

NIT Document
For
Selection of Agency for Shifting of Overhead Power line to
Underground Power Cable & other associated works under
Disaster Management, Relief & Rehabilitation, Maharashtra in
Thane District of Maharashtra

NIT No: TCIL/69/Maharashtra-DMU/ Thane /2024/06

Date of Issue: 07/08/2024

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INDEX

SL. NO.	DESCRIPTION	PAGE NO
1.	SECTION-1- NOTICE INVITED TENDER (NIT)	4
2.	SECTION-2- GENERAL TERMS & CONDITIONS OF THE CONTRACT	16
3.	SECTION-3- SPECIAL CONDITIONS OF CONTRACT	26
4.	SECTION-4- PROJECT EXPERIENCE	50
5.	SECTION-5- PRICE BID SCHEDULE	86
6.	SECTION-6- MANUFACTURER'S AUTHORISATION FORM (NOT APPLICABLE)	87
7.	SECTION-7- BID SECURITY BANK GUARANTEE (EMD) FORMAT	99
8.	SECTION-8- INTEGRITY PACT	90
9.	SECTION-9- AUTHORIZATION LETTER	91
10.	SECTION-10- CALCULATION OF LOCAL CONTENT	92
11.	SECTION-11- NO-CONVICTION CERTIFICATE	93
12.	SECTION-12- BID SUBMISSION FORM	94
13.	SECTION-13- MAKE IN INDIA UNDERTAKING	95
14.	SECTION-14- NIT CHECKLIST	98
15.	SECTION-15- RATE CONTRACT (NOT APPLICABLE)	99
16.	SECTION-16- PERFORMANCEBANK GUARANTEE (PBG FORMAT)	100
17.	SECTION-17- FORM OF AGREEMENT	101
18.	SECTION-18- ANNEXURE - A TO DISPUTE RESOLUTION CLAUSE	102
19.	SECTION-19- LAND BORDER SHARING OFFICE ORDER	103
20.	SECTION-20	106
21.	ANNEXURE-B- (UNDERTAKING REGARDING NON-PERFORMANCE / NON-CANCELLATION OF P.O)	118
22.	ANNEXURE-C-FINANCIAL DATA (FOR LAST 7 YEARS)	119
23.	ANNEXURE-D- CALCULATION OF BIDDING CAPACITY	120
24.	ANNEXURE-E- NON-RELATIONSHIP CERTIFICATE	121
25.	ANNEXURE-F- FORM OF CERTIFICATE OF FINANCIAL PARAMETERS FOR ELIGIBILITY	122

26.	ANNEXURE-G FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT / FACILITIES	123
27.	ANNEXURE-H	124
28.	DEFINITIONS	136
29.	ANNEXURE-I (DPR 9:- KALYAN EAST)	138
30.	ANNEXURE-J (DPR 10:- KALYAN WEST)	142
31.	ANNEXURE-K (DPR 11:- DOMBIVALI)	146
32.	ANNEXURE-L (DPR 12:- BADLAPUR EAST)	150
33.	ANNEXURE-M (DPR 13:- KALYAN (MURBAD)	154
34.	ANNEXURE-N (DPR 14:- KALYAN (TITWALA)	160
35.	ANNEXURE-O (DPR 15:- ULHASNAGAR)	164
36.	ANNEXURE-P (DPR 16:- THANE-II)	168
37.	ANNEXURE-Q (DPR 17:- VASHI)	176
38.	ANNEXURE-R-CONSTRUCTION GUIDELINES	217

SECTION-1**NOTICE INVITING TENDER (NIT)**

Bids are invited from all eligible Indian bidders for Selection of Agency for Shifting of Overhead Power line to Underground Power Cable & other associated works under Disaster Management, Relief & Rehabilitation, Maharashtra in Thane District of Maharashtra.

Telecommunications Consultants India Ltd. (TCIL) is a Govt. of India Enterprise, under Department of Telecommunications, Ministry of Communications. It was set up in 1978 to share Indian experience and expertise with developing countries and to assist bulk users of telecom services in setting up dedicated infrastructure/telecom networks.

TCIL has been undertaking various projects in all fields of telecommunications and information technology and also continuously deploying new technologies in the field of Telecom, Transmission Systems, Rural Telecommunications, Optical Fiber based Backbone Transmission Systems etc. TCIL has diversified its operation and has been executing projects in the field of development of infrastructure, all types of underground utilities works, Disaster Management Projects, Civil Infrastructure, Architecture and Power, Rural Roads and Civil Construction. TCIL has been executing projects in latest technologies like FTTH, VOIP, IPTV etc.

TCIL is acting as implementing agency (IA) for shifting of overhead power lines to underground power cable under Disaster Management Unit (Relief and Rehabilitation) in the different district of Maharashtra. This NIT is floated for Selection of a contractor for Shifting of Overhead Power line to Underground Power Cables & other associated works under Disaster Management, Relief & Rehabilitation in Thane District of Maharashtra. Works of Thane district has been divided into 9 DPR/Project namely (Kalyan East, Kalyan West, Dombivali, Badlapur East, Kalyan (Murbad), Kalyan (Titwala), Ulhasnagar, Thane-II, Vashi) where UGC (Under Ground Cabling) work has to be taken up by the contractor.

Submission of Online Bids is mandatory for this NIT. Prospective bidders need to submit their bids with the most competitive Techno-commercial offer for the aforesaid work. NIT document is available on TCIL website (<https://www.tcil-india.com/nit.php>) and GePNIC portal. The important dates are as given below:

1.1 IMPORTANT DATES

Date of Posting of NIT:	07.08.2024
Start Date of downloading/viewing NIT:	07.08.2024
Pre-bid Meeting with prospective bidders:	09.08.2024, 16:15
Last date & time for seeking clarification, if any:	12.08.2024 10:00
Reply of clarifications, if any	13.08.2024, 17:00
Start date & time for online submission of Bids:	08.08.2024, 10:00
Last date & time for online submission of Bids:	21.08.2024, 14:30
Online Opening of Technical Bid (Part-I):	21.08.2024, 15:00
Online Opening of Financial Bid (Part-II):	To be notified later

Pre-bid meeting is scheduled at TCIL, TCIL Bhawan, Conference room, 1st floor, Greater Kailash-I, New Delhi-110048 or prospective bidders may also join through VC. VC link will be shared with prospective bidders or it link will be also published/ communicated on TCIL website & also on GePNIC Portal (<https://www.etenders.gov.in>).

Bids shall be submitted on GePNIC Portal (<https://www.etenders.gov.in>). Bidders are advised to visit GePNIC portal (<https://www.etenders.gov.in>) and/or TCIL website regularly for any pre-bid meeting link/updates/amendments, if any. Bidders can contact NIC for Telephonic Help Support on Toll Free Help Desk Number- 1800 3070 2232 for requisite queries regarding registration, training, demonstration, minimum system requirements etc. of Government e-Procurement System of NIC (GePNIC).

1.2 ELIGIBILITY CRITERIA

a) Only Class-I local supplier, as defined under the order shall be eligible to bid in procurement undertaken by procuring entity, except when global tender enquiry has been issued.

(Mandatory Undertaking for Purchase Preference to MAKE In INDIA to be submitted along with this NIT. The bidder needs to submit calculation of local content as per format attached in Section- 11. The detailed clause is mentioned at Clause 2.3 in Section-2 of this NIT and the documents required for verification of local content needs to be submitted as per this Clause.)

b) The bidder should be an Indian Registered Company under Companies Act 1956 or 2013/ Proprietorship / Partnership Firm / Government Societies. Copy of Certificate of Incorporation/ Registration/ Partnership Deed or any other relevant document, as applicable, should be submitted along with a copy of address proof.

c) The Bidder shall fulfill the following financial criteria:

i. Average Annual Financial Turnover during the last 3 financial years, ending 31st March 2023 should be at least **Rs. 46.04 Cr (Rs.41.44 Crs for Startups)** excluding GST.

ii. The Net Worth of the bidder must be positive for the each of the last three Financial Years.

Net worth means the sum total of the paid up capital and free reserves (excluding reserves created out of revaluation) reduced by aggregate value of accumulated losses (including debit

balance in profit and loss account for current year) and intangible assets. **Refer enclosed Annexure-F (Form of Certificate of Financial Parameters for Eligibility).**

iii. The bidder should be in profit before tax (PBT) in two out of last three financial years.

iv. **Liquid assets (LA):** Bidder must have liquid assets (LA) and/ or evidence of access to or availability of fund based credit facilities of not less than **RS. 9.21 Crore** and the Banker should confirm that the Credit facility is earmarked for the Works specified under Bid on receipt of the Bid. Liquid Assets would include unencumbered cash (and equivalents), bank deposits with maturity less than 365 days, securities that can be freely traded or maturity less than 365 days and receivables which has general certainty of getting received minus payables which has general certainty of getting paid. **Refer enclosed Annexure-G (Evidence of access to or availability of credit/facilities).**

d) **Technical Experience Criteria:-**The prospective bidder must qualify all of the following technical requirements to be eligible to participate in the bidding. Bidders who meet following requirements will be considered as successful bidder and management has a right to disqualify those bidders who do not meet these requirements.

i. Experience of having successfully completed similar work means commissioned works during the last seven (7) years from the date of bid submission should be either of the following:

Three similar works each costing not less than **Rs. 27.62 Crs (Rs. 23.02 Crs_ for Startups)** excluding taxes, in last 7 years. The works under the above contract should be completed works only.

Or

Two similar works each costing not less than **Rs. 36.83 Crs (Rs. 32.23 Crs for Startups)** excluding taxes, in last 7 years. The works under the above contract should be completed works only.

Or

One similar work costing not less than **Rs. 64.46 Crs (Rs. 59.85 Crs for Startups)** excluding taxes, in last 7 years. The works under the above contract should be completed

works only.

(ii) For the purposes of satisfaction of Technical Requirement, similar works refers to:

- a) Project(s) execution in one or more sectors below :-
- 1) Electrical Transmission sector
 - 2) Sub-transmission sector
 - 3) Electrical distribution sector

In above sectors, type of construction works undertaken should be of the nature of one or more of the following:-

- 1) HT Underground Cable lines
- 2) LT Underground Cable lines
- 3) 33 kV, 11 kV Ring Main Units (RMUs)

- b) Notwithstanding the point- ii (a) above, experience in only LT lines would not be considered eligible.

One Similar Work means a Single Work/Purchase Order of value as per above clause. Work experiences of the bidder as per above shall be considered only if the works have been executed under Govt/ Semi-Govt/ autonomous body of Central/State Govt/ Electrical Power Utility/Power Deptt. in India Only. Completed works means commissioned works. It can be ongoing tender also.

Note: This NIT comes under **Works category** hence no benefit has been given to Micro & Small Enterprises (MSEs).

- e) Bidder should have a valid Electrical Contractor 's License. However, in case the bidder does not hold the license for the given State, then the bidder should possess the equivalent license for any one State in India and post-award the bidder is required to acquire the necessary license for the given State within a period of two months. The work is in the state of Maharashtra.
- f) The bidder should have a valid PAN and GST Registration (copy of PAN card and GST Registration certificate should be submitted in the bid). In case GST registration is not available, the bidder shall give undertaking that it will get registered before start of work, if work is awarded to them. The place of the works is Maharashtra.
- g) Material vendors should be from MSEDCL approved vendor. In case new vendor is proposed by the bidder then vendor approval is must from MSEDCL Testing department as per MSEDCL rules and regulations. Bidder has to submit undertaking regarding Material vendors should be from MSEDCL approved vendor. Link for Approved List of Suppliers/OEM(s) of M/s Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) and also detailed Material Technical Specifications

1. Please refer Link Given Below for MSEDCL approved Vendor List.

<https://www.mahadiscom.in/supplier/en/approved-vendor-list-all-schemes/>

2. Please refer Link mentioned below for Material Technical Specifications of all Equipment's/Items.

<https://www.mahadiscom.in/supplier/en/material-technical-specifications//>

The Technical Specifications provided at above link shall prevail in case of any ambiguity.

- h) The bidder should not be insolvent, in receivership, bankrupt or being wound up, not have had their business activities suspended and not be the subject of legal proceedings for any of the foregoing. An undertaking by the bidder should be submitted.

i) The Bidder should not be blacklisted/debarred/banned/restricted by any Union Govt./State Govt./PSU/any other state or central Govt entity as on date of submission of the Bid. "No-Conviction Certificate" duly signed by authorized signatory signing the bid, should be submitted in the prescribed format.

j) The bidder shall submit an undertaking on their letter-head stating that:

"In reference to the Government of India, Ministry of Finance, Department of Expenditure, Office Memorandum No. F.No. 6/18/2019-PPD, Dated 23-07-2020. I hereby submit that:

"We have read the Clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; We certify that we (in case of Consortium all the Consortium Partners) are not from such a country *or their beneficial owner is not from such a country or we will not sub-contract any work to a contractor from such countries*, if from such a country, have been registered with the Competent Authority.

We hereby certify that we (in case of Consortium all the Consortium Partners) fulfill all requirements in this regard and are eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]".

k) The bidder needs to submit un-priced BOQ also along with their technical bid.

l) The bidder needs to submit an Undertaking stating as per **Annexure- B attached**. Vendors, whose Purchase Order(s) for any Project of TCIL/ State Govt/Central Govt/any Govt entites was/were cancelled on risk & cost basis for non-performance or non- submission of performance guarantee in last 2 years, are not eligible to participate in this tender.

m) Proof of PF registration to be submitted by the bidder.

n) The bidder should have Local Office where work is to be executed. Else, he should give an undertaking that he will open Local office after Award of Works.

o) **Conflict of Interest:**

Any bidder having a conflict of interest, which substantially affects fair competition, shall not be eligible to bid in this tender. Bids found to have a conflict of interest shall be rejected as non-responsive. A bidder in this Tender Process shall be considered to have a conflict of interest if the bidder:

- 1). Directly or indirectly controls, is controlled by or is under common control with another Bidder; or
- 2). has the same legal representative/ agent as another bidder for purposes of this bid. A Principal can authorize only one agent, and an agent also should not represent or quote on behalf of more than one Principal. However, this shall not debar more than one Authorised distributor from quoting equipment manufactured by an Original Equipment Manufacturer (OEM), in procurements under Proprietary Article Certificate; or
- 3). has a relationship with another bidder, directly or through common third parties, that puts it in a position to have access to information about or influence the bid of another Bidder or influence the decisions of the Procuring Entity regarding this Tender process; or
- 4). participates in more than one bid in this tender process. Participation in any capacity by a Bidder (including the participation of a Bidder as sub-contractor in another bid or vice-versa) in more than one bid shall result in the disqualification of all bids in which he is a party. However, this does not limit the participation of a non-bidder firm as a sub-contractor in more than one bid; or
- 5). Any organization contracted for preparation of Detailed Project Report (DPR), design/ technical specifications, terms of reference (TOR)/ Activity Schedule/ schedule of requirements or the Tender Document and Cost Estimate etc of this Tender .

- 6). Any organization contracted to perform Project Monitoring Agency (PMA) / Third Party Quality Auditor (TPQA) for this work.
- 7). has a close business or family relationship with a staff of the Procuring Organisation who:
 - (i) are directly or indirectly involved in the preparation of the Tender document or specifications of the Tender Process, and/or the evaluation of bids; or
 - (ii) would be involved in the implementation or supervision of resulting Contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Procuring Entity throughout the Tender process and execution of the Contract.

(Annexure-E is attached for Non-Relationship)

p) **LABOUR LAWS:**

The Bidder should comply with all applicable Indian Labour laws, Payment of Minimum Wages Act, Workman's Compensation Act, EPF/ESI provisions and any such statutory provisions. In case the bidder is found to be not complying to any of the relevant statutory requirement, action as deemed fit may be initiated by TCIL at its sole discretion.

q) It is a mandatory requirement that the bidder shall provide formally certified skilled workforce or commitment to the effect that they would ensure that all their workers would be skilled through Recognition of Prior Learning (RPL) within two months from the date of commencement of work under the project, at the cost of the bidder. This is in compliance to Ministry of Skill Development and Entrepreneurship (MSDE) D.O dated 12.09.2022. The bidder shall provide undertaking to this effect.

r) **Bid by Consortium is allowed.** Consortium must comply the following requirements:

- i. The consortium agreement must be submitted clearly identifying the "Lead Partner". This authorization shall be evidenced by submitting with the bid an Authorization letter/Board Resolution signed by legally authorized signatories of all the partners. Application in consortium is permitted subject to a maximum of **three (03) agencies**.

In case a bid is submitted by a consortium, all the partners of the consortium shall meet, individually, the qualification of Net Worth as per clause 1.2 (c-ii) and collectively the requirement of Annual turnover as per clause 1.2 (c-i) and liquid assets (LA) as per clause 1.2 (c-iv) of section-1. The figures for each of the partner of the consortium shall be added together to determine the bidder's compliance with the minimum qualifying criteria set out in Annual turnover as per clause 1.2 (c-i) and liquid assets (LA) as per clause 1.2 (c-iv) of section-1; however in order for a consortium to qualify, the partner(s) of consortium must meet the following minimum criteria:

- (a). At least one partner (lead partner) shall meet, not less than 40% of the minimum criteria given for annual turnover as per clause 1.2 (c-i) and liquid assets (LA) as per clause 1.2 (c-iv) of section-1.
- AND
- (b). Each of the other partner(s) shall meet not less than 25% of the criteria given for Annual turnover per clause 1.2 (c-i) and liquid assets (LA) as per clause 1.2c(iv) of section-I.

In case of consortium, the experience criteria of similar work, all the partners of Consortium shall meet Experience Criteria collectively as per Criteria 1.2 (d). However individual bidder or each consortium partner as the case may be should have completed at least 1 contract costing not less than **Rs. 27.62 Cr (Rs.23.02 Crs for Startups)** excluding taxes, (30% for Non-Startup and 25% for startup of estimated cost).

In case Lead Partner nominated by the consortium does not meet the experience criteria and Net Worth Criteria, submitted bid shall not be considered. Each consortium partner shall be jointly and severally responsible for completing the task as per the contract. TCIL, in any case, will deal with the lead partner, who shall be responsible for execution of work and shall be entitled to receive payments as per payment terms.

- ii. The bid may be signed by all members of the consortium. Alternatively, the leader may sign the bid. In such a case, the Authorization Letter/ Board Resolution from each member authorizing the leader for signing and submission of bid on behalf of individual member must accompany the bid offer.
- iii. The formation of consortium or change in the consortium character/partners after submission of the bid and any change in the bidding regarding consortium will not be permitted.
- iv. The bid submission must include documentary evidence to the relationship between consortium partners in the form of Consortium Agreement to legally bind all partners jointly and severally for the proposed agreement, which should set out the principles for the constitution, operation, responsibilities regarding work and financial arrangements, participation (percentage share in the total) and liabilities (jointly and severally) in respect of each and all of the firms in the consortium.

Such consortium agreement must evidence the commitment of the parties to bid for the facilities applied for (if pre-qualified) and to execute the contract for the facilities if their bid is successful.
- v. The consortium agreement must provide that the lead partner shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the consortium and the entire execution of the contract shall be done with active participation of the lead partner.
- vi. The contract agreement should be signed by each consortium partners so as to legally bind all partners jointly and severally and bid shall be submitted with a copy of the consortium agreement providing the joint and several liabilities with respect to the contract. Subsequent declarations/letters/documents shall be signed by lead partner authorized to sign on behalf of the consortium or authorized signatory on behalf of consortium.
- vii. The consortium agreement must specifically state that it is valid for the project for which bidding is done. If consortium breaks up midway before award of work and during bid validity period, bid will be rejected. If consortium breaks up midway before award of work and during bid validity/after award of work/during pendency of contract, in addition to normal penalties as per provision of tender document, all the partners of the consortium shall be debarred from participating in future bids for a minimum period of twelve (12) months or maximum 36 months as per decision of TCIL.
- viii. No consortium partner(s) shall be allowed to submit another bid in same tender either independently or as consortium partner of other parties. If such case is found, all such bid(s) submitted by such consortium member(s) shall be rejected summarily without any notice.
- ix. Consortium agreement shall be registered in accordance with law so as to be legally valid and binding on the members before making any payment.

