiting the “informal group”. You should also report this incident to your supervisor and your Legal department.

You are attending a customer meeting with a colleague, and your colleague makes an untruthful statement about the company’s services. What should you do?

You should assist your colleague in correcting the inaccuracy during the meeting if possible. If this is not possible, raise the issue with your colleague after the meeting to enable him/her or the company to correct any misrepresentation made to the customer.

While working on a customer project, you receive a call from your colleague. He used to manage that customer account before you took over his role. He recalls that he had worked with the customer on developing a new ordering system which he thinks would be beneficial for another customer and requests you to send him the project details. What should you do?

You must not share this information without specific approval of the customer; you are not permitted to use a customer’s assets, including software, for another customer or for any personal use.

REMEMBER...

Striving for excellence in the standards of our work and in the quality of our goods and services is a core Tata value. It is the unwavering practice of this value that builds and sustains customer trust in our brand.

OUR COMMUNITIES AND THE ENVIRONMENT



In a free enterprise, the community is not just another shareholder in business but is in fact the very purpose of its existence.

Jamsetji Tata

Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

F. OUR COMMUNITIES AND THE ENVIRONMENT

Communities

1. We are committed to good corporate citizenship, and shall actively assist in the improvement of the quality of life of the people in the communities in which we operate.
2. We engage with the community and other stakeholders to minimise any adverse impact that our business operations may have on the local community and the environment.
3. We encourage our workforce to volunteer on projects that benefit the communities in which we operate, provided the principles of this Code, where applicable, and in particular the 'Conflicts of Interest' clause are followed.

The environment

4. In the production and sale of our products and services, we strive for environmental sustainability and comply with all applicable laws and regulations.
5. We seek to prevent the wasteful use of natural resources and are committed to improving the environment, particularly with regard to the emission of greenhouse gases, consumption of water and energy, and the management of waste and hazardous materials. We shall endeavour to offset the effect of climate change in our activities.

OUR VALUE-CHAIN PARTNERS



If we had done some of the things that some other groups have done, we would have been twice as big as we are today.
But we didn't, and I would not have it any other way.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

(on the pace of expansion of the Tata group in the 1960s and 70s)

G. OUR VALUE-CHAIN PARTNERS

1. We shall select our suppliers and service providers fairly and transparently.
2. We seek to work with suppliers and service providers who can demonstrate that they share similar values. We expect them to adopt ethical standards comparable to our own.
3. Our suppliers and service providers shall represent our company only with duly authorised written permission from our company. They are expected to abide by the Code in their interactions with, and on behalf of us, including respecting the confidentiality of information shared with them.
4. We shall ensure that any gifts or hospitality received from, or given to, our suppliers or service providers comply with our company's gifts and hospitality policy.
5. We respect our obligations on the use of third party intellectual property and data.

Q&A

You head the procurement function in our company. You have tight budgetary constraints for a project that you are working on. In order to complete the project within the targeted costs, you intend to request your supplier to provide you an exceptional discount on this project order on the understanding that you would "make it up to him" in future orders. Would you be violating the Code?

Yes, you would. Inducement in any form, including future benefits to the supplier, could compromise your ability to act objectively and in the best interests of the company and therefore must be avoided.

REMEMBER...

Our value-chain partners would include our suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents; joint-venture partners and other business associates.

OUR FINANCIAL STAKEHOLDERS



Ethical behaviour in business – in every sphere and with all constituents – has been the bedrock on which the Tata group has built, and operates, its enterprises. This has been an article of faith for the group ever since its inception, a fundamental element of our cherished heritage and the essence of our way of life.

Ratan Tata

Chairman, Tata Sons (1991 – 2012)

H. OUR FINANCIAL STAKEHOLDERS

1. We are committed to enhancing shareholder value and complying with laws and regulations that govern shareholder rights.
 2. We shall inform our financial stakeholders about relevant aspects of our business in a fair, accurate and timely manner and shall disclose such information in accordance with applicable law and agreements.
 3. We shall keep accurate records of our activities and shall adhere to disclosure standards in accordance with applicable law and industry standards.
-

GOVERNMENTS



Business, as I have seen it, places one great demand on you; it needs you to impose a framework of ethics, values, fairness and objectivity on yourself at all times. It is not easy to do this; you cannot impose it on yourself forcibly because it has to become an integral part of you.