1.3 The bidder should give an undertaking on the company's letter head that all the documents/certificates/information submitted by them against this NIT are genuine.

In case any of the documents/certificates/information submitted by the bidder is found to be false or forged, TCIL shall immediately reject the bid of such bidder(s) or cancel/terminate the contract and forfeit bid security / Performance Security submitted by the bidder and debar them from participation in future NITs/tenders of TCIL for a period upto 2 years.

1.4 A statement showing Clause-by-Clause compliance to all Terms & Conditions of all the Sections of this NIT duly Signed and Stamped on the Letter Head of their Organization. The bidder shall submit No-Deviation Certificate along with above.

1.5 B ID SECURITY (EARNEST MONEY DEPOSIT)

EMD amount shall be paid **Rs. 1.84 crs.** The validity period of BG (EMD) should be **180 days.**

EMD amount can be submitted in the form of **Demand Draft (DD)** drawn in favour of "Telecommunications Consultants India Limited" payable at New Delhi along with the bid, OR in the form of a **Bank Guarantee (BG)** / e-BG in the prescribed format (Section-8) from a SFMS enabled Scheduled Commercial Bank through SFMS Platform OR as an **Insurance Surety Bond** as per format given in Section-22 OR **Fixed Deposit Receipt (FDR)** OR **Bankers Cheque.**

Details of beneficiary for issue of BG under SFMS Platform is as below:

Name Of Beneficiary and ITS Details	Name	Telecommunications Consultants India Limited
	Address	TCIL Bhawan, Greater Kailash-1, New Delhi-110048
	Account No	000705005880
Name Of Beneficiary Bank and ITS Details	Name	ICICI Bank Limited
	Address	9-A PHELPS Building, Connaught Place, New Delhi- 110001
	IFSC Code	ICIC0000007

EMD can also be paid through the following prescribed electronic modes of payment (**UTR No. is to be provided by bidder in the technical online bid**):

- Debit card powered by RuPay
- Unified Payment Interface (UPI) (BHIM-UPI) – TCIL VPA ID – tcil80@ICICI
- Unified Payment Interface (UPI) Quick Response Code: As below.
- Bank details for NEFT: same as given above.



Note:- Bids received without Bid Security (EMD) may be summarily rejected.

1.6 **TENDER FEES**

Tender Fees shall be paid **Rs. 20000+18% GST.** Tender Fee can be paid through the following prescribed electronic mode of payment (**UTR No. is to be provided by bidder in the technical online bid**):

- Debit card powered by RuPay
- Unified Payment Interface (UPI) (BHIM-UPI) – TCIL VPA ID – tcil80@ICICI
- Unified Payment Interface (UPI) Quick Response Code: As below.
- Bank details for NEFT: same as given above.



Notes for EMD and Tender Fees Exemption:

- a) This NIT comes under **Works category** hence no benefit has been given to Micro & Small Enterprises (MSEs), only Start-up Enterprises are exempted from the payment of EMD & Tender Fees.
- b) To avail benefits prescribed in the tender for **Start-up Enterprises**, the bidder shall submit their registration certificate issued by DIPP/DPIIT. Non-submission of requisite proof shall be treated as non-Start-up Enterprise bid.
- c) Deleted
- d) Traders/ resellers / distributors/authorized agents will not be considered for availing benefits under MSME Act 2006 and PPP Policy 2012 as per MSE guidelines issued by MoMSME.
- e) MSEs who are manufacturer of Goods /Items and provider of Services, need to ensure that ALL delivered Goods/items and Services of the tender are listed in their MSME/NSIC certificate. Partial-listing of Goods/Services in their certificate shall render MSEs ineligible for benefits.
- f) **The bids submitted without bid security/tender fees or inadequate bid security/tender fees will be rejected. No interest shall be payable on bid security amount.**
- g) **If bid security/tender fees is submitted as BG/DD, it should reach o/o, TCIL Bhawan, 4th Floor, Room No- 413 Greater Kailash-I, New Delhi-110048 within the last date & time stipulated for bid submission in the tender.**
- h) The EMD/Bid Security of unsuccessful bidder shall be returned as promptly as possible but not later than 30 days after expiry of the bid validity period.
 - (i) The EMD/Bid Security may be forfeited if:
 - (ii) If the Bidder withdraws his bid during the period of bid validity specified by the Bidder on the Bid form or
 - (ii) fails or refuses to execute the Contract, if required; or
 - (iii) The successful bidder fails to submit performance security within the prescribed time. or
 - (iv) The proceed of EMD shall be payable to TCIL in case of breach of any of the terms and conditions of the contract/PO/tender by the vendor.

1.7 EVALUATION

- a) TCIL shall evaluate bids in respect to substantive responsiveness of the bid or otherwise. TCIL shall carry out detailed evaluation of the substantially responsive bids only.
- b) A bid determined as substantially non-responsive technically/financially shall be rejected, even after opening the price bid.
- c) TCIL may waive any minor infirmity or non-conformity or irregularity in the bid which does not constitute a material deviation.
- d) Among all technically qualified bids, the lowest bid will be termed as L1 (excluding taxes) derived from Price Bid Schedule. The Purchase Preference needs to be given as per Purchase Preference defined in this NIT.
- e) If there is a discrepancy between the unit price and total price that is obtained multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected.
- f) Figure in words will prevail in case of ambiguity between quoted figure and words.

g) BID CAPACITY:

The bidders will be qualified for opening of their Price Bids only if their available Bid Capacity is equal or more than the estimated cost of work put to Tender. The bid capacity Shall be worked out on the following formula:

$$\text{Bid capacity} = \{[A \times M \times N] - B\}$$

Where,

A = Maximum value of engineering (Civil/ Electrical/ Mechanical as relevant to work being procured) works executed in any one year during the last Seven years (updated at the current price level), taking into account the completed as well as works in progress

M = Multiplier Factor = 1.5

N = Numbers of years prescribed for completion of work for which bids has been invited;

B = Value (updated at the current price level) of the existing commitments and ongoing works to be completed in the next 'N' years

Note : The bidders to submit the following documents in respect of Bidding Capacity:-

(i) Bid Capacity as mentioned above along with the calculations and supporting documents (copy of letter of award and last bill payment from client for each work) should be duly certified by Statutory Auditor/ Chartered Accountant on their letter head with details of Membership No, Contact (email and phone number) and UDIN number.

(ii) Bidder has to submit the Financial data for latest last Seven financial years ending with FY 2022-23, in **Annexure-C** along with audited financial statements. The financial data in the prescribed format shall be certified by the Statutory Auditor/ Chartered Accountant.

(iii) Value of existing commitments including awarded LOI value and ongoing works to be completed during the period of completion of work for which bids have been invited, has to be submitted by the bidder in **Annexure-D**, which shall be certified by the Statutory Auditor/ Chartered Accountant along with all the supporting documents considered for arriving at the value of works in hand. Any such certified document submitted by the Bidder without UDIN number mentioned thereon shall not be considered as part of bid and shall not be taken into account during evaluation of documents. Prescribed format shall be certified by the Statutory Auditor/ Chartered Accountant.

(iv) In the case of a consortium, the above formula will be applied to each member to the extent of his proposed participation in the execution of the work. If the proposed % participation is not mentioned then equal participation will be assumed.

(v) The bid capacity should be equal or more than the value of **Estimated Tender Cost. i.e Rs 92.08 Crores excluding GST.**

(vi) If any false information is furnished by the bidder, then the bidder shall be disqualified/terminated even after award of work.

1.8 **VALIDITY PERIOD OF BID**

Bid shall remain **valid for 180 days** after the date of bid opening. The bid valid for a shorter period shall be rejected as non-responsive.

In exceptional circumstances, TCIL may request the bidder for an extension to the period of bid validity if same is extended by end client and accordingly, the bid security shall also be suitably extended by the bidder.

1.9 **IP PROGRAMME** :

As a part of implementation of Integrity Pact Programme (IPP) in TCIL, all tenders with the estimate value equal to or exceeding the threshold value will be covered under the Integrity Pact Programme (IPP) and the vendors are required to sign the IP document and submit the same to TCIL before or along with the bids. Latest IP document is available at TCIL website (www.tcil.net.in) Link- https://www.tcil.net.in/integrity_pact.php Even in case of tenders with the estimated value less than the threshold value, the vendors would be required to sign the IP document if the total value of the Purchase Orders (POs) exceeds the threshold value in respect of:

☐ Multiple/repeat POs on the single vendors against a tender.

- ☐ POs placed on multiple vendors against a tender.

Only those vendors who have signed the IP document can send their grievances, if any, to the Independent External Monitors (IEMs) through the nodal officer, i.e. Chief Vigilance Officer (CVO). TCIL in the prescribed proforma.

NAME OF IEMS WITH THEIR CONTACT DETAILS:

- 1) Shri Anil Kumar Shrivastava, Independent External Monitor Email ID: anilifs86@gmail.com
- 2) Shri Harishwar Dayal, Independent External Monitor E mail ID: dayalagra@gmail.com

NAME & CONTACT DETAILS OF NODAL OFFICER (IP) IN TCIL: Shri Niraj Verma, Chief Vigilance Officer E-mail ID: cvotcil@tcil.net.in

If the Order, with total value equal to or more than the threshold value, is split to more than one vendor and even if the value of PO placed on any/each vendor(s) is less than the threshold value, IP document having been signed by the vendors at bid stage itself, the Pact shall continue to be applicable.

In respect of tenders for Pre-bid tie up/Expression of Interest (NIT): In case of TCIL getting the Order from the client, before placement of Purchase Order/Work Order on technically & commercially qualified vendor, the selected vendor is required to sign the IP document.

IP document shall be in plain white sheet and to be signed by the vendor and TCIL with two witnesses from each party. The name, designation, company etc. of the persons signing the IP document and the project/tender name shall be clearly mentioned. All pages of the IP document shall be initialed by both parties along with company seal.

Tender received without signed & stamped copy of the Integrity Pact document will be liable to be rejected, and the bidder himself will be responsible for that.

1.10 INTEGRITY PACT

- a) This NIT is covered under Integrity Pact Programme of TCIL and bidders are required to sign the Integrity Pact Document and submit same to TCIL before or along with the bids.
- b) Integrity Pact Agreement duly signed and stamped by Authorized Signatory & Witnesses has to be submitted in physical form at the time of bid submission. In case of consortium bid, the lead partner shall sign as authorized signatory and the consortium partner as witness.
- c) NIT received without signed copy of the Integrity Pact document will be liable to be rejected.
- d) In case of Joint Venture, all partners of the joint venture should sign the Integrity Pact. In case of sub-contracting, the Principal Contractor shall take the responsibility of the adoption of IP by sub- contractor. It is to be ensured that all sub-contractors also sign the IP.

e) Mediation Clause

In the event of any dispute between management and the contractor relating to those contracts where integrity pact is applicable, in case, both the parties are agreeable, the dispute may be settled through mediation before the panel of IEMs in a time bound manner. If required, the organizations may adopt any mediation rules for this purpose.

In case the dispute remains unresolved even after mediation by panel of IEMs, the organization may take further action as per terms and conditions of the contract.

1.11 SIGNING OF NON-DISCLOSURE AGREEMENT - Deleted

1.12 AUTHORIZATION LETTER/ BOARD RESOLUTION :

The bidders need to submit board resolution along with authorization Letter in Online mode authorizing the signatory to act on behalf of the bidder. The Authorized person should be either authorized by Board or a employee authorized by one of the following person who has the Board Resolution to delegate authorization to other :

1. Managing Director
2. The Chief Executive Officer
3. The Manager;
4. The Company Secretary
5. The Whole-time Director
6. The Chief Financial Officer

The bidder should ensure that the Digital Signature used for uploading the tender document in e-tender portal should be of the authorized signatory.

1.13 AGREEMENT

The selected bidder will have to sign an AGREEMENT with TCIL (**as per Section-18**) within 21 days of issue of LOI on Non-Judicial Stamp Paper of appropriate value.

1.14 SUBMISSION OF FORGED DOCUMENTS

Bidders should note that TCIL may verify authenticity of all the documents/certificate/information submitted by them against the NIT. In case at any stage of this process, if it is established that bidder has submitted forged documents/certificates/information or false information towards fulfillment of any of the NIT/contract conditions, TCIL shall immediately reject the bid of such bidder(s) or cancel/terminate the contract and forfeit bid security / Performance Security submitted by the bidder and debar them from participation in future tenders of TCIL for a period upto 2 years.

1.15 CLARIFICATION FROM BIDDERS

The queries may be asked from bidders for submitting shortfall to be submitted within specified date and time. Also, every document submitted against following queries should be signed by the person authorized as per Authorization letter / Board Resolution submitted by bidder against tender, without which the documents will not be accepted as valid.

1.16 REGISTRATION OF MSE VENDORS

All MSE bidders may be registered on TReDS platform (www.rxil.in) and MSME-SAMADHAAN portal. Participating MSE bidders shall submit an undertaking regarding the same.

1.17 The bidder must ensure that their bid is complete in all respects and conforms to NIT terms and conditions, NIT specifications etc. including client specifications, failing which the bids are liable to be rejected without seeking any clarifications on any exception/deviation taken by the bidder in their bid.

1.18 TCIL reserves the right to accept or reject any or all the NITs without assigning any reason.

1.19 On award of work of the Tender/Work/Project, the vendor shall provide its GeM Seller id to TCIL (not applicable for “works” contract or non-Indian vendor).

1.20 PRE-BID MEETING

1.20.1 The bidder or its official representative is invited to attend pre-bid meeting(s) which will take place, date and time designated in the Bidding Document.

1.20.2 The bidder is advised to visit the Site and study the bid document thoroughly, and is requested to submit any questions in writing or by mail, to reach the IA not later than 3 days before the pre-bid meeting.

1.20.3 Non attendance at the pre-bid meeting will not be a cause for disqualification of a bidder. Nevertheless, senior representatives of the bidders are strongly encouraged to participate in the pre-bid meeting to help ensure that they fully understand the key concerns of the IA and the IA's requirements.

1.21 CONTACT INFORMATION

Project Division: (IT-T-III) Division

Mr. Subhash Chand Rojjha

General Manager (NP)

Telephone: 01126202471

e-mail: subhash.rojjha@tcil.net.in

Mr. Jogiender Sahu

Joint General Manager (EE)

Mobile: +91-9999108241

e-mail: jogiender.sahu@tcil.net.in

Mr. Rakesh Kumar Lakhera (Nodal Officer)

Deputy General Manger (EE)

Mobile: +91-9818075026

e-mail: rakesh.lakhera@tcil.net.in

END OF SECTION-1

SECTION-2

GENERAL TERMS & CONDITIONS OF THE CONTRACT

2.1 FINANCING OF TRADE RECEIVABLES OF MSE'S THROUGH TRADE RECEIVABLES DISCOUNTING SYSTEM (TREDS) PLATFORM

- a) Based on the initiatives of government of India to help MSME vendors get immediate access to liquid fund based on TCIL's credit rating by discounting MSE's trade receivables through an auction mechanism where multiple financiers can participate and bid, TCIL registered itself on TReDS platform with M/s RXIL.
- b) Micro and Small Enterprise (MSE) bidders / vendors can avail this benefit by registering themselves with M/s RXIL providing e-discounting/electronic factoring services on its TReDS platform and following the procedures defined therein.
- c) All costs relating to availing the facility of discounting on TReDS platform including but not limited to Registration charges, Transaction charges for financing, Discounting Charges, Interest on financing, or any other charges known by any name shall be borne by MSE Bidders / Vendor.
- d) MSE Bidders / Vendor hereby agrees to indemnify, hold harmless and keep TCIL and its affiliates, Directors, officers, representatives, agents and employees indemnified, from any and all damages, losses, claims and liabilities (including legal costs) which may arise from Sellers submission, posting or display, participation, in any manner, on the RXIL's TReDS Platform or from the use of Services or from the TCIL's breach of any of the terms and conditions of the Usage Terms or of this Agreement and any Applicable Law on a full indemnity basis.
- e) TCIL shall not be liable for any special, indirect, punitive, incidental or consequential damages or any damages whatsoever (including but not limited to damages for loss of profits or savings, business interruption, loss of information), whether in contract, tort, equity or otherwise or any other damages resulting from using facilities on RXIL's TReDS platform.

2.2 PRICE PREFERENCE TO MICRO AND SMALL ENTERPRISES

(Price Preference to MSEs shall be extended as per GOI guidelines applicable from time to time).

- a) If items mentioned in EOI are **non-splittable / non-dividable** and L1 is non-MSE bidder:
 - i) If a MSE vendor / bidder is within L1+15% price range, the complete purchase / work order shall be given to MSE bidder subject to their matching the L1 price.
 - ii) If MSE vendor / bidder is not within L1+15% price range then complete purchase / work order shall be given to L1 bidder.
- b) If items mentioned in EOI are **splittable/dividable** and MSE is neither L1 nor within L1+15% The purchase/work order shall be given to L1 bidder.
- c) If the items mentioned in EOI are **splittable/dividable** and MSE is not L1 but within L1+15% 25% of total procurement shall be made from MSE, subject to their matching of L1 price. In case of more than such eligible MSEs who are within L1+15% range, procurement will be shared equally among such MSEs with a minimum 5% procurement from SC/ST MSEs, subject to their matching of L1 price. In event of failure of SC/ST MSEs to participate in EOI process or meet EOI requirements and L1 price or none of these SC/ST MSEs are in L1+15%, then this 5% sub-target shall be met from other MSEs. Minimum 3% reservation within above mentioned 25% reservation shall be applicable for women-owned MSEs.

2.3 PURCHASE PREFERENCE: MAKE IN INDIA

(Purchase Preference to Make IN India shall be given as per GOI guidelines applicable from time to time.) Refer Annexure-I

- a) Minimum local content: **50%**
- b) Margin of purchase preference: 20%
- c) Subject to the provisions of this order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order. Purchase preference shall be given to Class-I local supplier in procurements undertaken by procuring entities in the manner specified here under
- d) In the procurements of goods or works, which are covered by para 1.2(a) and which are **divisible in nature** 'Class-I local supplier' shall get purchase preference over Class -II local supplier as well as 'Non-local supplier' as per following procedure:
 - i. Among all qualified bids, the lowest bid will be termed as L1, if L1 is Class -I local supplier the contract for full quantity will be awarded to L1.
 - ii. If L1 bid is not a Class-I local supplier, 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the Class -I local supplier will be invited to match the L1 price for the remaining 50% quantity subject to the Class -I local supplier's quoted price falling within the margin of Purchase preference and contract for that quantity shall be awarded to such Class -I local supplier subject to matching the L1 Price. In case such lowest eligible Class -I local supplier fails to match the L1 price or accepts less than the offered quantity the next higher 'Class -I local supplier' within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on and contract shall be awarded accordingly. In case some quantity is still left uncovered on Class-I local suppliers, then such balance quantity may also be ordered on the L1 bidder.
- e) In the procurements of goods or works, which are covered by para 1.2(a) of section-1 and which are **not divisible in nature** and in procurement of services where the bid is evaluated on price alone, the 'Class-I local suppliers' shall get purchase preference over 'Class-II local supplier' as well as 'Non- local supplier' as per following procedure.
 - i) Among as qualified bids, the lowest bid will be termed as L1. If L1 is Class-I local supplier, the contract will be awarded to L1.
 - ii) If L1 is not 'Class-I local supplier' the lowest bidder among the Class-I local supplier will be invited to match the L1 price subject to Class-I local supplier's quoted price falling within the margin of purchase preference and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price.
 - iii) In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the Class-I local supplier within the margin of purchase preference matches the L1 price, the contract may be awarded to the L1 bidder.
- f) Class-II local supplier' will not get purchase preference in any procurement, under taken by procuring entities.

g) Verification of local content:

- i. In cases of procurement for a value less than Rs. 10 crores, the local supplier (Class-I and Class-II), at the time of bidding, shall submit a self-certification that the item offered meets the minimum local content and shall give details of the location(s) at which the local value addition is made.
- ii. In cases of procurement for a value in excess of Rs. 10 crores, the local supplier(Class-I & Class-II) shall be required to provide a certificate from statutory auditor or cost auditor of company (in case of companies) or from practicing cost accountant or chartered accountant (in respect of suppliers other than companies) giving percentage of local content in addition to self-certification at point(i)

2.4 **RESTRICTIONS ON PROCUREMENT FROM A BIDDER OF A COUNTRY WHICH SHARES A LAND BORDER WITH INDIA**

Bidders shall submit the certificate for sourcing products and services in tender as per clause 1.2 k.

- 2.4.1 The bidder shall offer and supply only those product(s)/goods/equipment(s)/Software(s) under this contract which are in compliance with Government of India, Ministry of Finance, Department of Expenditure, Office Memorandum No. F.No. 6/18/2019-PPD dated 23-07-2020, circular attached as **Section 20** of this NIT.

GUIDELINES FOR ELIGIBILITY OF A 'BIDDER FROM A COUNTRY WHICH SHARES A LAND BORDER WITH INDIA':

As per Order dated 23.07.2020, issued by Department of Expenditure, Ministry of Finance, Govt, of India in this regard, the following guidelines have been issued by DoE for tenders:-

1. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.

Competent Authority for the purpose of registration shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT), as mentioned under Annex I of the Order (Public Procurement No.1) dated 23.07.2020.

2. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency, branch or office controlled by such person, participating in a procurement process.
3. "Bidder from a country which-shares a land border with India" for the purpose of this Order means;-
 - i. An entity incorporated, established or registered in such a country; or
 - ii. A subsidiary of an entity incorporated, established or registered in such a country; or
 - iii. An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - iv. An entity whose beneficial owner is situated in such a country; or
 - v. An Indian (or other) agent of such an entity; or
 - vi. A natural person who is a citizen of such a country; or
 - vii. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

4. The beneficial owner for the purpose of (3) above will be as under:-

- i. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person (s), has a controlling ownership interest or who exercises control through other means.

Explanation-

- a) **"Controlling ownership interest"** means ownership of or entitlement to, more than twenty five per cent, of shares or capital or profits of the company;
- b) **"Control"** shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;
- ii. In case of a partnership firm, the beneficial owner is the natural persons) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than **fifteen percent of capital or profits of the partnership**;
- iii. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
- iv. Where no natural person is identified under (i) or (ii) or (iii) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
- v. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.
- vi. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

2.4.2 PROCUREMENT OF PRODUCTS FROM TRUSTED SOURCES

If the supplied product(s) under this contract is to be connected with Telecommunication Network then such product(s)/goods/equipment(s)/Software(s) shall be only from Trusted Sources duly certified by NSCT as notified by Govt. of India, Ministry of Communication vide OM No. 20-271/2010 AS-I (Vol-III) dated 10.03.2021. Copy of circular/guidelines is attached as **Section-21** of this NIT.

2.4.3 Bidder who is found violating these directions /guidelines of Govt. of India or any other guidelines in this regard shall be liable to face action from TCIL which may include non-award of work, cancellation of contract, rejection of goods supplied, getting the work done at risk and cost of the bidder, forfeiting the PBG, banning for future work for period up to five (5) years or any other action as deemed fit.

2.5 RISK PURCHASE

- a) In case, the Contractor/ Supplier is not performing its obligations under the contract, the notice shall be sent as per law to the contractor informing that in case of non-performance by a particular date/period, the contract shall be terminated and the work/project will

be executed (through a third party) at the risk and cost of the said contractor/ supplier as per the terms of the contract.

- b) On completion of the specified period/date, the notice of termination shall be issued clearly specifying that the remaining work shall be executed (through a third party) at the risk and cost of the contractor/supplier. Along with this notice of termination, intimation shall be sent to the said contractor/supplier for joint preparation of inventory of the works performed/ supplies already undertaken by him. If the contractor/supplier fails to turn up on an appointed date for joint preparation of inventory, in that situation he shall be proceeded ex parte and the inventory shall be prepared by TCIL/IA and the same be sent to the contractor/supplier.
- c) Further at the time of award of work to another contractor/ Supplier, if the work is awarded at an additional cost than the original contractor/ Supplier, another notice may be issued to the original contractor/ Supplier specifying that the work has been awarded to another agency at the additional cost of such and such amount, and he is liable to pay that amount to TCIL.
- d) Demand notices may be sent to the original contractor/ Supplier from time to time.

2.6 **GENERAL LIEN / SET-OFF**

- a) Whenever under this contract, any sum of money is recoverable from and payable by the supplier, the IA shall be entitled to recover such sum by appropriating in part or in whole the security deposit of the supplier, if a security is taken from the supplier. In the event of the security being insufficient or if no security has been taken from the supplier, the balance or the total sum recoverable, as the case may be, shall be deducted from any sum due to the supplier or which at any time thereafter may become due to the supplier under this or any other contract with the IA. Should this sum be not sufficient to cover the full amount recoverable, the supplier, shall pay to the IA on demand the remaining balance due.
- b) Any sum of money (including refundable security deposit) due and payable to the supplier, under this contract or any other contract entered between the parties herein whether continuing or completed may be appropriated by TCIL and set off against any claim of TCIL of any nature whatsoever, arising under this contract or any other contract entered into between the parties, herein whether continuing or completed.

2.7 **REPEAT/ADD-ON ORDER**

- a) In exceptional situation where the requirement is of an emergent nature, the IA reserves the right to place repeat order up to 50% of the value of goods and services contained in the running tender/contract within a period of twelve months from the date of commissioning/ commercialization of the project (date of acceptance of APO of the items procured in case where no installation, commissioning is involved) at the same rate or a rate negotiated (downwardly) with the existing vendors considering the reasonability of rates based on prevailing market conditions and the impact of reduction in duties and taxes etc.
- b) Further if required, an additional order for 50% of the value of the goods & services limited to 100% of the value of goods and services contained in the running tender/contract may be placed within a period of twelve months from the date of commissioning/ commercialization of the project (date of acceptance of APO of the items procured in case where no installation, commissioning is involved) on the existing vendors at the same rate or a rate negotiated (downwardly) considering the reasonability of rates based on prevailing

market conditions and the impact of reduction in duties and taxes etc.(with due approval of competent authority).

2.8 **IA RIGHT TO VARY QUANTITIES**

The quantity of items given in the Price Schedules forming part of the Contract are provisional. The variation in quantity of the items shall be within the limit of plus/minus (+/-) fifty percent (50%) for individual items. In case the quantity variation of the individual items is beyond the limit specified above, the unit rates for the quantity beyond the said limit, shall be mutually agreed based on prevailing market rates as may be fair and reasonable.

It is to be noted that IA may choose to approve a variation of upto 20% of contract value (calculated using the rates quoted at the time of bidding) which has been caused due to quantity variation. For variation of greater than 20% but less than 50% of contract value (calculated using the rates quoted at the time of bidding), is subjected to approval from client.

2.9 **FORCE MAJEURE**

The supplier shall be exempted from the responsibility for any non-performance arising from a case of force majeure or act of God, hereinafter called force majeure (a) war and (b) earthquake. If such circumstances should arise, the supplier shall inform the IA within 72 hours in writing of the existence of the fact before suspending work without penalty on either side from the period of such suspension not exceeding 3 months. Likewise, it must proceed to inform the end of such fact. As soon as the facts constituting a force majeure cease in their effects, the supplier shall restart or continue the fulfillment of its obligations agreed upon. Should suspension of work as explained above exceeds three months, the contract shall be violable at the option of either party without penalty on either side.

2.10 **DISPUTE RESOLUTION**

- 1) The parties to this agreement/contract agree that they shall resolve all disputes or differences whatsoever arising between them under and/or in connection with and/or in respect of this Tender/NIT/Agreement/Purchase Order/MoU through a "Conciliation and Settlement Mechanism (CSM)" and the detailed guidelines/procedure for such CSM is annexed hereto as **Annexure-A** in Section-19 of this NIT. That it is understood and agreed between the parties that the CSM annexed as **Annexure-A** in Section-19 with the present agreement forms and shall be treated as part and parcel of the present agreement.
- 2) If the parties fail to resolve such disputes through the conciliation proceedings, then and only then, a party shall refer the dispute to arbitration as mentioned in the following manner:
 - a. All disputes or differences whatsoever arising among the parties under and/or in connection with and/or in respect of this Tender/NIT/Agreement/Purchase Order/MoU shall be referred to and decided by a sole arbitrator, who shall be appointed by the CMD, TCIL only. The arbitration shall be conducted in accordance with Arbitration and Conciliation Act of 1996, as amended from time to time, and the venue of the arbitration shall be in New Delhi.
 - b. Notwithstanding the generality of the above, it is a term of this contract that no person other than a person appointed by CMD, TCIL as aforesaid, should act as arbitrator and if for any reason that is not possible or any party does not agree to such appointment of Arbitrator by CMD, TCIL for whatsoever reason, then the matter is not to be referred to arbitration at all and such disputes shall be resolved under the mechanism provided by

the state in form of Courts of Law/Ordinary Civil Courts for resolution of such disputes under applicable Laws.

- 3) The courts at New Delhi shall have exclusive jurisdiction in respect to any dispute pertaining to this agreement.
- 4) The parties shall continue to perform their respective obligations as per the Agreement during the pendency of proceedings under this clause.

For Public Sector Undertaking / Government Departments:

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Center Enterprise (CPSEs)/Port Trusts inter se and also between CPSEs and Govt. Depts/ organizations (excluding disputes relating to Railways, Income Tax, Customs & Excise Dept), such dispute or difference shall be taken up by either party for its resolution through AMRCD as mentioned in DPE OM No. 05/003/2019-FTS-10937 dated 14th December 2022 and the decision of AMRCD on the said dispute will be binding on both the parties.

2.11 FALL CLAUSE (Not Applicable)

- a) The prices once fixed will remain valid during the scheduled delivery period.
- b) The vendor while applying for extension of time for delivery of services, if any, shall have to provide an undertaking as "We have not reduced the sale price, and/ or offered to sell the same or similar service to any person/organization including Department of central/state Government or any central/state PSU at a price lower than the price chargeable under the contract for scheduled delivery period."

2.12 OFFLINE DOCUMENTS

The Bidder should submit all the bid documents (except Bank Guarantee/DD) online as indicated in the Tender /NIT schedule. The Tender Fees / EMD if paid through online mode), UTR No. is to be provided by bidder in their online bid. Only Bank Guarantee/DD shall be taken in offline mode and submitted to given below address.

TCIL Bhawan, 4th Floor, Room No- 411 Greater Kailash-I, New Delhi-110048

Documents submitted in online mode should be uploaded using DSC of person authorized as per Authorization letter /Board Resolution for signing bid documents.

2.13 BANNING OF NON-PERFORMING VENDOR

In case any of the vendor's work/PO/agreement is cancelled/terminated by TCIL after award, due to non-performance, the vendor may be banned/blacklisted upto 2 years or action as deemed fit may be taken by TCIL

2.14 AMENDMENT TO BID DOCUMENTS

- a) At any time, prior to the date of submission of bids, TCIL may for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bid documents by amendments, which shall be available on TCIL Website and the e-tendering portal.

- b) In order to give required time to the prospective bidders, in which to take the amendments into action in preparing their bid, TCIL may at its discretion extend the deadline for submission of bid suitably.

2.15 **BID PRICE**

The prices quoted by the bidder shall remain firm during the entire period of the contract and shall not be subject to variation (unless asked by TCIL). Clauses such as “at actual”, “extra”, “to be given later” etc. shall also be treated as non-responsive & are liable for rejection. **Price adjustment will be as per Annexure-H.**

2.16 **MODIFICATION AND WITHDRAWAL OF BIDS**

- a) Bid withdrawal/modification shall not be allowed after end date and time of bid submission.
- b) Withdrawal of a bid between the deadline for submission of bids and the expiration of the period of bid validity specified in the tender or as extended, may result in the forfeiture of the bid security. Such defaulting vendor is liable to be debarred from participating in future bids for a period of upto 2 years.

2.17 **CLARIFICATION OF BIDS**

During evaluation of bids, TCIL may at its discretion ask the Bidder for clarifications / confirmations / deficient documents of its bid. The request for clarification and the response shall be in writing and no change in the price of substance of the bid shall be sought or permitted.

2.18 **IA'S RIGHT TO SEEK QUOTES DIRECTLY FROM OEM**

During the NIT process, TCIL reserves its right to seek rates directly from OEM or its authorized representative/distributor for one or all items of BOQ under this NIT.

2.19 **TERMINATION FOR DEFAULT**

- a) TCIL may, without prejudice to any other remedy for breach of contract, by written notice of default, sent to the supplier, terminate this contract in whole or in part.
- if the supplier fails to deliver any or all the services/goods within the time period specified in the contract, or any extension thereof granted by TCIL.
 - if the supplier fails to perform any other obligation(s) under the contract;
 - if the supplier, in either of the above circumstances, does not remedy his failure within a period of 15 days (or such longer period as TCIL may authorize in writing) after receipt of the default notice from TCIL.
 - Failure of the successful bidder to comply with the requirement of submission of performance security shall constitute sufficient ground for cancellation of the award of work and forfeiture of the bid security.
- b) In the event TCIL terminates the contract in whole or in part pursuant to above clause, TCIL may procure, upon such terms and in such manner as it deems appropriate, goods/services similar to those undelivered and the supplier shall be liable to pay TCIL for any excess cost for such similar goods/services. However, the supplier shall continue the performance of the contract to the extent not terminated.

2.20 **TERMINATION FOR INSOLVENCY:**

TCIL may at any time terminate the contract by giving written notice to the supplier, without compensation to the supplier, if the supplier becomes bankrupt or otherwise insolvent as

declared by the competent court; provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to TCIL.

2.21 **TERMINATION FOR CONVENIENCE:**

TCIL may, at any time, terminate the contract without cause after giving 15 days notice to the contractor.

2.22 At any time, in case it comes to the knowledge of TCIL any of wrong information related with eligibility of the bidder or non-compliance to any terms and conditions of tender, then TCIL reserves the right to cancel or reject the bid of such bidder, cancel the tender or take any other action as deemed fit in accordance with tender terms and conditions.

2.23 **ADDITIONAL CLAUSES FOR DEBARMENT:**

- A. A bidder or any of its successor, shall be debarred from participating in any procurement process undertaken by TCIL for a period not exceeding **three (3) years** if he has been convicted of an offence as under:
 - a) under the Prevention of Corruption Act, 1988; or
 - b) the Indian Penal Code or any other law for the time being in force, for causing any loss of life or property or causing a threat to public health as part of execution of a public procurement contract.
- B. A bidder or any of its successor, shall be debarred from participating in any procurement process undertaken by TCIL for a period not exceeding **two (2) years** if the following code of integrity as per rule 175 of GFRs 2017, is breached:
 1. prohibition of
 - a) making offer, solicitation or acceptance of bribe, reward or gift or any material benefit, either directly or indirectly, in exchange for an unfair advantage in the procurement process or to otherwise influence the procurement process.
 - b) any omission, or misrepresentation that may mislead or attempt to mislead so that financial or other benefit may be obtained or an obligation avoided.
 - c) any collusion, bid rigging or anticompetitive behaviour that may impair the transparency, fairness and the progress of the procurement process.
 - d) improper use of information provided by the procuring entity to the bidder with an intent to gain unfair advantage in the procurement process or for personal gain.
 - e) any financial or business transactions between the bidder and any official of the procuring entity related to tender or execution process of contract; which can affect the decision of the procuring entity directly or indirectly.
 - f) any coercion or any threat to impair or harm, directly or indirectly, any party or its property to influence the procurement process.
 - g) Obstruction of any investigation or auditing of a procurement process.
 - h) ***making false declaration or providing false information*** for participation in a tender process or to secure a contract;
 2. Disclosure of conflict of interest.
 3. Disclosure by the bidder of any previous transgressions made in respect of the provisions of sub-clause (i) with any entity in any country during the last three years or of being debarred by any other procuring entity.
- C. A bidder or any of its successor, shall be debarred from participating in any procurement process undertaken by TCIL for a period not exceeding **two (2) years** if the following is breached:

- (i) If a Bidder withdraws the proposal or increases the quoted prices after opening of the Proposal and during the period of Bid validity period or its extended period, if any.
- (ii) In case of a successful Bidder, if the Bidder fails to sign the Agreement in accordance with the terms and conditions (including timelines for execution of the Agreement) of this tender or fails to furnish the Performance Bank Guarantee in accordance with the terms and conditions (including timelines for furnishing PBG) of this tender.
- (iii) During the Bid process, if a Bidder indulges in any act as would jeopardize or unnecessarily delay the process of bid evaluation and finalization.

D. The debarment in all cases shall be automatically extended to all its allied firms. In case of Joint ventures/Consortium is debarred all partners shall also stand debarred for a period specified in debarment order. The names of partners should be clearly specified in the debarment order

2.24 **SUB-CONTRACTS**

The bidder shall notify the IA in writing of all Suppliers/OEM awarded for supply items under this contract in the bid. The bidder should ensure that it shall not award the work to other Suppliers. The bidder after award of supply contract of material to supplier(s)/OEM(s) may change supplier(s)/OEM(s) within declared list of supplier(s)/OEM(s) in bid with prior written permission of IA. The decision of IA in this regard shall be final and not challengeable by bidder.

END OF SECTION-2

SECTION – 3

SPECIAL CONDITIONS OF CONTRACT

Note: In case clauses/sub-clauses have any difference mentioned in this NIT at different places, the conditions mentioned in this section-3 shall prevail.

3.1 PAYMENT TERMS

Payment terms and all other terms & conditions with the contractor would be on back to back basis. Payment shall be released to with in 15 days to the contractor on receipt of payment from DM, R&R, Govt. of Maharashtra on the basis of if and when received.

3.1.1 Interest bearing Mobilization Advance

- a. 10% Mobilization Advance will be given against 110% value of ABG.
- b. This advance shall be recouped in installments of 10% from the running payments.
- c. ABG shall be released after full recovery of Mobilization Advance. However ABG value can be reduced on adjustment of 50% advance on proportionate basis.
- d. The interest rate on advance payment shall be Marginal Cost of Funds Based Lending Rate (MCLR) for one year of the State Bank of India, prevailing on the date of advance payment to the Contractor. The interest accrued on interest bearing advance shall be adjusted first before releasing any payment. The interest rate shall be calculated on the daily progressive balances outstanding as on the date of recovery/adjustment i.e. on daily rest basis.
- e. Complete advance amount will be recovered within 12 months from the date of initial payment of advance.
- f. Up to date accrued interest shall also be recovered while making the payment against each running bill.

3.1.2 Payment on supply of Material

The payment shall be released for each DPR (Division) once a month. { DPR/Project are enclosed from Annexure I to Q}.

- a. 60% payment of items mentioned in Material Table A shall be released against supply of material at store/site.

(Note: Refer DELIVERY / IMPLEMENTATION SCHEDULE (Clause 3.6 of section-3).

- b. 30% payment of supplied Items mentioned in **Material Table A** shall be made after Installation, erection, commissioning and associated civil work and completion of site acceptance testing of the same.
- c. 90% payment of material mentioned in **Associated Material Table B** shall be made after Supply, Installation, and erection and commissioning, associated civil work and acceptance testing of the same.

3.1.3 Payment of Erection , Testing and Commissioning services.

90 % Payment of Erection, Testing and Commissioning shall be made for each DPR after completion of all works of DPR (Division) (DPRs are enclosed from Annexure I to Q for a particular district), after submission of all required documents.

3.1.4 Balance 10 % payment of all supplied items (Material in Table A + Material in Table B) and Erection , Testing and Commissioning services shall be made after Handover of the whole work of the contract, including all test reports and other documents not limited to store receipt of dismantled material and surplus material.