Ratan Tata

Chairman, Tata Sons (1991 – 2012)

I. GOVERNMENTS

Political non-alignment

1. We shall act in accordance with the constitution and governance systems of the countries in which we operate. We do not seek to influence the outcome of public elections, nor to undermine or alter any system of government. We do not support any specific political party or candidate for political office. Our conduct must preclude any activity that could be interpreted as mutual dependence/favour with any political body or person, and we do not offer or give any company funds or property or other resources as donations to any specific political party, candidate or campaign.

Any financial contributions considered by our Board of Directors in order to strengthen democratic forces through a clean electoral process shall be extended only through the Progressive Electoral Trust in India, or by a similar transparent, duly-authorised, non-discriminatory and non-discretionary vehicle outside India.

Government engagement

2. We engage with the government and regulators in a constructive manner in order to promote good governance. We conduct our interactions with them in a manner consistent with our Code.
3. We do not impede, obstruct or improperly influence the conclusions of, or affect the integrity or availability of data or documents for any government review or investigation.

OUR GROUP COMPANIES



I do not think anyone was on par with Jamsetji as an industrial visionary. But that is not the sole reason why I have been an admirer of Jamsetji. The major reason was his sense of values, sterling values, which he imparted to this group. If someone were to ask me, what holds the Tata companies together, more than anything else, I would say it is our shared ideals and values which we have inherited from Jamsetji Tata.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

J. OUR GROUP COMPANIES

1. We seek to cooperate with our group companies, including joint ventures, by sharing knowledge, physical resources, human and management resources and adopting leading governance policies and practices in accordance with applicable law including adherence to competition law, where relevant.
2. We shall strive to achieve amicable resolution of any dispute between us and any of our group companies, through an appropriate dispute resolution mechanism so that it does not adversely affect our business interests and stakeholder value.
3. We shall have processes in place to ensure that no third party or joint venture uses the TATA name/brand to further its interests without proper authorisation.
4. Our Board of Directors shall consider for adoption policies and guidelines periodically formulated by Tata Sons and circulated to group companies.

Q&A

You are in the process of selecting potential vendors for an IT project in our company. In the final shortlist of two companies, one is a new start-up with limited references and a lower price-quotation, while the other is a Tata company with thirty years of implementation experience and good references, but a marginally higher quote for the same job. With all other parameters of choice being nearly equal, which company should you select for the job?

While price is undoubtedly an important criterion for decision making, it is clearly not the only one to be evaluated. You may also need to consider good customer references, proven track record and shared value systems in order to decide on your IT partner.

You are in the process of selecting potential vendors for a project. One of the three finalists is a group company. In reviewing the final proposals, you rank the group company second out of the three proposals based on pricing and total cost of ownership, and select the first-ranked vendor. Is this the right decision?

Yes. You should select the vendor that, on its own merits, is the vendor that is most appropriate for your company's requirements. You should not select a group company only because of its affiliation.

RAISING CONCERNS

We encourage our employees, customers, suppliers and other stakeholders to raise concerns or make disclosures when they become aware of any actual or potential violation of our Code, policies or law. We also encourage reporting of any event (actual or potential) of misconduct that is not reflective of our values and principles.

Avenues available for raising concerns or queries or reporting cases could include:

- immediate line manager or the Human Resources department of our company
- designated ethics officials of our company
- the 'confidential reporting' third party ethics helpline (if available)
- any other reporting channel set out in our company's 'Whistleblower' policy.

We do not tolerate any form of retaliation against anyone reporting legitimate concerns. Anyone involved in targeting such a person will be subject to disciplinary action.

If you suspect that you or someone you know has been subjected to retaliation for raising a concern or for reporting a case, we encourage you to promptly contact your line manager, the company's Ethics Counsellor, the Human Resources department, the MD/CEO or the office of the group's Chief Ethics Officer.

Q&A

My supervisor has asked me to do something which I believe may be illegal. I am afraid if I do not do what I am told, I could lose my job. Should I do it?

No. Breaking the law is never an option. Discuss the situation with your supervisor to be certain that you both understand the facts. If your concerns are not resolved, contact a higher level supervisor, the Ethics Counsellor, the Legal department or report them via the company's confidential reporting system, if available.

I feel that my supervisor is treating me unfairly for reporting a concern to the Ethics Counsellor. What should I do?