3.1.5 Payment / Reimbursement of ROW/ RI Charges

In case concerned Government Department/ Bodies/Agency/ Municipality approve road reinstatement by bidder RI charges will be paid as per contract , In this case bidder has also to deposit supervision charges in concerned Government Department/ Bodies/Agency/ Municipality this amount will be reimbursed to the bidder in RA bills on production of documentary evidence of payment and after supervision of the concerned agency. The bidder shall be responsible for rectification of defect notified by the supervisory agency.

In case concerned Government Department/ Bodies/Agency/ Municipality not approve road reinstatement by bidder , then bidder has to deposit ROW/RI charges in concerned Government Department/ Bodies/Agency/ Municipality this amount will be reimbursed to bidder in RA bills on production of documentary evidence of payment.

Note:-

- 1 Supply payment shall be made as per actual material delivered in Store / Site for material mentioned in Table A and Table B and accepted by IA and TPQAA after submission of FAT/Test Certificate report & all other required documents.
- 2 GST shall be reimbursed after submission of GST R1, GST R3V and Payment Challan of GST

Table A (Materials)

S.No	Items
1	HT/LT Cables and Conductors, Current Transformer, Potential Transformer
2	HDPE Pipe
3	Distribution Transformers (DT)
4	Ring Main Unit (RMU)
5	Feeder Pillar Box, Pole

Table B (Associated Materials)

S.No.	Items
1.	RCC Pipes
2	Heat Shrink Straight Through and Termination Joint Kit
3	Pin Insulators/Disc/ PG Clamps/ Dead End & Suspension
4	Tiles
5	GI Channel/ Angle/ Flat and accessories
6	Half Round Cement Pipe
7	Sundries

3.2 PERFORMANCE SECURITY

- a) The successful bidder needs to deposit/submit a Performance Bank Guarantee within **21 days** from date of issue of Letter of Intent (LOI) equal to **3% of total value of contract** in the form of Bank Guarantee from nationalized bank OR Scheduled Commercial Bank in the given format in tender
- b) In Addition to performance security, additional performance security (APS) may be required to be submitted by the successful bidder in case of abnormally low bids, if deemed fit and after approval of competent authority, as per the detail below:

Sr.No.	Range of difference between the estimated cost put to tender and bid amount.	“Additional performance security” to be deposited by the successful bidder.
I	Below up to 5%	No additional performance security
li	Below more than 5%	100% of Difference between (estimated cost put to tender-5%) and quoted bid Amount.

The performance security (PBG) and additional performance security (APS) should be submitted within 15 days from the date of issue of LOI failing which TCIL may cancel the offer made to the bidder.

- a) Advance Bank guarantee (ABG)/ Performance Bank Guarantee (PBG)/ Additional Performance Security (APS) will be in the name of '**Disaster Management Unit, Relief and Rehabilitation Department Govt of Maharashtra**' (DM R&R).
- b) Performance Bank Guarantee (PBG) / e-PBG (as per format given in Section-17)
- c) Fixed Deposit Receipts (FDR)
- d) Insurance Surety Bond (as per format given in Section-23)
- e) Bankers Cheque
- f) PBG to be submitted in the prescribed format from a SFMS enabled Scheduled Commercial Bank through SFMS Platform as per details below:

Name of Beneficiary and its Details	Name	Telecommunications Consultants India Limited
	Address	TCIL Bhawan, Greater Kailash-1, New Delhi- 110048
Name of Beneficiary Bank and its Details	Name	ICICI Bank Limited
	Account No	000705005880
	Address	9-A PHELPS Building, Connaught Place, New Delhi- 110001
	Unique Identifier Code	TC503394486 (UID to be mentioned in field 7037 of the BG advising message code)
	IFS Code	ICIC0000007

- j) The proceed of performance security shall be payable to TCIL in case of breach of any of the terms and conditions of the contract/PO/tender by the vendor. Recovery/adjustment due to LD or any other loss to TCIL shall be in addition to point f).
- k) Performance security (PBG) and Additional performance security (APS), if applicable should be valid for minimum 180 days beyond DLP period. The PBG shall be released after 180 days of issue of successful completion of DLP certificate issue by MSEDCL.

- l) Failure of the successful bidder to submit the Performance Security (PBG) and Additional performance security (APS), if applicable or bidder's failure to complete its obligations under the contract shall constitute sufficient ground for the annulment the award /cancellation of the award of work and forfeiture of the bid security/performance security.
- m) Additionally, TCIL reserves the right to debar such defaulting bidder from participating in future bids for a period up to 2 years.

3.3 PRICE BASIS

3.3.1

- a). The tenderer shall furnish their rate in terms of % above/ below/ at par against Overall Estimated Cost.
- b). Percentage % to be quoted is defined as below:
 - i) = 0% means at Par same as estimated price
 - ii) > % means above(positive) /more than the estimated price.
 - iii) <% means below(negative)/less than the estimated price.
- c). Rates quoted on percentage basis is uniformly applicable to each item (Supply & for erection amount) of BOQ and shall be considered up to two(2) decimal places.

3.3.2 Price quoted should be in Indian Rupees, GST shall paid extra as actual.

3.3.3 A bid submitted with an adjustable price quotation will be treated as non-responsive and rejected.

3.3.4 Prices charged by the bidder for goods/work delivered and services performed under the contract shall not be higher than the prices quoted by the bidder in his Bid.

3.3.5 Bidder shall indicate taxes separately in his invoice & submit Tax invoice only.

3.3.6 Evaluation of bid will be made based on total price inclusive of tax.

3.3.7 "DISCOUNT, if any, offered by the bidders shall not be considered unless specifically indicated in the price schedule. Bidders desiring to offer discount shall therefore modify their offers suitably while quoting and shall quote clearly net price taking all such factors like Discount, free supply, etc, into account".

3.3.8 The amount payable to the Contractor will be as per payment Schedule and no price escalation or any kind of escalation is payable during the contract period and extended period (if any). Price adjustment will be as per **Annexure-H**

3.3.9 Figure in words will prevail in case of ambiguity between quoted figure and words

3.4 PAYING AUTHORITY

Project Director, TCIL

3.5 INSURANCE

3.5.1 To the extent specified in the Contract Agreement titled Insurance requirements, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the contract, the insurances set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the IA, who should not unreasonably withhold such approval.

Note : The Policy will be taken in the name of 'Disaster Management Unit,Relief and Rehabilitation Department Govt of Maharashtra' (DM R&R)/TCIL

a) Marine Cargo Policy/Transit Insurance Policy:

I. (i) Marine Cargo policy for imported equipment.

Since imported finished materials are not permitted under the contract, this policy shall not be applicable,

(ii) Transit Insurance Policy for indigenous equipment.

Transit Insurance Policy shall be taken wherein only inland transit is involved for the movement of Plant and Equipment supplied from within India. The policy shall cover movement of Plant and Equipment from the manufacturer's works to the project's warehouse at final destination site. Inland Transit Clause (ITC) 'A' along with war & Strike Riots & Civil Commotion (SRCC) extension cover shall be taken. The policy shall cover movement of Plant and Equipment from the manufacturer's works to the project's warehouse at final destination site. The policy shall cover all risk for loss or damage that may occur during transit of Plant and Equipment from the Contractor/subContractor's works or stores until arrival at project's warehouse/ store at final destination. Institute Cargo Clause (ICC) 'A' along with war & Strike Riots & Civil Commotion (SRCC) cover shall be taken.

II. If during the execution of Contract, the IA requests the Contractor to take any other add-on cover(s)/ supplementary cover(s) in aforesaid insurance, in such a case, the Contractor shall promptly take such add-on cover(s)/ supplementary cover(s) and the charges towards such premium for such add-on cover(s)/ supplementary cover(s) shall be reimbursed to the Contractor on submission documentary evidence of payment to the Insurance company. Therefore, charges towards premium for such add-on cover(s)/ supplementary cover(s) are not included in the Contract Price.

III. The Contractor shall take the policy in the joint names of IA and the Contractor. The policy shall indicate the IA as the beneficiary. However, if the Contractor is having an open policy for its line of business, it should obtain an endorsement of the open cover policy from the insurance company indicating that the dispatches against this Contract are duly covered under its open policy and include the name of the IA as jointly Insured in the endorsements to the open policy.

b) Erection All Risk Policy/Contractor All Risk Policy:

I. The policy should cover all physical loss or damage to the facility at site during storage, erection and commissioning covering all the perils as provided in the policy as a basic cover and the add on covers as mentioned at Sl. No. (III) below.

II. The Contractor shall take the policy in the joint name of IA and the Contractor. All these policies shall indicate IA as the beneficiary. The policy shall be kept valid till the date of the Operational Acceptance of the project and the period of the coverage shall be determined with the approval of the IA. If the work is completed earlier than the period of policy considered, the Contractor shall obtain the refund as per provisions of the policy and pass on the benefit to IA. In case no refund is payable by the insurance company then the certificate to that effect shall be submitted to IA at the completion of the project.

III. The following add-on covers shall also be taken by the Contractor:

- i. Earthquake
- ii. Terrorism
- iii. Escalation cost (approximately @10% of sum insured on annual basis)
- iv. Extended Maintenance cover for Defect Liability Period

v. Design Defect

vi. Other add-on covers viz., 50-50 clause, 72 hours clause, loss minimization clause, waiver of subrogation clause (for projects of more than Rs. 100 crores, cover for offsite storage/fabrication (over Rs. 100 crores).

- IV. Third Party Liability cover with cross Liability within Geographical limits of India as on ADD-on cover to the basic EAR cover:

The third party liability add-on cover shall cover bodily injury or death suffered by third parties (including the IA/MSEDCL personnel) and loss of or damage to property (including the IA/MSEDCL property and any parts of the Facilities which have been accepted by the IA/MSEDCL) occurring in connection with supply and installation of the Facilities.

- V. The cost of insurance premium is to be reimbursed to the Contractor for IA/MSEDCL Supplied Materials (OSM) for which the insurer is to be finalized by the Contractor as detailed therein. Alternatively, the Contractor may take a single policy covering the entire cost of the project including the cost of OSM. For this purpose, the Contractor shall submit documentary evidence for the premium paid for the entire project to the IA and IA shall reimburse to the Contractor the proportion of premium equal to value of OSM to total sum insured.
- VI. If during the execution of Contract, the IA requests the Contractor to take any other add-on cover(s)/ supplementary cover(s) in aforesaid insurance, in such a case, the Contractor shall promptly take such add-on cover(s)/ supplementary cover(s) and the charges towards such premium for such add-on cover(s)/ supplementary cover(s) shall be reimbursed to the Contractor on submission documentary evidence of payment to the Insurance company. Therefore, charges towards premium for such add-on cover(s)/supplementary cover(s) are not included in the Contract Price.

c) **Automobile Liability Insurance**

The Contractor shall ensure that all the vehicles deployed by the Contractor or its Sub Contractors (whether or not owned by them) in connection with the supply and installation of the Facilities in the project are duly insured as per RTA act. Further the Contractor or its Sub Contractors may also take comprehensive policy (own damage plus third party liability) of each individual vehicles deployed in the project on their own discretion in their own name to protect their own interest.

d) **Workmen Compensation Policy:**

- I. Workmen Compensation Policy shall be taken by the Contractor in accordance with the statutory requirement applicable in India. The Contractor shall ensure that all the workmen employed by the Contractor or its Sub Contractors for the project are adequately covered under the policy.
- II. The policy may either be project specific covering all men of the Contractor and its Sub Contractors. The policy shall be kept valid till the date of Operational Acceptance of the project. Alternatively, if the Contractor has an existing 'Workmen Compensation Policy' for all its employees including that of the Sub Contractor(s), the Contractor must include the interest of the IA/MSEDCL for this specific Project in its existing 'Workmen Compensation Policy'.
- III. Without relieving the Contractor of its obligations and responsibilities under this Contract, before commencing work the Contractor shall insure against liability for death of or injury to persons employed by the Contractor including liability by statute and at common law. The insurance cover shall be maintained until all work including remedial work is completed including the Defect Liability Period. The insurance shall be extended to indemnify the Principal for the Principal's

statutory liability to persons employed by the Contractor. The Contractor shall also ensure that each of its Sub Contractors shall effect and maintain insurance on the same basis as the 'Workmen Compensation Policy' effected by the Contractor.

- e) **Contractor's Plant and Machinery (CPM) Insurance** The IA/ MSEDCL (including without limitation any consultant, servant, agent or employee of the IA) shall not in any circumstances be liable to the Contractor for any loss of or damage to any of the Contractor's equipment or for any losses, liabilities, costs, claims, actions or demands which the Contractor may incur or which may be made against it as a result of or in connection with any such loss or damage.
- f) **Other Insurances** Such other insurances as may be specifically agreed upon by the Parties hereto as listed in the Annexure-9 to the Contract Agreement titled Insurance Requirements.
- 3.5.2 The IA shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to clause 3.5.1 above, except for the Third Party Liability, Workers' Compensation and IA's Liability Insurances, and the Contractor's Sub Contractors shall be named as coinsureds under all insurance policies taken out by the Contractor pursuant to clause 3.5.1 above except for the Cargo Insurance During Transport, Workers' Compensation and IA's Liability Insurances. All insurer's rights of subrogation against such coinsureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.
- 3.5.3 The Contractor shall, in accordance with the provisions of the Annexure-9 to the Contract Agreement titled Insurance Requirements, deliver to the IA certificates of insurance or copies of the insurance policies as evidence that the required policies are in full force and effect. The certificates shall provide that no less than twenty-one (21) days' notice shall be given to the IA by insurers prior to cancellation or material modification of a policy.
- 3.5.4 The Contractor shall ensure that, where applicable, its Sub Contractor(s) shall take out and maintain in effect adequate insurance policies for their personnel and vehicles and for work executed by them under the Contract, unless such Sub Contractors are covered by the policies taken out by the Contractor.
- 3.5.5 If the Contractor fails to take out and/or maintain in effect the insurances referred to clause 3.5.1 above, the IA may take out and maintain in effect any such insurances and may from time to time deduct from any amount due the Contractor under the Contract any premium that the IA shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Contractor.
- 3.5.6 Unless otherwise provided in the Contract, the Contractor shall prepare and conduct all and any claims made under the policies effected by it pursuant to this Clause 3.5, and all monies payable by any insurers shall be paid to the Contractor. The IA shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the IA's interest is involved, the Contractor shall not give any release or make any compromise with the insurer without the prior written consent of the IA. With respect to insurance claims in which the Contractor's interest is involved, the IA shall not give any release or make any compromise with the insurer without the prior written consent of the Contractor.

INSURANCE REQUIREMENTS

A) Insurances to be taken out by the Contractor

In accordance with the provisions of Clause 3.5, Section-III the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the IA, such approval not to be unreasonably withheld. The inability of the insurers to provide insurance cover in the sums and with the deductibles and other conditions as set forth below, shall not absolve the Contractor of his

risks and liabilities. However, in such a case the Contractor shall be required to furnish to the IA documentary evidence from the insurer in support of the insurer's inability as aforesaid.

In addition to the existing clause 3.5, Section-III and the directives of the Government of Maharashtra resolution :

AIF/ 2183/ CR-174/ 83ADM-5 Date 16/01/1984
Vimasa-1098/Pr.Kra28/98/Shashan Hami Dt. 19/08/1998
Vimassa-1011/Prakra 15/Vima Prashasan Date 29/04/2011 and
L.No: AIF/2311/Co-Ins/MST Co/Ltd/F da.04.02.2012
and the directives issued by the Executive Director (H.R) MSEDCL vide letter No: IR/Insurance/9623 Date 13.04.2012,

The Contractor All Risk Policy (CAR) or Transit cum Erection (TCE) or Erection All Risk Insurance Policy (EAR) in respect of contract works awarded by IA as principle to the contract and workman's compensation insurance in respect of the workmen engaged and deployed by the contractor's to complete the contract work is required to be obtained from

M/s National Insurance Co. Ltd on co-insurance cum servicing basis under indirect method in the ratio of 40:60 (i.e. Govt. Insurance fund @ 40% and national Insurance co.@ 60%) and their offices as specified in the circulars or following divisional / Branch office only.

National Insurance Co. Ltd. Red Cross House, 11 M.G. Road, Pune 411 001 Ph 020 26134267/ /9890011793 National Insurance Co. Ltd. 104, Bharat House 3rd Floor, Mumbai Samachar Marg, Fort Mumbai 400023 Phone 022-22610110 /22673692/9820308755

As per the Directive of Govt. Of Maharashtra letter No: NMP1009/Sankra 39/NV 26 date: 16th March 2009, in case the directives are not followed by the contractor , the IA shall recover (1%) one percent amount of the contract value and deposit the same with Director of Insurance Govt. Maharashtra through Cheque/demand draft with complete particulars of contract works along with copy of work order.

(a) **Marine Cargo Policy/Transit Insurance Policy:**

- (I) Transit Insurance Policy for indigenous equipment
 Similarly, Transit Insurance Policy shall be taken wherein only inland transit is involved for the movement of Plant and Equipment supplied from within India. The policy shall cover movement of Plant and Equipment from the manufacturer's works to the project's warehouse at final destination site. Inland Transit Clause (ITC) 'A' along with war & Strike Riots & Civil Commotion (SRCC) extension cover shall be taken.

Amount	Deductible Limits	Parties Insured	From	To
120% of Ex-work Price of all the Plant and Equipment to be supplied from within India plus Excise Duty and Sales Tax/ GST etc., if additionally payable.	Nil	Contractor & IA	Mfrs warehouse	Project's warehouse store at final destination

- (II) If during the execution of Contract, the IA requests the Contractor to take any other add-on cover(s)/ supplementary cover(s) in aforesaid insurance, in such a case, the Contractor shall promptly take such add-on cover(s)/ supplementary cover(s) and the charges towards such premium for such add-on cover(s)/ supplementary cover(s) shall be reimbursed to the Contractor on submission documentary evidence of payment to

the Insurance company. Therefore, charges towards premium for such add-on cover(s)/ supplementary cover(s) are not included in the Contract Price.

- (III) The Contractor shall take the policy in the joint names of IA and the Contractor. The policy shall indicate the IA as the beneficiary. However, if the Contractor is having an open policy for its line of business, it should obtain an endorsement of the open cover policy from the insurance company indicating that the dispatches against this Contract are duly covered under its open policy and include the name of the IA as jointly Insured in the endorsements to the open policy.

(b) Erection All Risk Policy/Contractor All Risk Policy:

- (I) The policy should cover all physical loss or damage to the facility at site during storage, erection and commissioning covering all the perils as provided in the policy as a basic cover and the add on covers as mentioned at Sl. No. (III) below.

Amount	Deductible Limits	Parties Insured	From	To
105% of Ex-work Price of all the Plant and Equipment to be supplied from within India plus Excise Duty and Sales Tax/ GST etc., if additionally payable. and 100% of erection price component	Nil	Contractor & IA	Receipt at site of first lot of the Plant and Equipment	Up to Operational Acceptance

- (II) The Contractor shall take the policy in the joint name of IA and the Contractor. All these policies shall indicate IA as the beneficiary. The policy shall be kept valid till the date of the Operational Acceptance of the project and the period of the coverage shall be determined with the approval of the IA. If the work is completed earlier than the period of policy considered, the Contractor shall obtain the refund as per provisions of the policy and pass on the benefit to IA. In case no refund is payable by the insurance company then the certificate to that effect shall be submitted to IA at the completion of the project.
- (III) The following add-on covers shall also be taken by the Contractor:
- Earthquake
 - Terrorism
 - Escalation cost (approximately @10% of sum insured on annual basis)
 - Extended Maintenance cover for Defect Liability Period
 - Design Defect
 - Other add-on covers viz., 50-50 clause, 72 hours clause, loss minimization clause, waiver of subrogation clause (for projects of more than Rs.100 crores, cover for offsite storage/fabrication (over Rs.100 crores).
- (IV) Third Party Liability cover with cross Liability within Geographical limits of India as on ADD-on cover to the basic EAR cover: The third party liability add-on cover shall cover bodily injury or death suffered by third parties (including the IA's/ MSEDCL's personnel) and loss of or damage to property (including the IA's/ MSECL's property and any parts of the Facilities which have been accepted by the IA) occurring in connection with supply and installation of the Facilities.

Amount	Deductible Limits	Parties Insured	From	To
<ul style="list-style-type: none"> • For projects upto Rs. 100 crores, the third party liability limit shall be 10% of the project value for single occurrence/ multiple occurrences in aggregate during the entire policy period. • For projects from Rs. 100 crores to Rs. 500 crores, the third party liability limit shall be Rs. 10 crores for single occurrence/multiple occurrences in aggregate during entire policy period. For projects of more than Rs.500 crores, the third party liability limit shall be Rs. 25 crores for single occurrence/ multiple occurrences in aggregate during entire policy period. 	Nil	Contractor/ SubContractor	Receipt at site	Upto Defect Liability Period.

- (V) As per Clause 3.5.1 –(b) –V, Section-III , the cost of insurance premium is to be reimbursed to the Contractor for Owner Supplied Materials (OSM) for which the insurer is to be finalized by the Contractor as detailed therein. Alternatively, the Contractor may take a single policy covering the entire cost of the project including the cost of OSM. For this purpose, the Contractor shall submit documentary evidence for the premium paid for the entire project to the IA and IA shall reimburse to the Contractor the proportion of premium equal to value of OSM to total sum insured.

If during the execution of Contract, the IA requests the Contractor to take any other add on cover(s)/ supplementary cover(s) in aforesaid insurance, in such a case, the Contractor shall promptly take such add-on cover(s)/ supplementary cover(s) and the charges towards such premium for such add-on cover(s)/ supplementary cover(s) shall be reimbursed to the Contractor on submission documentary evidence of payment to

the Insurance company. Therefore, charges towards premium for such add-on cover(s)/ supplementary cover(s) are not included in the Contract Price.

(c) Automobile Liability Insurance

The Contractor shall ensure that all the vehicles deployed by the Contractor or its Subcontractor (whether owned by them) in connection with the supply and installation of the Facilities in the project are duly insured as per RTA act. Further the Contractor or its Subcontractors may also take comprehensive policy (own damage plus third-party liability) of each individual vehicle deployed in the project on their own discretion in their own name to protect their own interest.

(d) Workmen Compensation Policy:

- (I) Workmen Compensation Policy shall be taken by the Contractor in accordance with the statutory requirement applicable in India. The Contractor shall ensure that all the workmen employed by the Contractor or its Subcontractors for the project are adequately covered under the policy.
- (II) The policy may either be project specific covering all men of the Contractor and its Subcontractors. The policy shall be kept valid till the date of Operational Acceptance of the project. Alternatively, if the Contractor has an existing 'Workmen Compensation Policy' for all its employees including that of the Subcontractor(s), the Contractor must include the interest of the IA for this specific Project in its existing 'Workmen Compensation Policy'.
- (III) Without relieving the Contractor of its obligations and responsibilities under this Contract, before commencing work the Contractor shall insure against liability for death of or injury to persons employed by the Contractor including liability by statute and at common law. The insurance cover shall be maintained until all work including remedial work is completed including the Defect Liability Period. The insurance shall be extended to indemnify the Principal for the Principal's statutory liability to persons employed by the Contractor. The Contractor shall also ensure that each of its Subcontractors shall affect and maintain insurance on the same basis as the 'Workmen Compensation Policy' effected by the Contractor.

(e) Contractor's Plant and Machinery (CPM) Insurance

The IA (including without limitation any consultant, servant, agent or employee of the IA) shall not in any circumstances be liable to the Contractor for any loss of or damage to any of the Contractor's Equipment or for any losses, liabilities, costs, claims, actions or demands which the Contractor may incur or which may be made against it as a result of or in connection with any such loss or damage.

The IA shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to Clause 3.5.2, Section-III except for the Third-Party Liability, Workmen Compensation Policy Insurances, and the Contractor's Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to Clause 3.5.2, Section-III except for the Cargo Insurance During Transport and Workmen Compensation Policy Insurances. All insurer's rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.

B) Insurances to be taken out by the IA

The IA shall at its expense take out and maintain in effect during the performance of the Contract the following insurances.

Amount	Deductible Limits	Parties Insured	From	To
NIL				

3.6 DELIVERY / IMPLEMENTATION SCHEDULE:

1. Delivery of the goods/works shall be made by the bidder in accordance with the terms specified by the IA in its schedule of requirements/BOQ and special conditions of contracts, and the goods/work shall remain at the risk of the supplier until installation, testing and commissioning has been completed. The delivery of the goods/works shall be to the ultimate consignee as given in the purchase order. The delivery of goods shall be completed as per Implementation schedule specified in Clause 3.6 (4) Section III below.
2. All Technical assistance for construction, commissioning and monitoring of the equipment shall be provided by the bidder at no extra cost during laboratory evaluation, validation/ type approval and field trial, if any.
3. The extension of delivery period against the purchase order, if any, should be granted subject to the condition that TCIL shall have the absolute right to levy penalty for the delayed supplies.
4. **Implementation Schedule:** The Period of completion for the project is 18 Months from the Date of Issuance of the LOI to the successful bidder.

Sr. No.	Phase	Sr. No.	Particulars	No. of Working Months																	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Project Inception / Design & Preliminary Services	1	Award of Contract																		
		2	Site establishment and team mobilization																		
		3	Contract Signing																		
		4	Kick-off Meeting with TCIL Officials, PMA, MSEDCL & brief discussion on the approach towards the Project																		
		5	Project Implementation Plan																		
		6	Data Analysis, Survey & Collection of Relevant Data from various																		

2	Supply		Utilities																
		7	BOQ Finalisation & Approvals																
		1	GTP approval																
		2	Vendor Approval																
		3	Factory Acceptance Test/ Pre-Dispatch Inspection of Materials	As per requirement of schedule															
		4	Supply of HT Cable	Min 40%	Min 30%	30%/ Balance													
		a	33 Kv HT Cable	Min 40%	Min 30%	30%/ Balance													
		b	22 Kv HT Cable	Min 40%	Min 30%	30%/ Balance													
		c	11 Kv HT Cable	Min 40%	Min 30%	30%/ Balance													
		5	Supply of LT Cable	Min 40%	Min 30%	40%/ Balance													
		6	Supply of Cable accessories	Min 40%	Min 30%	30%/ Balance													
		7	Supply of RCC pipes /Half round RCC pipe	Min 40%	Min 30%	30%/ Balance													
		8	Supply of HDPE / G.I. Pipe	Min 40%	Min 30%	30%/ Balance													
		9	Supply of Poles	Min 40%	Min 30%	30%/ Balance													
		10	Supply of Overhead Line accessories	Min 40%	Min 30%	30%/ Balance													
		11	Supply of AAAC Conductor	Min 40%	Min 30%	30%/ Balance													
		12	Supply of Transformer	Min 40%	Min 30%	30%/ Balance													
		13	Supply of LT Feeder pillar box	Min 40%	Min 30%	30%/ Balance													
		14	Supply of HT Feeder pillar box	Min 40%	Min 30%	30%/ Balance													
		15	Supply of 33 Kv RMU	Min	Min	30%/ Balance													

[illegible]

Note:- Field Quality Test:- Includes Sample Material Test, , Civil Works(Depth Test of Trench), Functional Test etc..

As soon as the work is awarded to bidder Integrated Programme Chart for the execution of work showing clearly all activities from the start of work to completion with details of manpower and other input information required for the fulfilment of the timelines given therein., The bidder will intimate to IA about the project Team, both on - site and off-site, starting from Chief Engineer to Junior Engineer associated with execution of the work. The Programme Chart should, inter-alia, include descriptive note explaining sequence of the various activities, CPM Network Milestones etc. This will form Base Line Programme and the subsequent progress of the work shall be reviewed with reference to this during periodic Progress Review Meeting preferably monthly. Any increase in time period from the Base Line Value shall be construed as Time Overrun.

The submission to and consent by the IA of such programmes or the provision of such general descriptions or cash flow estimates shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

3.7 WARRANTY

3.7.1. The bidder shall warrant that the stores (Material) to be supplied shall be new and free from all defects and faults in materials used, workmanship and manufacture and shall be of the highest grade and consistent with the established and generally accepted standards for materials of the type ordered and shall perform in full conformity with the specifications and drawings. The supplier shall be responsible for any defect that may develop under the conditions provided by the contract and under proper use, arising from faulty material, design or workmanship such as corrosion of the equipment, inadequate quantity of material to meet equipment requirements, inadequate contact protection, deficiencies in circuit design and/or otherwise and shall remedy such defects at his own cost when called upon to do so by the IA who shall state in writing in what respect the stores are faulty. This warranty shall survive inspection or payment for/and

acceptance of goods/work, but shall expire (except in respect of complaints notified prior to such date) 60 months from the date of issue of Taking Over Certificate/ Handing Over.

- 3.7.2 If it becomes necessary for the Supplier to replace or renew any defective portion(s) of the equipment under this clause, the provisions of the clause 3.7.1 shall apply to the portion(s) of the equipment so replaced or renewed or until the end of the above mentioned period of Twelve months, whichever may be later. If any defect is not remedied by supplier within a reasonable time, IA may proceed to get the defects remedied from other supplier etc., at the supplier's risk and expenses, but without prejudice to any other rights which IA may have against the supplier in respect of such defects.

Replacement under warranty clause shall be made by the supplier free of all charges at site including freight, insurance and other incidental charges.

3.7.3 Defect Liability Period (DLP)

- 3.7.3.1 The Contractor warrants that the Facilities or any part thereof shall be free from defects in the design, engineering, materials and workmanship of the Plant supplied and of the work executed. The Contractor's liability for latent defects warranty shall be limited to, 5 years reckoned from the end of Defect Liability Period including extension thereof. The extension of Defect Liability Period, in aggregate, shall, not exceed 24 months

- 3.7.3.2 The Defect Liability Period shall be 60 Months for major material and 24 months for minor material from the date of installation and issuance of taking over certificate by MSEDCL unless specified otherwise pursuant to Clause 3.7.3.10 below, and the duration of every extension applicable (The extension of Defect Liability Period,

In aggregate, shall, not exceed 24 months) should be same as the duration of the defect liability period above. The aggregate value of all extensions will be subject to the maximum extension permissible (The extension of Defect Liability Period, in aggregate, shall, not exceed 24 months.).

If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant supplied or of the Installation Services/ work executed by the Contractor, the Contractor shall promptly, in consultation and agreement with the IA regarding appropriate remedying of the defects, and at its own cost, repair, replace or otherwise make good such defect as well as any damage to the Facilities caused by such defect, to the satisfaction of the IA. The Contractor shall not be responsible for the repair, replacement or making good of any defect or of any damage to the Facilities arising out of or resulting from any of the following causes:

- (a) improper operation or maintenance of the Facilities by the IA/ MSEDCL;
- (b) operation of the Facilities outside specifications provided in the Contract; or
- (c) normal wear and tear.

- 3.7.3.3 The Contractor's obligations under Defect Liability Clause 3.7.3 shall not apply to:

- (a) any materials that are supplied by the IA/MSEDCL are normally consumed in operation, or have a normal life shorter than the Defect Liability Period stated herein;
- (b) any designs, specifications or other data designed, supplied or specified by or on behalf of the IA/ MSEDCL or any matters for which the Contractor has disclaimed responsibility herein; or
- (c) any other materials supplied or any other work executed by or on behalf of the IA, except for the work executed by the IA under Clause 3.7.3.7 below.

- 3.7.3.4 The IA/MSEDCL shall give the Contractor a notice stating the nature of any such defect

together with all available evidence thereof, promptly following the discovery thereof. The IA shall afford all reasonable opportunity for the Contractor to inspect any such defect.

3.7.3.5 The IA/ MSEDCL shall afford the Contractor all necessary access to the facilities and the Site to enable the Contractor to perform its obligations under this Defect Liability Clause 3.7.3. The Contractor may, with the consent of the IA/ MSEDCL, remove from the Site any Plant or any part of the facilities that are defective if the nature of the defect, and/or any damage to the facilities caused by the defect, is such that repairs cannot be expeditiously carried out at the Site.

3.7.3.6 If the repair, replacement or making good is of such a character that it may affect the efficiency of the Facilities or any part thereof, the IA may give to the Contractor a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such remedial work, whereupon the Contractor shall carry out such tests.

If such part fails the tests, the Contractor shall carry out further repair, replacement or making good, as the case may be, until that part of the Facilities passes such tests. The tests shall be agreed upon by the IA and the Contractor.

3.7.3.7 If the Contractor fails to commence the work necessary to remedy such defect or any damage to the Facilities caused by such defect within a reasonable time (which shall in no event be considered to be less than fifteen (15) days), the IA may, following notice to the Contractor, proceed to do such work, and the reasonable costs incurred by the IA in connection therewith shall be paid to the IA by the Contractor or may be deducted by the IA from any monies due the Contractor or claimed under the Performance Security.

3.7.3.8 If the facilities or any part thereof cannot be used by reason of such defect and/or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the facilities or such part cannot be used by the IA/ MSEDCL because of any of the aforesaid reasons.

Upon correction of the defects in the Facilities or any part thereof by repair/replacement, the repaired/ replaced item(s) shall have the Defect Liability Period extended by a period mentioned in 3.7.3.2 above from the time of such replacement/repair of the facilities or any part thereof. However, such extension of Defect Liability Period, in aggregate, shall, not exceed the period specified in 3.7.3.1 above.

3.7.3.8.1 At the end of the Defect Liability Period, the Contractor's Liability ceases except for latent defects. The Contractor's liability for latent defects warranty shall be limited to period specified in 3.7.3.1 above, reckoned from the end of Defect Liability Period including extension thereof. For the purpose of this clause, the latent defects shall be the defects inherently lying within the material or arising out of design deficiency, which do not manifest themselves during the Defect Liability Period defined in this Defect Liability Clause 3.7.3 but later.

3.7.3.9 Except as provided in Clauses 3.7.3 and 3.19 (Indemnity Clause), the Contractor shall be under no liability whatsoever and howsoever arising, and whether under the Contract or at law, in respect of defects in the Facilities or any part thereof, the Plant, design or engineering or work executed that appear after Completion of the Facilities or any part thereof, except where such defects are the result of the gross negligence, fraud, or criminal or willful action of the Contractor.

3.7.3.10 In addition, any such component of the Facilities, and during the period of time as may be specified in the Contract, shall be subject to an extended defect liability period. Such obligation of the Contractor shall be in addition to the defect liability period specified under Clause 3.7.3.1 above.

Note:

“Facilities” (alternatively referred to as the “Works”) means the Plant to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract.

“Installation Services” means all those services ancillary to the supply of the Plant for the Facilities, to be provided by the Contractor under the Contract, such as transportation and provision of marine or other similar insurance, inspection, expediting, site preparation works (including the provision and use of Contractor’s Equipment and the supply of all construction materials required), installation, testing, pre-commissioning, commissioning, operations, maintenance, the provision of operations and maintenance manuals, training, etc. as the case may require.

“Contractor’s Equipment” means all facilities, equipment, machinery, tools, apparatus, appliances or things of every kind required in or for installation, completion and maintenance of Facilities that are to be provided by the Contractor, but does not include Plant, or other things intended to form or forming part of the Facilities.

“Completion” means that the Facilities (or a specific part thereof where specific parts are specified in the Contract) have been completed operationally and structurally and put in a tight and clean condition, that all work in respect of Pre-commissioning, Guarantee Test, Commissioning and Asset Tagging on the GIS Portal of the Facilities or such specific part thereof has been completed as provided in relevant Clause (Pre-commissioning, Commissioning, Guarantee Tests and Completion of Facilities) hereof.

“Pre-commissioning” means the testing, checking and other requirements specified in the Employer’s Requirements that are to be carried out by the Contractor in preparation for Commissioning as provided in relevant Clause (Pre-commissioning, Commissioning, Guarantee Tests and Completion of Facilities) hereof.

“Commissioning” means operation of the Facilities or any part thereof by the Contractor following Pre-commissioning, which operation is to be carried out by the Contractor as provided in relevant Clause (Pre-commissioning, Commissioning, Guarantee Tests and Completion of Facilities) hereof, for the purpose of carrying out Guarantee Test(s).

“Guarantee Test(s)” means the test(s) specified in the Employer’s Requirements to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, in accordance with the provisions of relevant Clause (Pre-commissioning, Commissioning, Guarantee Tests and Completion of Facilities) hereof.

“Operational Acceptance” means the acceptance by the Employer of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts), which certifies the Contractor’s fulfillment of the Contract in respect of Functional Guarantees of the Facilities (or the relevant part thereof) in accordance with the provisions of the relevant Clause (Functional Guarantees) hereof and shall include deemed acceptance in accordance with the relevant Clause (Operational Acceptance) hereof.

“Defect Liability Period” means the period of validity of the warranties given by the Contractor commencing at Completion of the Facilities or apart thereof, during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof) as provided in this Clause (Defect Liability) hereof.

3.8 TIME OF COMPLETION

18 Months from the Date of Issuance of LO A to the successful bidder. The date of start of work will be considered from the date of issue of LOA.

3.9 TERMINATION OF CONTRACT

In addition to clause no. 2.19, 2.20 & 2.21 of section II, if client/owner terminates contract with TCIL then Contract between TCIL and bidder will also be terminated.

3.10 PENALTY

3.10.1 Penalty for causing inconvenience to the Public

- (a) To ensure progress during the execution of work and to cause minimum inconvenience to the public, the bidder shall not dig a trench of more than 200 Metres at a stretch in a route at a time. He shall cause to lay cable and close such trenches expeditiously. Under any circumstances a stretch of trench of maximum 200 Metres shall not be kept open for more than 4 days in case of cable laying by digging paved surfaces. In the event of bidder falling to comply with, these conditions, a penalty of recovery up to Rs 300/- per day the trench is kept open beyond the time limit allowed may be imposed by the TCIL. This penalty will be in addition to that payable for delay or slow work.
- (b) The bidder shall not be allowed to dump the empty cable drums/waste materials in Govt/public place, which may cause inconvenience to Govt/ Public. If the bidder does not dispose off the empty cable drums/waste materials within 10 days of becoming empty, the TCIL is at liberty to dispose off the drum in any manner deemed fit and the costs incurred by the TCIL in disposing off such materials. The TCIL may also levy a penalty up to Rs 1000 for each such default.
- (c) If any such penalty is levied on a bidder for more than 2 occasions, then his/her contract could be terminated. In this regard the decision of TCIL shall be final and binding on contractor .

3.10.2 Penalty for cutting/damaging the existing utilities

- (a) During excavation of trench utmost care is to be taken by the bidder, so that the existing underground utilities are not damaged or cut. In-case any damage/ cut is done to the existing utilities, a penalty as per the schedule given below will be charged from the bidder or the amount will be deducted from his running bills. This is applicable to the entire length of the network being constructed as part of this tender.

Size of existing UG utiliiies	Amount of penalty per cut/damage
Water Pipe upto 2" size/ sewer pipes upto 4" size/ telecom cables/ OFC cables/ Gas pipelines upto 1" size	Rs. 1,00,000.00 (One Lacs)
Sizes more than above as at Sl. No. 1	Rs 2,00,000.00 (Two Lacs)

- (b) Penalty shall not be levied subject to verification of repair of damages and submission of No Objection Certificate from the operator/user within 10 days of occurrence.
- (c) All the repairs/ rectifications including material for the damaged services will be borne by the bidder in addition to the penalties.
- (d) However, the amount of claim will be deducted from the bidder in addition to above penalty amount (if applicable), if any claim is raised by concerned authority.

- 3.10.3 Penalty shall be recoverable from the bills of the bidder and/or by adjustment from the security deposit or from the bills of any other contract. However, adjustment from security deposit will be made only when the contract has been terminated or at the time of final settlement of bills on completion of work.