Retaliation against anyone who raises a concern is a violation of the Code. You should therefore promptly report this action of your supervisor to the Ethics Counsellor or the MD/CEO of your company or via the company's confidential reporting system, if available.

ACCOUNTABILITY

This Code is more than a set of prescriptive guidelines issued solely for the purpose of formal compliance. It represents our collective commitment to our value system and to our core principles.

Every person employed by us, directly or indirectly, should expect to be held accountable for his/her behaviour. Should such behaviour violate this Code,

they may be subject to action according to their employment terms and relevant company policies.

When followed in letter and in spirit, this Code is *'lived'* by our employees as well as those who work with us. It represents our shared responsibility to all our stakeholders, and our mutual commitment to each other.

SPEAK UP...

If you are unsure whether a particular action you are about to take is consistent with the principles set forth in the Code, ask yourself:

- Could it directly or indirectly endanger someone or cause them injury?
- Is it illegal/unlawful or out of line with our policies and procedures?
- Does my conscience reject it? Does it conflict with my personal values?
- Would I feel uncomfortable if the story appeared in the media? Would it shame my company, spouse, partner, parent or child?
- Does it 'feel' wrong?

If the answer to any of these questions is "Yes", please stop and consult your reporting manager, the Ethics Counsellor, the Human Resource department, the Legal department or any member of the senior management team, to assist you in making the decision.

When faced with a dilemma: Stop, Think, Act Responsibly

NOTE

The Code does not provide a comprehensive and complete explanation of all expectations from a company standpoint or obligations from a stakeholder standpoint.

Our employees have a continuing obligation to familiarise themselves with all applicable law, group-level advisories and policies, company-level policies, procedures and work rules as relevant. For any guidance on interpretation of the Code, we may seek support from our company's Ethics Counsellor or from the group's Chief Ethics Officer, as appropriate.

All joint ventures are encouraged to adopt the Tata Code of Conduct (TCOC) or a code of conduct that incorporates all elements of the TCOC.

This version of the Tata Code of Conduct supersedes all earlier versions and associated documents and stands effective from 29th July, 2015.

For any query or clarification on the Code, please contact the office of the group's Chief Ethics Officer via email at: ethicsoffice@tata.com.

TATA CODE OF CONDUCT – 2015

I acknowledge that I have received the Tata Code of Conduct.

I have read the Tata Code of Conduct and I acknowledge that as a Tata employee, I am required to comply with the guidelines described therein and failure to do so may subject me to action as per my employment terms and relevant company policies.

If I have a concern about a violation, or a potential violation of the Tata Code of Conduct, I understand that there are channels available to me in my company to report such concerns. By making use of these channels when necessary, I will play my part in maintaining the high ethical standards to which we hold ourselves.

Signature: _____

Date: _____

Name: _____

Department: _____

Address: _____

(Please submit this declaration to your Ethics Counsellor or the Human Resource department of your company.)



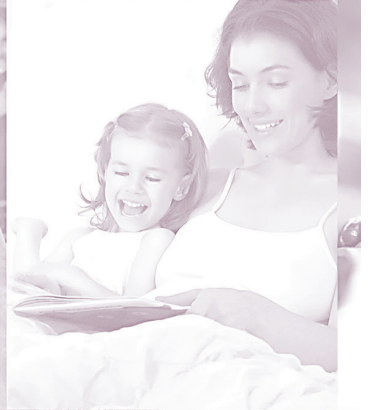


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NOTES

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For further information on the Code please contact:
The Ethics Office,
Tata Sons Ltd.,
Bombay House,
24, Homi Mody Street,
Mumbai – 400001, India.
Email: ethicsoffice@tata.com

CORPORATE ENVIRONMENT POLICY

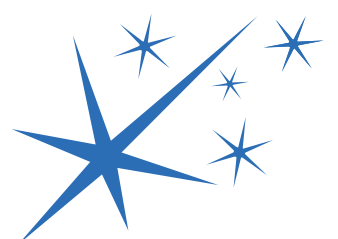
Tata Power is committed to a clean, safe and healthy environment, and we shall operate our facilities in an environmentally sensitive and responsible manner. Our commitment to environmental protection and stewardship will be achieved by:

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



(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018



CORPORATE SUSTAINABILITY POLICY

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

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

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



(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