3.11 **LIQUIDATED DAMAGES**

Liquidated Damages, wherever referred under this Tender/Agreement, shall mean and refer to the damages, not in the nature of penalty, which the supplier agrees to pay in the event of delay in delivery of stores, installation, commissioning, breach of contract etc. as the case may be. Liquidated Damages is not a penalty but is a sum which is agreed by the parties as a reasonable and genuine pre-estimate of damages which will be suffered by the IA on account of delay/breach on the part of the supplier. **Liquidated Damages will be levied DPR/project wise.**

- 3.11.1 The date of delivery of the stores and Installation and/or Commissioning stipulated in the acceptance of the tender should be deemed to be the essence of the contract and delivery must be completed not later than the dates specified therein. Extension will not be given except in exceptional circumstances subject to conditions as enumerated in the contract/tender including levying of Liquidated Damages in terms of Clause 3.11.2 below.

- 3.11.2 While granting extension of delivery period as per tender terms, the liquidated damages shall be levied as follows:-

- i. **For delivery of stores:** Should the supplier fails to deliver the store or any consignment thereof within the period prescribed and agreed for delivery, the IA, without prejudice to other remedies available to the IA shall be entitled to recover Liquidated Damages, for breach of contract, a sum equivalent to **0.1% of the value of the delayed supply and/ or undelivered material/ supply for each day of delay or part thereof**. All the above LD amounts will be withheld from the material payment and are subject to 3.11.2 (ii), (iii) & (iv) below.
- ii. **Installation & Commissioning:** Should the supplier fail to install and commissioning the project with the stipulated time the IA shall be entitled to recover Liquidated Damages, **0.1% of the value of the purchase order for each day of delay or part thereof**. In cases where the delay affects installation/commissioning of only a part of the project and part of the equipment is already in commercial use, then in such cases, LD shall be levied on the affected part of the project.
- iii. Provisions contained in clause 3.11.2 (i) shall not be applicable for durations (periods) which attract L.D. against clause 3.11.2 (ii) above.
- iv. If bidder completes the Project within stipulated time without any delay, LD withheld against clause 3.11.2 (i) will be released.

3.12 **DELIVERY PERIOD EXTENSION** :

- a) DP extension would not be generally allowed. The extension may be decided in most exceptional circumstances on case to case basis, by the Tender approving authority, stating reasons and justifications for grant of extension of delivery period.
- b) In the case of package supply/ turnkey projects when the delayed portion of the supply materially hampers installation and commissioning of the systems, LD charges shall be levied as above on the total value of package of the Purchase .Order.

- c) Quantum of liquidated damages assessed and levied by the IA and decision of the IA thereon shall be final and binding on the supplier, further the same shall not be challenged by the supplier either before Arbitration tribunal or before the court. The same shall stand specifically excluded from the purview of the arbitration clause, as such shall not be referable to arbitration.
 - d) The total value of the liquidated damages as per above sub-clauses shall be limited to a maximum of **10% (Ten percent) of the contract value (Division/DPR wise)**.
 - e) The Liquidated Damages shall be calculated on the all inclusive Price CIF-destination inclusive of Freight, Forwarding Packing, insurance, any other incidental charges and other non-creditable taxes after discount, if any but excluding GST and other creditable taxes. GST on LD shall be calculated as per GST rule as applicable from time to time.
 - f) If the deliveries are made after expiry of the contracted delivery period, without prior concurrence of the IA and accepted by the consignee, such delivery will not deprive the IA of its right to recover liquidated damages under clause 3.11.2 above.
- 3.13** In cases where the scheduled delivery period is distributed month-wise or is in installments, the liquidated damages shall be imposed for delay in each scheduled month/ installment. Liquidated damages shall be calculated separately for quantities to be supplied in every month/ installment and the corresponding delay. If the supplier supplies full quantity before the expiry of the scheduled delivery period of the last month/ installment but there is delay in month-wise/ installment-wise supply, then also liquidated damages shall be levied on the supplies against the earlier months/ installments that have been delayed. Twenty (20) weeks for the purpose of additional BG and grant of DP extension shall be counted from the last month/ installment.
- 3.14** Notwithstanding anything contained in this Agreement or any other agreement between the parties, the IA may, without prejudice to its right to effect recovery by any other method, deduct the amount of Liquidated Damages from any money belonging to the supplier in its hand in relation to this or any other contract between the parties (which includes IA's right to claim such amount against invoices raised by the supplier or Bank Guarantees submitted by the supplier under this Contract or any other contract) or which may become due to the supplier. Any such recovery of Liquidated Damages shall not in any way relieve the supplier from any of its obligations to complete the Works or from any other obligation and liabilities under the Contract.
- 3.15** To facilitate recovery of Liquidated Damages from the invoices raised by the supplier, the Credit Note shall be issued by the supplier, failing which the IA shall adjust the amount to be recovered from the pending payments by issuing an invoice/debit note for the corresponding amount, at the risk and cost to the supplier including applicable GST, interest and penalty, if any.

3.16 TAXES (GST)

GST invoice / Debit Note / Credit Note:

- a. It shall be the responsibility of Bidder / Supplier / Contractor / Vendor to raise Tax Invoice (e-invoice wherever applicable) as per the provisions of GST Laws and send to TCIL promptly.
- b. The Bidder / Supplier / Contractor / Vendor shall ensure that Tax Invoice contains all the requirements as per GST Law from time to time, for eg. E-Way bill along with transportation details etc, wherever applicable. TCIL GST Number to be mentioned on the Invoices as advised by TCIL, etc.
- c. The Bidder / Supplier / Contractor / Vendor shall ensure to issue Debit / Credit Note (wherever applicable) as prescribed under GST Act and send to TCIL within the

prescribed time limit. All documents should be received well in advance so as to enable TCIL to claim eligible credit.

GST Compliances:

- d. The Bidder / Supplier / Contractor / Vendor shall ensure
- To issue Tax Invoice / Debit Notes / Credit Notes to enable TCIL to claim tax benefit on or before the stipulated time period provided by the GST law.
 - To file its GST Returns (GSTR – 1 and GSTR – 3B) within the time limits prescribed in GST Laws with all Debit and Credit Note details, so as to ensure availing ITC Credit of GST by TCIL.
 - To declare correct information on invoice and GSTN viz. the amount, the place of supply, rate of tax etc.
 - To issue all Tax Invoices / Debit Notes / Credit Notes to the registered premise of TCIL for availing of credit and ensure that the place of supply as per GST law is same as registered premise of TCIL.
- e. The Bidder / Supplier / Contractor / Vendor shall ensure to keep its GST Numbers active at all times and in case the same is blacklisted, cancelled or blocked etc by GST Authorities, the same needs to be promptly intimated to TCIL.

Tax Indemnity:

- f. There should not be any loss of ITC of GST to TCIL due to default of bidder. In case of any financial loss including interest, same will be recovered from the Bidder / Supplier / Contractor / Vendor for delay / non-compliance on the part of the Bidder / Supplier / Contractor / Vendor.
- g. In case, the eligibility of ITC of GST is questioned or denied to TCIL on account of default by the Bidder, the same would be recovered by TCIL from the Bidder / Supplier / Contractor / Vendor.
- h. No payment shall be made by TCIL against Performa Invoice issued by Bidder / Supplier / Contractor / Vendor. Payment will be made only against Valid Tax Invoice as per GST Laws.
- i. In case of delay in deposit of Tax & filling GSTR-1 by the Bidder / Supplier / Contractor / Vendor, the input tax credit will not be available to TCIL and as a result TCIL to pay the total output tax without availing input tax credit and in such case the financial loss including interest shall be recovered from the Bidder / Supplier / Contractor / Vendor.

Documents:

- j. Self-declaration along with evidence that the Bidder / Supplier / Contractor / Vendor is not blacklisted.
- k. An undertaking from the Bidder / Supplier / Contractor / Vendor that information provided by him is correct and in case of any loss, the Bidder / Supplier / Contractor / Vendor is fully responsible.

3.17 RELEASE OF GST PAYMENT ALONG WITH PAYMENT OF RA BILL

- a) In all projects, where running bill continue to be raised periodically, GST shall be paid along with running bill but amount equivalent to GST of previous RA bill as well as current RA shall be withheld if GST of previous bill is not paid/reflecting at time of payment of next (current) RA bill.
- b) At the time of final bill of the project, GST shall be paid only if payment of all GST dues of the project by vendor is visible in GST portal.
- c) The above shall be applicable for all projects involving payment in multiple trenches (Running bill).

Note: As payment of GST dues in statutory requirement hence no undertaking is required separately for this from vendor.

3.18 AUDIT AND TECHNICAL EXAMINATION

1. IA or DMU shall have the right to cause an audit and technical examination of the work and the final bills of the bidder including all supporting vouchers, abstract etc. to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the bidder under the contract or any work claimed by him to have been done by him under the contract and found not to have been executed, the bidder shall be liable to refund the amount of over payment and it shall be lawful for IA or DMU to recover the same from him in the manner prescribed in clause with the heading payment of bills (same chapter), or in any other manner legally permissible and if it is found that the bidder was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by IA or DMU to the bidder.
2. Provided that IA or DMU shall be entitled to recover any sum overpaid, nor the bidder shall be entitled to payment of any sum paid short where such payment have been agreed upon between the IA on one hand and the bidder on the other under any term of the contract permitting payment for work after assessment by the IA
3. Any sum of money due and payable to the bidder (including security deposit returnable to him) under this contract may be appropriate by the IA for the payment of a sum of money arising out or under any other contract made by the bidder with the IA.
4. IA has right to check the route within one year from the date of commissioning the route by any agency nominated by IA- Any discrepancies found by them will be legally binding to the bidder for rectification of defect without any additional cost.
5. Bidder shall assist in Investigation of works by CTE/CVC as per their Guidelines.

3.19 INDEMNITIES

- 3.19.1** The bidder shall at all times hold the IA harmless and indemnify from against all action, suits, proceedings, works, cost, damages, charges claims and demands of every nature and descriptions, brought or procured against the IA, its officers and employees and forthwith upon demand and without protect or demur to pay to the IA any and all losses and damages and cost (inclusive between attorney and client) and all costs incurred in endorsing this or any other indemnity or security which the IA may now or at any time have relative to the work or the bidders obligation or in protecting or endorsing its right in any suit on other legal proceeding, charges and expense and liabilities resulting from or incidental or in connection, with injury, damages of the bidder or damage to property resulting from or arising out of or in any way connected with or incidental to the operations caused by the contract document. In addition the bidder shall reimburse the IA or pay to the IA forthwith on demand without protect or demur all cost, charges

and expenses and losses and damages otherwise incurred by it in consequences of any claim, damages and actions which may be brought against the IA arising out of or incidental to or in connection with the operation covered by the bidder.

- 3.19.2** The bidder shall at his own cost at the IA request defend any suit or other proceeding asserting a claim covered by this indemnity, but shall not settle, compound or compromise any suit or other finding without first consulting the IA.
- 3.19.3** All materials supplied by bidder shall be at all times open to inspection by the Representative of IA.
- 3.19.4** The bidder shall submit a proper account every month of all the materials.
- 3.19.5** The bidder shall ensure timely supply of the material towards the construction of the route.
- 3.19.6** The bidder shall indemnify the IA against all third-party claims of infringement of patent, trademark or industrial design rights arising from use of the goods/work or any part thereof in Indian Network.

3.20 Priority of Documents

The documents forming the Contract are to be taken as mutually explanatory of one another. If there is an ambiguity or discrepancy in the documents, the IA shall issue any necessary clarification or instruction to the Contractor, and the priority of the documents shall be as follows:

- a) The Contract Agreement;
- b) The Letter of award;
- c) The Bid (accepted Price Proposal);
- d) Price bill of quantities,;
- e) The Conditions of Tender.
- f) The IA's Requirements (including Specifications and Drawings); and
- g) The Contractor's Proposal (Technical Proposal, including completed Schedules).

END OF SECTION-3

Section-4**Scope of Work**

Sl. No.	DESCRIPTION	PAGE NO
1	BRIEF INTRODUCTION OF SCOPE	53
1.1	Quantity	53
2	THE CONTRACTOR	53
2.1	General Obligations	53
2.2	Contractor's Representative	54
2.3	Co-ordination of the Works	55
2.4	Site Data	55
2.5	Access Route	56
2.6	Protection of the Environment	58
2.7	Electricity, Water, Gas and Storage Space	58
2.8	Clearance of Site	58
2.9	Progress Reports	58
2.10	Cash Flow Estimate to be submitted	59
2.11	Contractor's Equipment	59
2.12	Safety Precautions, Project Execution Instructions and penalty Related to Safety Violations	59
2.13	Shifting of Existing Infra	61
2.14	Shut Down and Charging Instructions	61
2.15	Material Removal	61
2.16	Security of the Site	61
2.17	Contractor's Operations on Site	61
2.18	Salvage Material/ Other Materials	62
2.19	Fossils	62
2.20	Safety at work site	62
2.21	Security at Work Site	62
2.22	Unforeseeable difficulties	62
2.23	Contractor's care of the Works	63
3	DESIGN	63
3.1	General Obligations	63
3.2	Construction Documents	64
3.3	As-Built Drawings and Closure Data	65
3.4	Operation and Maintenance Manuals	66
3.5	Error by Contractor	66
3.6	Contractor's Superintendence	66
3.7	Contractor's Personnel	67

3.8	Disorderly Conduct	71
3.9	Festivals and Religious Customs	71
4	PLANT, MATERIALS AND WORKMANSHIP	71
4.1	Manner of Execution	71
4.1.1	General	71
4.2	Quality Assurance, Material Testing and Tests on Completion	71
4.2.1	Quality Assurance	71
4.2.2	Type Test and Routine Test/ Factory Acceptance Tests and other special test and Field Quality Test	72
4.3	Field Test	73
4.3.1	General	73
4.3.2	Third Party Inspection	73
4.3.3	Inspection by CTE/CVC, Auditors, Statutory Authorities, Local Bodies etc.	73
4.3.4	Rejection	73
4.4	Tests on Completion	74
4.5	Delayed Tests	74
5	MEASUREMENT OF WORK	74
5.1	Measurement	74
5.2	Responsibility of taking and recording measurements	74
5.3	Method of recording of nomenclature of items	75
5.4	Method of measurement	75
5.5	Measurement of depth of trenches	75
5.6	Measurement of lengths and profiles of strata and protection	75
5.7	Measurement of length of cable	76
5.8	Measurement of other items	76
5.9	Site Order Book	76
6	HANDING AND TAKING OVER CERTIFICATE	76
6.1	Taking-Over Certificate	76
6.2	Handing Over Authority (MSEDCL) and use of completed system	77
6.3	Failure to Remedy Defects or to Complete Part of Works	77
6.4	Contractor to Search	78
6.5	Final Contract Completion Certificate	78
6.6	Unfulfilled Obligations	78
6.7	Ownership of Plant and Materials	78
7	FACILITIES TO BE PROVIDED FOR THE IA AND its REPRESENTATIVES	78
8	EXAMINATION OF WORK BEFORE COVERING UP	79
9	UNCOVERING AND MAKING OPENINGS	79
10	INSTRUCTIONS FOR CABLE LAYING AND INSTALLATION DURING PROJECT EXECUTION	79
10.1	Introduction for cable laying	79

10.2	Trenching	79
10.3	Trenchless digging	80
10.4	Cable handling	81
10.5	Damage to property	81
10.6	Cable route markers/cable joint markers	81
10.7	Depth of laying & spacing between cables	81
10.8	Paying out the cable	83
10.9	Sand bedding and brick	83
10.10	Flaking	83
10.11	Back filling	83
10.12	Prevention of damage due to sharp edges	83
10.13	Road, railway tracks, water pipe line crossings	83
10.14	Foot path cutting	84
10.15	Reinstatement	84
10.16	Tools and plants	84
10.17	Jointing and termination of cables	84
10.18	Tents / covers	85
10.19	Precautions before making a joint/ end termination	85
10.20	Identification	85
10.21	Making A Joint/ End Termination	85
10.22	Cable terminations	85
10.23	Bonding of screen / armour	86
10.24	Erection of cable terminating structures	86
10.25	Warning tape	86
10.26	Tests after installation on cables.	87
11	DOCUMENTS	87
11.1	Documents on Site	87
11.2	Provision of Construction Documents	87
11.3	Approved List of Suppliers/OEM(s) of M/s Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) and Material Technical Specifications	87

1. **BRIEF INTRODUCTION OF SCOPE:**

Work Involves Survey, Design, Engineering, Supply, Erection Testing & Commissioning for Shifting of critical Overhead Electrical Infrastructure, such as Overhead Lines, Pole mounted Transformers, Feeder Pillars to Underground Power lines, Plinth mounted Transformers and Ring Main Units (RMU) respectively.

Further, LT/HT OH lines are to be converted to UG lines by using cables along with other electrical infrastructure such as RMUs, HT and LT Feeder Pillars etc.

The project involves raising the height of RMU/LT substations, aiming to mitigate the impact of disasters such as floods, cyclones, earthquakes, and tsunamis.

The Objective of the project is to enhance infrastructure resilience by replacing overhead lines with underground electric lines, ensuring improved safety and reliability against external challenges, Ensure Uninterrupted Power Supply by focusing on ensuring continuous power supply and also Optimize Operational Efficiency by minimizing downtime and maintenance costs by converting overhead electric lines to its underground alternatives especially in cyclone-prone regions, during flood and water logging situations.

Aligning with disaster management goals to efficiently respond to emergencies and to improve overall power supply continuity.

Work of Thane District is spread over following areas.

Sl. No.	Project Code by DMU	Name of DPR /Proejct	Annexure No. (DPR Enclosed)
I.	03/0303/T/UGC/1	Kalyan East	Annexure-I
II.	03/0303/T/UGC/2	Kalyan West	Annexure-J
III.	03/0303/T/UGC/3	Dombivali	Annexure-K
IV.	03/0303/T/UGC/6	Badlapur East	Annexure-L
V.	03/0303/T/UGC/7	Kalyan (Murbad)	Annexure-M
VI.	03/0303/T/UGC/4	Kalyan (Titwala)	Annexure-N
VII.	03/0303/T/UGC/5	Ulhasnagar	Annexure-O
VIII.	03/0306/T/UGC/1	Thane-II	Annexure-P
IX.	03/0306/T/UGC/2	Vashi	Annexure-Q

1.1 Quantity:

Quantity for DPR (Division) wise is mentioned in BOQ, which are to be considered along with other tender conditions.

2. THE CONTRACTOR

2.1 General Obligations

- The Works as completed by the Contractor shall be wholly in accordance with the Contract and fit for the purposes for which they are intended, as defined in the Contract. The Works shall

include any work which is necessary to satisfy the IA's Requirements / Client Requirements, Contractor's Proposal and Schedules, or is implied by the Contract, or arises from any obligation of the Contractor, and all works not mentioned in the Contract but which may be inferred to be necessary for stability or completion or the safe, reliable and efficient operation of the Works.

- b) The Contractor shall provide all superintendence, labour, Plant, Materials, Contractor's Equipment, Temporary Works and all other things, whether of a temporary or permanent nature, required in and for such design, execution, completion and remedying of defects, till the completion of Defect Liability Period (DLP). (Any delay in repairing / replacement of materials or defect rectification, if delayed will leads to extension of DLP of the system).
- c) All Works shall be carried out in strict conformity with the provisions under the IE Rules 1956, Electricity Act 2005 and drawings approved by the IA, using Standard Method of Construction. The Contractors shall comply with all electrical safety regulations and no work shall be carried out on any live equipment on the Site. The Contractor shall provide adequate safety devices, as per the applicable codes, standards and practices, for handling and installing the Plant and Equipment and testing the facilities, and shall employ an adequate number of qualified, full-time electricians during both the Contract Period and the Guarantee Period as necessary to ensure satisfactory installation of the Plant and Equipment and guarantee of the facilities.
- d) The Contractor is required to check the design criteria and calculations (if any) included in the bidding document, to confirm their correctness in its bid and to assume full responsibility for them. Before commencing design, the Contractor shall satisfy himself regarding the IA's Requirements (including design criteria and calculations, if any) The Contractor shall give notice to the IA's Representative of any error, fault or other defect in the IA's Requirements or such items of reference. IA shall issue clarification on such notice.
- e) The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations, of all methods of construction and of all the Works, irrespective of any approval or consent by the IA's Representative.

2.2 Contractor's Representative

The Contractor shall, within 3 days of the Effective Date, submit to the IA for consent the name and particulars of the person the Contractor proposes to appoint. The Contractor shall not revoke the appointment of the Contractor's representative without the prior consent of the IA. The Contractor's Representative shall give his whole time to dedicate the preparation of the Construction Documents and the execution of the Works. Except as otherwise stated in the Contract, the Contractor's Representative shall receive (on behalf of the Contractor) all notices, instructions, consents, approvals, certificates, determinations and other communications under the Contract. Whenever the Contractor's Representative is to be absent from the Site, a suitable replacement person shall be appointed, and the IA's Representative shall be notified accordingly.

The Contractor's Representative may delegate any of his powers, functions and authorities to any competent person, and may at any time revoke any such delegation. Any such delegation or revocation shall be in writing and shall not take effect until the IA's Representative has received prior notice signed by the Contractor's Representative, specifying the powers, functions and authorities being delegated or revoked. The Contractor's Representative and such persons shall be fluent in the language for day-to-day communications.

2.3 Co-ordination of the Works

The Contractor shall be responsible for the co-ordination and proper execution of the Works, including co-ordination of other contractors to the extent specified in the IA's Requirements, as well as coordinating and liaising with the relevant governmental offices, including the Electrical Inspector Office, Forest Office, Municipal Offices, Gram Panchayat, Railway Offices, Public Works Department and any other Department, consumer or group of consumers, etc., as may be needed for timely completion of the Works.

The Contractor shall afford all reasonable opportunities for carrying out their work to:

- a) any other contractors employed by the IA/Other Govt Bodies/agencies and their workmen,
- b) The workmen of any legally constituted public authorities who may be employed in the execution on or near the Site of any work not included in the Contract, which the IA may require.
- c) No delay on account of coordination is not allowed.

2.4 Site Data

- a) Contractor, prior to the last date for submission of Bids, collect all details/ data on conditions at the site, and studies on environmental impact. The Contractor shall be responsible for interpreting all data.
- b) The Contractor will not have any right for availing benefit due to non-availability of data, The Contractor shall be deemed to have inspected and examined the Site, its surroundings, the above data and other available information, and to have satisfied himself (so far as is practicable, taking account of cost and time) before submitting the Tender, as to:
 - (i) the form and nature of the Site, including land use and sub-surface conditions,
 - (ii) the extent and nature of the work and Materials necessary for the execution and completion of the Works, and the remedying of any defects, and
 - (iii) The means of access to the Site and the accommodation he may require.
- c) The IA does not warrant either the sufficiency or accuracy of data provided in this document or elsewhere. The Contractor shall be wholly responsible for interpreting all data, including any data listed elsewhere in the Contract as open for inspection at the office of the IA, and for undertaking any necessary confirmatory or additional surveys that he deems necessary before submitting the Tender.
- d) The contractor shall be deemed to have carefully examined all tender documents to his entire satisfaction. The IA shall provide such clarification (during pre-bid replies) as may be necessary, in writing to the contractor. Any information otherwise obtained from the IA shall not in any way relieve the contractor of his responsibility to fulfil his obligation under the contract.
- e) The estimate is based on the tentative survey carried out. IA ,Owner and MSEDCL will not be responsible for reduction in quantity while executing the work. No claim in whatsoever regarding reduction in quantity will be entertained. However , IA reserves the right to increases/decreases the quantity .

- f) Before tender submission contractor is advised for project survey, to assess the additional /special resources requirement during project execution. So that, Contractor will adopt all possible measures/deploy resources for work execution/completion so as to avoid any hinderances and work is completed within time in hassle free environment, and bidder has to consider its financial implications while submitting its offer/tender.
- g) Drawing/Sketch/GPS location for survey are provide for project area location, however changes are possible during execution to include additional surrounding area. Therefore bidder are advised to survey those area also. Further , rate of soil excavation for cable laying/refilling/compaction (including other project work) in hard/soft/normal or any other type of soil are same, neither any extra payment will be made nor any deduction will be done. Any hindrance like concrete blocks/hard rock/building material/unused pipes or cables etc , bidder has to remove without any additional cost to 'IA'.

2.5 Access Route

The Contractor shall be deemed to have satisfied himself as to the suitability and availability of the access routes he chooses to use. The Contractor shall (as between the parties) be responsible for the maintenance of access routes. The Contractor shall provide any signs or directions which he may consider necessary for the guidance of his staff, labour and others. The Contractor shall obtain any permission that may be required from the relevant authorities for the use of such routes, signs and directions.

The IA will not be responsible for any claims which may arise from the use or otherwise of any access route. The IA does not guarantee the suitability or availability of any particular access route, and will not entertain any claim for any non-suitability or non-availability for continuous use during construction of any such route.

- 2.5.1** The Contractor shall bear all costs and charges for special or temporary rights-of-way required by him for access to the Site and shall make his own arrangements for construction of the field offices, workshops, stores, assembling yards, testing laboratories, etc. The Contractor shall also provide, at his own cost, any additional facilities outside the site required by him for the purposes of the Works.

Contractor shall liaison to obtain necessary Statutory Approvals/ Permission/ Clearances/ Certificates from the concerned Local Bodies & Statutory Authorities like District Authorities, Municipal Corporation, Panchayati Raj Institutions, Town Planning Board, Electricity Board/ Fire Department, State/ Central Pollution Control Boards, State/ Central Environmental Authorities, Forest and Wild• life authorities etc (for e.g. removal of trees, re-locating utilities; conversion of railway level crossings, laying of railway sidings needed by the work; rehabilitation and resettlement of persons affected by the work; traffic control; mining of earth and stone; interfering protected monuments; blasting permission, environmental/ forest/ wild- life clearances; and shifting of religious shrines etc) to start the execution work have been obtained. IA/PMA shall be responsible for providing all assistance on best effort basis to Contractor in this process, like forwarding application, providing support document (if any) etc. Delays in obtaining Statutory Approvals/ Permission/ Clearances/ Certificates will be attributed to Contractor.

- 2.5.2** IA shall help Contractor to make the work site available with assistance from line departments free from encumbrances to Contractor (however if other contractors are working/required to work, necessary cooperation/coordination is contractor responsibility).

Coordination for Availability of auxiliary services - like Electrical outage, power blocks, roads, power, water, solid & liquid waste disposal system, street lighting, other civic services etc. is contractor responsibility. Any amount officially submitted through any receipt will be reimbursed to contractor after completion of DLP period. Bidder are advised to keep them minimum, any wastage or not utilizing power block/traffic etc will not be paid.

2.5.3 For storage purpose, if any land is provided by any Government Bodies/Utility/Statutory bodies/Municipal Corporation/IA etc, necessary rental charges are in contractor scope and contractor has to pay in advance. Necessary Cleaning of site before and after usage is contractor responsibility. IA will not provide any Land for storage, so land for storage is contractor Scope and its price is included in of tender scope of work.

2.5.4 The bidder shall obtain/provide at his own cost all easements, permits and license necessary to do work including following for which the payment to the concerned authorities shall be done by the bidder against the demand note/estimate and submit the original/copy of the same along with bill for reimbursement as per the actuals. No additional payment would be made to bidders for pursuance of easements, permits, ROW etc. from the different local authorities. Any delay in getting the permissions shall be the responsibility of the bidder.

- (i) "Right of User" easements and permits.
- (ii) Railway, Highway, Forest and other Authorities crossing permits including bridge.
- (iii) Canal/stream crossing permits.
- (iv) ROW, etc

- a. The bidder shall be fully responsible for angling and obtaining all necessary easements, permits and licenses, for moving all construction equipment, tools, supplied materials and men across Railways and Highway, across public or private road as well as premises of any public utility within the right of user and for bearing all costs that may be incurred in respect of the same.
- b. The bidder is to confine his operation to the provided construction "Right of User" unless it has made other arrangement with the particular property owners and /or tenants such other arrangements shall be entirely at the responsibility of the bidder as to cost and arrangement as also breach and claim and shall be entitled with a copy to the Senior Engineer.
- c. The bidder will not be entitled to extra compensation for hardship and increase in cost by the cable trench being routed adjacent to or across other pipeline, Highway, Railways, telephones or posser poles and wires or guy wires, embankment, cliffs, streams or other obstacles which may physically or otherwise in any manner, restrict or limit the use of the construction "Right of User". Some construction and such contingency shall be deemed to have been providing for in the rates.
- d. The reimbursement of ROW charges shall be paid on submission of payment proof by the bidder. The bidder shall submit such ROW/RI bills on monthly basis and shall by IA after receiving of payment from client on back-to-back basis.
- e. ROW charges shall not be paid in case they are waived off.
- f. In case of any change in the ROW charges due to delay in execution of the works by the bidder, the difference of amount has to be borne by the bidder.
- g. Crop /Tree Compensation

Any loss arising (including crop/Tree compensation or any other) out of or in consequence of the execution or completion of the Works and remedying of any defects therein, and the costs of any claims, proceedings, damages, charges and expenses whatsoever in respect thereof or in relation thereto are to the Contractor's account.

2.5.5 Right of Access

Until the Performance Certificate has been issued, the Contractor shall have the right of access to all parts of the Works and to records of the working and performance of Works, except as may be inconsistent with any reasonable security restrictions by the organization responsible for operating the Works.

2.6 Protection of the Environment

The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations. The Contractor shall ensure that air emissions, surface discharges and effluent from the Site during the Contract Period shall not exceed the values prescribed by law.

2.7 Electricity, Water, Gas and Storage Space

The Contractor shall arrange electricity, water, gas and other services as at their own cost. For Storage of material no space will be provided by the Client. Contractor has to make its own store near the project site and all charges in this respect has to be born by the contractor.

2.8 Clearance of Site

During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction, and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.

Upon the issue of any Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which such Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave such part of the Site and the Works in a clean and safe condition to the satisfaction of the IA's Representative. Except that, the Contractor shall be entitled to retain on Site, until the expiry of the Contract Period, such Contractor's Equipment, Materials and Temporary Works as required by him for the purpose of fulfilling his obligations under the Contract.

2.9 Progress Reports

Monthly or mutually agreed period, progress reports shall be prepared by the Contractor in a Mutually agreed format and submitted to the IA/PMA representative. The first report shall cover the period up to the end of the calendar month after that in which the Commencement Date occurred; reports shall be submitted as per agreed period. Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works. Bidder has to prepare the dash board for project progress and continuously update with in 15 days.

Each report shall include:

- i. Photographs/videos and detailed descriptions of progress, including each stage of design, procurement, manufacture, delivery to Site, construction, erection, testing and commissioning to be uploaded on web console (if any) of IA/ Owner.
- ii. charts showing the status of Construction Documents, purchase orders, manufacture and construction;

- iii. for the manufacture of each main item of Plant and Materials, the name of manufacturer, manufacture location, percentage progress, and the actual or expected dates of commencement of manufacture, Contractor's inspections, tests and delivery;
- iv. records of personnel and Contractor's Equipment on Site;
- v. copies of quality assurance documents, test results and certificates of Materials;
- vi. safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations;
- vii. comparisons of actual and planned progress, with details of any aspects which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome such aspects; and
- viii. Early warning of any specific likely events or circumstances which may adversely affect the implementation schedule, with details of proposals to mitigate the effects of such events.
- ix. Bidder shall be responsible for providing Physical Progress Reports to IA representative/IA in the form of CPM (Critical Path Method) Network on monthly basis for reviewing of the progress of the work vis - a vis Base Line Program and taking all necessary remedial actions, after taking into account client observations made in respect of quality and progress of the work during the monthly/ periodic Project Review Meetings. To ensure timely completion of work as per mutually agreed time-schedule/ milestones and within agreed Cost

2.10 Cash Flow Estimate to be submitted

The Contractor shall, within 10 days after the date of the Letter of Acceptance, provide to the Engineer for his information a detailed cash flow estimate, in quarterly periods, of all payments to which the Contractor will be entitled under the Contract and the Contractor shall subsequently supply revised cash flow estimates at quarterly intervals, if required to do so by the Engineer.

2.11 Contractor's Equipment

The Contractor shall provide all Contractor's Equipment necessary to complete the Works, including testing and commissioning, and to maintain, inspect and repair as necessary the constructed facilities.

All Contractor's Equipment shall, when brought on to the site, be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any such Contractor's Equipment without the prior written consent of the IA's Representative. Contractor shall utilize advanced equipment's for erection of poles. Contractor shall use latest technology equipment, so that minimum hindrance to public during execution of contract.

2.12 SAFETY PRECAUTIONS, PROJECT EXECUTION INSTRUCTIONS AND PENALTY RELATED TO SAFETY VIOLATIONS

The Contractor shall comply with all applicable safety regulations in his design, access arrangements and operations on Site as per the provisions under the IE Rules 1956, Electricity Act 2005, Safety instruction notified by the electrical Inspector, Electrical Inspection Departments Govt. of Maharashtra and "best practices" established within the industry. the Contractor shall, from the commencement of work on Site until taking-over by the IA, provide:

- a) fencing, lighting, guarding and watching of the Works, and

- b) temporary roadways, footways, guards and fences which may be necessary for the accommodation and protection of owners and occupiers of adjacent land, the public and others, and
- c) Adequate safety devices, as per the applicable codes, standards and practices, for handling and installing the Plant and Equipment and testing the facilities.
- d) Adequate Traffic management System is Contractor's Responsibility. Contractor has to deploy adequate manpower round the clock. Any penalty imposed by Local authority and by Court on account of any Accident due to project work, will be deducted from Contractor Running Bills. Any penalty imposed to IA due to default of contractor will be back-to-back recovered from contractor along with an additional amount of 2% of Penalty.
- e) Further an additional penalty (in addition to above clause of d) of 5000/- per incident will also be charged to contractor, if lapse on account of safety violation continues by contractor. IA can take stringent action (increase in penalty amount/termination of contract), if safety violation continued.
- f) Arrangement of Necessary Dewatering arrangement. Dewatering from excavating/excavated trench is contractor Responsibility. Contractor is advised to familiarized with weather conditions of site from last 10-year data/ weather details before quoting. Any delay due to rain or adverse weather conditions are not acceptable. Therefore, it is responsibility of Contractor to plan according. It is advised to deploy Manpower having sufficient experience of working in these similar projects.
- g) Material delivery schedule is planned in such a way that all necessary permission from local Authorities shall be obtained by the Contractor.
- h) With in one Month of letter of Award/Zero date, Contractor has to request all concerned Authority/Government/Private/local state Bodies/Central bodies/ for Clearance of all utility hurdles i.e. Gas pipelines, Drainage, Sewage, water pipelines, telephone, Power/electricity cables, Road (State/Central Department), Railway, Metro rail, Forest department etc. further, coordination with concerned authority for approval is Contract Responsibility. The Drawings/Documents required by Concerned Authority are in Contractor Scope.
- i) Necessary Safety Barricading after excavation of Cable is contractor Responsibility. Barricading Material should be available before excavation and no deployment of necessary Barricading material will attract a penalty of Rs 500/- Per Meter per day. Any repetition of such event will increase the penalty amount to Rs 1000 Per meter Per day from Running Bills.
- j) During Night laying/working necessary illumination arrangement has to be made by Contractor.
- k) For important public roads involving VIP movements, excavation of trench and cable laying has to be Completed with in 2 days.
- l) Soil has to compacted to desired strength & level is in contractor scope. If additional soil is required for compaction, the contractor has to make its arrangement and no extra payment in this regard will be given.
- m) Any Utility damages by Contractor have to be repaired by the Contractor on Immediate basis. Delayed in repair charges have to recover from contractor.

2.13 For shifting of LT/HT lines/DTC etc, the encumbrance free land /ROW, where existing infrastructure is proposed to be shifted (by the bidder during design stage, if required), such shifting has to be done by the bidder, without any financial implications to client.

2.14 Shut Down and Charging Instructions

Specific Shutdown will not be granted for such shifting & amp; conversion works. The said shall be carried out as per MSEDCL/MSETCL planned maintenance shutdown schedule, Not exceeding beyond 3 hours. Sufficient Manpower & Machinery shall be engaged to expedite work execution within stipulated time & to limit of shutdown Schedule & power interruptions.

All specified safety Norms & amp; regulation shall be followed during shifting of works and during erection testing & commissioning and also during construction of work.

Before charging assets, WCR (work completion report) must be submitted to office and charging permissions must be obtained from concerned officials/Executive Engineer of Division/Circle etc.

2.15 Material removed from the site should be credited to store (if any), by the contractor without any financial implications without any time delay (within 2 days).

2.16 Security of the Site

- a) Contractor shall be responsible for keeping unauthorized persons off the Site.
- b) Authorized persons shall be limited to the employees of the Contractor and persons authorized by the IA or the IA's Representative.

The Contractor shall have total responsibility for the safety and security of all Plant, Equipment and Materials delivered to the Site, including goods which are stored, loose, semi-assembled and/ or erected, from the time of delivery to the Site until the date of taking over by the IA, as certified by the Taking-Over Certificate issued. The Contractor shall make suitable security arrangements to ensure the protection of all Plant, Equipment and Materials from theft, fire, pilferage and any other damages or loss. All Plant, Equipment and Materials provided by the Contractor shall enter and leave the Site only with the written authorization of the IA's Representative in the prescribed manner.

2.17 Contractor's Operations on Site

The Contractor shall confine his operations to the Site, and to any additional areas which may be provided by the Contractor and agreed by the IA's Representative as working areas. The Contractor shall take all necessary precautions to keep his personnel and equipment within the Site and such additional areas, and to keep and prohibit them from encroaching on adjacent land.

2.18 Salvage Material/ Other Materials

All materials salvaged by the Contractor during his work on rehabilitation, replacement, reconstruction and/or upgrading of existing facilities and/or re-conducting of existing power lines shall remain the absolute property of the MSEDCL. The contractor has to handover all salvage material at concerned divisional store of MSEDCL. The cost is inclusive in quoted cost i.e. no

any additional payment will be made by the IA for this activity. Copy of receipt shall also be submitted to IA.

2.19 Fossils

All fossils, coins, articles of value or antiquity, and structures and other remains or things of geological or archaeological interest discovered on the Site shall (as between the parties) be the property of the IA. The Contractor shall take reasonable precautions to prevent his staff, labour or other persons from removing or damaging any such article or thing. The Contractor shall, immediately upon discovery of such article or thing, advise the IA's Representative, who may issue instructions for dealing with it.

2.20 Safety at work site

The Contractor and its sub-contractors shall follow the safety instructions and take all safety measures for workmen and vehicles plying in the work area in accordance with Applicable Laws, Good Industry Practice and the provisions of this Agreement.

2.21 Security at Work Site

Contractor shall arrange for necessary Security and Safety of their materials, Plant & Equipment etc. including night patrolling at all work sites with security staff till the project is taken over by Authority.

2.22 Unforeseeable difficulties

Except as otherwise specified in the Agreement:

- a. the Contractor accepts complete responsibility for having foreseen all difficulties and costs of successfully completing the Works;
- b. the Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs; and
- c. the Scheduled Completion Date shall not be adjusted to take account of any unforeseen difficulties or costs.
- d. Impact due to rain will not be considered for adjustment for contract price & extension of time period. Necessary draining facilities are in contract scope. Necessary additional Safety precaution to be taken during adverse weather condition (without any financial implication to 'IA').

For the purposes of this Clause, unforeseeable difficulties include physical conditions like man-made or natural physical conditions including sub- surface and hydrological conditions which the Contractor encounters at the Site during execution of the Works.

2.23 Contractor's care of the Works

The Contractor shall bear full risk in and take full responsibility for the care of Works, and of Materials, goods and equipment for incorporation therein, on and from the Appointed Date and until the date of Provisional Certificate, with respect to the Works completed prior to the issuance

of the Provisional Certificate and/or Completion Certificate, with respect to the Works referred to in the repair List, save and except to the extent that any such loss or damage shall have arisen from any default or neglect of the client.

3. DESIGN

3.1 General Obligations

The Contractor shall carry out, and be responsible for, final design of the Works, including any site surveys, subsoil investigations, materials testing, and all other things necessary for proper planning and design. All risks due to subsoil /any other is on account of contractor, therefore contractor is advised to necessary survey, all type of investigations/soil investigations and Local environmental conditions before submitting the bid at their own cost.

Design shall be prepared by qualified designers who are engineers or other professionals who are knowledgeable about the requirements of the IE Rules 1956 and Electricity Rules 2005 and experienced in design of transmission and distribution systems.

For each part of the Works, the prior consent of the IA's Representative shall be obtained to the designer and design Subcontractor, if they are not named as such in the Contract. Nothing contained in the Contract shall create any contractual relationship or professional obligations between any designer, and a design Subcontractor, and the IA.

The Contractor's responsibility for design will normally be limited to those activities which are necessary to comply with the requirements as per Construction Documents. Final designs and construction documents will be based on preliminary designs provided by the IA, and will usually include conducting the necessary surveys, site investigations, subsoil investigations and detailed designs for the following works:

- (i) Finalization of alignments for new and/ or relocated sub-transmission lines;
- (ii) Verification of drawings & submission of final route alignment drawings of proposed UG Cable network
- (iii) Finalization of foundation designs and drawings for all structures;
- (iv) Finalization of construction drawings for road crossings, railway crossings, river crossings, utility crossings, etc., as applicable;
- (v) Any other designs that may be reasonably required for satisfactory completion of the Works;
- (vi) Finalization of layout plans for New RMUs/Feeder Pillar;
- (vii) Finalization of site grading, architectural, structural, electrical and sanitary designs and drawings, etc., for new facilities, as applicable.
- (viii) Soil Investigation / Resistivity measurements any other investigation required for design of civil structure/foundation & electrical design/drawings are in contractor scope. All payments in this regard are included in contract price.
- (ix) Dismantling and handing over of dismantled materials to MSEDCL Stores by contractor without any financial implications to client. Locations of store will be intimated during project execution.

The Contractor has not to re-design or submit drawings for works that are already adequately covered by the IA's / MSEDCL Standard Drawings, nor will he be required to prepare new designs for Plant and Equipment that is adequately covered by the Manufacturer's Drawings. In case the IA's Drawings, do not cover all of the Works that are required under the Contract, then

the Contractor shall use the appropriate standard drawings issued by MSEDCL/IS standard (whichever is stringent & approved/suggested by IA).

To the extent required, all designs shall be prepared using commercially available design software. All construction drawings shall be prepared using Auto CAD, at an appropriate scale which shall be agreed with the IA's Representative. Four number of copies of all designs and drawings to be submitted to the IA for design approval. Further Six sets of Drawings & documents shall be submitted of approved design drawings & documents by contractor with 3 days.

The Contractor holds himself, his designers and design Subcontractors as having the experience and capability necessary for the design. The Contractor undertakes that the designers shall be available to attend discussions with the IA's Representative at all reasonable times during the Contract Period. Contractor will attend all meeting without any financial implications with 'IA' and various other associated government bodies/agencies/departments etc.

The Contractor will be fully responsible to ensure that its designs, drawings and construction documents satisfy the requirements for constructing Works that are complete and sufficient in all respects, and satisfy the objectives of providing completed facilities that can be operated efficiently and economically. No approval of, or failure to object to, the Contractor's designs, drawings or Construction Documents by the IA's Representative will relieve the Contractor of its responsibility.

3.2 Construction Documents

The Contractor shall prepare Construction Documents according to instruction of IA and standard method of construction in sufficient detail to satisfy all regulatory approvals, to provide suppliers and construction personnel sufficient instruction to execute the Works, and to describe the operation of the completed Works. The IA's Representative shall have the right to review and inspect the preparation of Construction Documents, wherever they are being prepared.

The Contractor shall submit, the proposed "Submission and Anticipated Approval Program" of all necessary Construction Documents for approval by the IA's Representative. Such Program shall be developed in order to ensure availability of all construction documents on site in a timely manner essential for systematic and professional management of all construction works.

Each of the Construction Documents shall, when considered ready for use, be submitted to the IA's Representative for pre-construction review.

In this Sub-Clause, "review period" means the period required by the IA's Representative, which shall not exceed 21 days, calculated from the date on which the IA's Representative receives a Construction Document and the Contractor's notice that it is considered ready, both for a pre-construction review in accordance with this Sub-Clause, and for use. If the IA's Representative, within such review period, notifies the Contractor that such Construction Document fails (to the extent stated) to comply with the IA's Requirements, it shall be rectified, resubmitted and reviewed in accordance with this Sub-Clause, at the Contractor's cost.

Drawings/design submitted without showings/mentioning necessary details will not be considered for review and review period will not be counted. Drawings/Design calculations/Field Quality Plan/Quality Assurance Plan etc should mention necessary details from tender and Relevant IS standards. Any Deviation from tender documents/IS standards is not acceptable, contractor has to specially brought into the notice of client for any such deviation. All Drawings/design should mention this deviation specially if any.

For each part of the Works, and except to the extent that the prior consent of the IA's Representative shall have been obtained:

- a) construction shall not commence prior to the expiry of the review periods for the Construction Documents which are relevant to the design and construction of such part;
- b) construction shall be in accordance with such Construction Documents; and If the Contractor wishes to modify any design or document which has previously been submitted for such pre-construction review, the Contractor shall immediately notify the IA's Representative, and shall subsequently submit revised documents to the IA's Representative for pre-construction review.

If the IA's Representative instructs that further Construction Documents are necessary for carrying out the Works, the Contractor shall upon receiving the IA's Representative's instructions prepare such Construction Documents.

Errors, omissions, ambiguities, inconsistencies, inadequacies and other defects shall be rectified by the Contractor at his cost.

3.3 As-Built Drawings and Closure Data

The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records of the execution of the Works, showing the exact "as-built" locations, sizes and details of the work as executed, with cross references to relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-Clause. Two copies shall be submitted to the IA's Representative prior to the commencement of the Tests on Completion.

In addition, the Contractor shall prepare and submit to the IA's Representative "as-built drawings" of the Works, showing all Works as executed. The drawings shall be prepared as the Works proceed, and shall be submitted to the IA's Representative for his inspection. The Contractor shall obtain the consent of the IA's Representative as to their size, the referencing system, and other pertinent details.

Prior to the issue of any Taking-Over Certificate, the Contractor shall submit to the IA's Representative one microfiche copy, one soft (electronic) copy, one full-size original copy and six printed copies of the relevant "as-built drawings", and any further Construction Documents specified in the Contract. The Works shall not be considered to be completed for the purposes of taking-over until such documents have been submitted to the IA's Representative.

Without limiting the generality of the foregoing, the as-built drawings and other relevant documentation shall include:

- (i) Site investigation data, DGPS surveys and subsoil investigation reports;
- (ii) Manufacturers drawings & testing reports for all Plant and Equipment supplied under the Contract. The bidder shall provide the Line / cable schedules, consumer indexing data in soft and hard copy data etc.
- (iii) The bidder shall provide material reconciliation data, scarp assessment, financial closure data
- (iv) Relevant structural designs and drawings for buildings.
- (v) Final alignment drawings for sub-transmission and distribution lines;
- (vi) Location plans for distribution transformers, indicating their rated capacity and the manufacturer's name;
- (vii) All such other data related to the Works as finally constructed.

3.4 Operation and Maintenance Manuals

Prior to commencement of the Tests on Completion, the Contractor shall prepare, and submit to the IA's Representative, operation and maintenance manuals in accordance with the IA's Requirements and in sufficient detail for the IA representative, to operate, maintain, dismantle, reassemble, adjust and repair the Works. The Works shall not be considered to be completed for the purposes of taking-over until such project specific operation and maintenance manuals have been submitted to the IA's Representative.

All minor nature materials/ spares such as caps, lugs, jumper wires nut bolts, jointing kits if required should be provided with O&M manuals bidders tender price include this also.

3.5 Error by Contractor

- (i) If errors are found in the Construction Documents, then the Works shall be corrected at the Contractor's cost.
- (ii) Contractor should avoid damages to the existing road/ road outside the Cable trench excavation permitted. Cost of any such damage will be recovered from contractor.

3.6 Contractor's Superintendence

The Contractor shall provide all necessary superintendence during the design and execution of the Works, and as long thereafter as the IA's Representative may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. Such superintendence shall be given by sufficient persons having adequate knowledge of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents) for the satisfactory and safe execution of the Works.

The Contractor shall submit, within 14 days of signing the Agreement, the proposed Deployment Program of all key personnel as well as workers for superintendence of construction activities for approval by the IA's Representative. Such Deployment Program shall be developed showing details of qualifications and experience of key personnel and number of skilled/semi-skilled/unskilled workers to be deployed on a timeline essential for proper superintendence and systematic and professional management of all construction works.

The IA's Representative shall scrutinize, modify if required and approve such proposed Deployment Program, in consultation with the Contractor, within 10 days of submission by the Contractor. If the IA's Representative does not give its approval or objection within the stated period, the Deployment Program shall be deemed to be accepted.

Nevertheless, any approval by the IA's Representative, or failure to object to the proposed Deployment Program, will not relieve the Contractor of any of its obligations or responsibility under the contract.

3.7 Contractor's Personnel

- a) The Contractor shall employ (or cause to be employed) only persons who are careful and appropriately qualified, skilled and experienced in their respective trades or occupations.
- b) The personnel shall constitute the Engineers who are the degree holders in Electrical Engineering having minimum five years' experience in the field.
- c) Also, for the supervision of the civil works at site, the person qualified as a degree or diploma in Civil Engineering with relevant experience shall be appointed whose name shall be enlisted in the proposed personal.

- d) The IA's Representative may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative, who in the opinion of the IA's Representative:
- persists in any misconduct,
 - is incompetent or negligent in the performance of his duties,
 - fails to conform with any provisions of the Contract, or
 - Persists in any conduct which is prejudicial to safety, health, or the protection of the environment, If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.
 - Contractor (including its sub-contractor) to implement required Health, Safety & Environmental (HSE) practices at the Construction Sites and also to comply with all statutory obligations related to workmen deployed at the Construction Site. 'IA' will act as Principal Employer in respect of all Statutory Obligations related to workmen deployed at the site in execution of the work. Bidder has to coordinate to obtain necessary labor license and after project completion no objection certificate from labour department are to be submitted by the bidder. Any penalty by concerned agencies will be recovered from contractor's bill.
 - Contractor shall have to provide local labor up to maximum extent as per work requirement and monthly details of skilled and non-skilled manpower of local region has to be provided by the contractor.

3.7.1 KEY PERSONNEL

The minimum experience and number of key personnel to be deployed by the Contractor at the Project Site during the Construction are given below. The Contractor shall provide a brief bio-data of each of the key personnel:

MINIMUM KEY STAFF REQUIREMENT

Sl. No.	Position	Qualification	Experience Required	Min. Req.	Penalty On Non-Deployment Per Month Per Person
1	Project Manager	Electrical/Power Engineering Graduate	Having minimum 15 years of total experience out of which 12 years should be in projects of similar nature.	1 no.	Rs. 1,00,000 Per Month
2	Deputy Project Manager /Electrical	Electrical/Power Engineering Graduate	Having minimum 12 years of total experience out of which 10 years should be in projects of similar nature.	1 no.	Rs. 60,000 Per Month
3	Assistance Project Manager/Civil	Civil Engineering Graduate	Having minimum 10 years of total experience out of which 8 years should be in projects of similar nature.	1 no.	Rs. 40,000 Per Month

Sl. No.	Position	Qualification	Experience Required	Min. Req.	Penalty On Non-Deployment Per Month Per Person
4	EHS Engineer	Diploma/Degree in Safety from Govt . institute	Should have experience of 7 years in Electrical safety/EHS and Other Safety requirement of workers.	1 Nos	Rs.40,000 Per Month
5	Public relations officer	Graduate	Should have experience of 10 years in similar project of 2 Nos Rs 80-100 crores each.	1 No	Rs.40,000 Per Month
6	Cable Jointer Cum site Supervisor	-Diploma/ITI is preferable	Cable Jointer, at least having experience of 1 No similar Project (and approved/certified by cable Manufacturer).	2 no.	Rs.35,000 Per Month
7	All other professional bidder has to asses as per project requirements				
8	Skilled Labour	-	As per project requirement.		
9	Un-skilled labour	-			

Note:

- Above resources are the minimum requirement but bidder shall ensure minimum resources as per project requirement to achieve timely milestone. If minimum resources not deployed by contractor employer reserve the right to deduct the suitable payment as decided by Employer Representative and The decision of IA in this regard shall be final and not challengeable by bidder.. Manpower shall be Graduate/Diploma Holder in Electrical/Civil for Engineer.
- Manpower at SI No 1 to 5 are to deployed within 7 days of LOA/Contract signing whichever is later.
- These minimum resources are as per the requirements of various activities at different stages of works. All resources need not to be mobilized simultaneously, resources as per the requirement of various stages of works shall be mobilized in accordance with the instructions of the Project Manager /Project Director of IA . The decision of the PM /PD of IA in this regard, shall be final and binding. Above manpower should be deployed at project site.
- Please note that in case Authority judges that the continuation of any person of the tenderer/bidder including its subcontractor(s) is not in the interest of the project, a written notice will be given to tenderer/bidder who will promptly remove the person within a week. Authority can withdraw the approval of any persons at any stage during execution.
- The Tenderer/Bidder shall submit the Site Organization Chart with narrative description and the relationship between Head Office and the Site Management clearly indicating the distribution of authority and responsibility between Head Office and Site Management.

- f. Except as the Authority may otherwise agree, no changes shall be made in the key personnel and if for any reason beyond the reasonable control of the contractor, it becomes necessary to replace any of the personnel, the contractor shall forth will provide as a replacement, a person of equivalent or superior qualifications with the approval of the client within 30 days from the date of approval.
- g. In case of non-deployment of project personnel, the penalty shall be imposed as indicated above and deducted from Contractor's running / final bills. In case of non-deployment, for the part of the month, same shall be imposed on proportionate basis. The decision of the IA in this regard, shall be final and binding.
- h. Working of Contractor personnel simultaneously on different projects or other duties/role simultaneously of same project is not allowed.

NOTE: The decision of IA in this regard shall be final and not challengeable by bidder.

3.8 Disorderly Conduct

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his staff and labour, and to preserve peace and protection of persons and property in the neighborhood of the Works against such conduct.

3.9 Festivals and Religious Customs

The Contractor shall in all dealings with his staff and labour have due regard to all recognized festivals, days of rest and religious or other customs.

4. PLANT, MATERIALS AND WORKMANSHIP

4.1 Manner of Execution

4.1.1 General:

All Plant and Materials to be supplied shall be manufactured, and all work to be done shall be executed, in the manner set out in the Contract. Where the manner of manufacture and execution is not set out in the Contract, the work shall be executed in a proper, workmanlike and careful manner, with properly equipped facilities and non-hazardous Materials, and in accordance with recognized good practice.

All Plant and Materials provided by the successful bidder shall conform in all respects to the specifications of the tender documents, or better, and shall be subject to the approval of the IA's Representative.

The Contractor shall guarantee that all Plant, Equipment and Materials will be new and free from defects in materials and workmanship and suited for its normal operating conditions. It is expected that the Bidder shall quote for supply of equipment of best makes which conform to the highest national and international standards.

In its offer, the Bidder should only consider makes from reputed manufacturers of equipment corresponding to the state-of-the-art technology and to the latest international / Indian standards.

All Plant and Equipment supplied for sub-stations shall be designed so that the completed facilities will be compatible with future SCADA operating systems, irrespective of whether such requirement is specifically included in the IA's Specifications or not.

4.2 Quality Assurance, Material Testing and Tests on Completion

4.2.1 Quality Assurance

- a) The Contractor shall institute a Quality Assurance and Quality Control (QA/QC) system in accordance with accepted industry standards and practices, as well as the requirements described in the Contract Documents, to demonstrate compliance with the requirements of the Contract. Compliance with the quality assurance system shall not relieve the Contractor of his duties, obligations or responsibilities.
- b) The Contractor shall submit **within 10 days**, the proposed Quality Assurance and Quality Control (QA/QC) Program for approval by the IA's Representative. Such QA/QC Program shall be developed to describe the type, frequency and procedure of tests to be done on the Site(s); type, frequency and procedure of tests to be done at manufacturers' locations outside the Site; all parameters to be measured in these tests; permissible limits of such parameters; details of laboratories to be established at the Site(s); details of testing equipment and machines and their calibration schedules; details of the contractor's internal control systems for assuring quality control at locations of manufacturers' outside the Site; details of qualifications and experience of the Quality Control professionals to be deployed by the contractor for the entire project; and the systems of Quality Audit to be instituted by the contractor, etc., essential for systematic and professional management as well as adherence to the highest standards of quality of all construction works.
- c) The IA's Representative shall scrutinize, modify if required and approve such proposed QA/QC Program, in consultation with the Contractor, within 14 days of submission by the Contractor. If the IA's Representative does not give its approval or objection within the stated period, the QA/QC Program shall be deemed to be accepted. Nevertheless, any approval by the IA's Representative, or failure to object to the proposed QA/QC Program, will not relieve the Contractor of any of its obligations or responsibility under the contract.

4.2.2 Type Test and Routine Test/ Factory Acceptance Tests and other special test and Field Quality Test

All XLPE insulated HV cables, LT cables, Cables Accessories, Transformer, VCB, Isolator, CT, PT Earthing Materials, insulators, Conductor and RMU and other Electrical and Structural materials etc. shall conform to all Type, Routine and Acceptance tests listed in the relevant IS /IEC & shall submit the type test reports for Employer's approval.

The test-reports submitted shall be of the tests conducted within last 5 (five) years prior to the date of bid opening. In case the test reports are of the test conducted earlier than 5 (five) years prior to the date of bid opening, the Contractor shall repeat these test(s) at no extra cost to the IA, however the delay in supply due to type-test will not be acceptable during the project.

Inspection at Manufacturer's Premises: Materials shall be inspected by representative of IA/MSEDCL/TPQAA Jointly.

No material shall be dispatched without inspection as per approved Quality Assurance Plan (QAP) and dispatch instructions (DI) issued by IA unless waived by the IA.

Inspection may be carried out by IA's authorized representative/third party agency (to be appointed by IA). **At least Ten (10) days** prior notice shall be given by the Contractor for carrying out inspection at manufacturer's / supplier's premises.

At any time during the execution of the contract, IA reserves the right to test and inspect any material for quantity and quality, without any additional cost to "IA" MSEDCLs specifications/IS standard/IEC standard/other relevant procedure of factory inspection/ stage inspection shall be followed for all material purchased or being purchased by the contractor for the project.

- (a) Factory acceptance test and Routine shall be carried out on all items being supplied. Equipment shall not be shipped to the Purchaser until required factory tests are completed satisfactorily.
- (b) Factory acceptance tests shall not proceed without the prior submission and approval of all test documentation by the Purchaser.
- (c) QAP for Routine, Factory Acceptance Test and Type Test for factory and Field quality plan will be approved by the Client during design engineering.
- (d) Any destructive test on material or sample of material taken will not be paid extra by the client. Bidder has to consider its costing based on project specification/experience.
- (e) The cost incurred for travel, boarding and lodging shall be borne by contractor- However, all other costs incurred for conduct of the FATs would have to be borne by the bidder including for equipment, software, test equipment etc. that may be required for the successful conduct of the FATs.

The above notwithstanding, neither the execution of a test and/ or inspection of Plant and Equipment or any part of the Works and Facilities, or the attendance by the IA or IA's Representative for any tests, nor the issue and acceptance of any test certificates and/ or inspection reports shall not in any way relieve the Contractor of any of his responsibilities for quality standards, performance guarantees, and other obligations under the Contract.

4.3 FIELD TEST

4.3.1 General:

The works shall be deemed to have been completed only after the same has been accepted by the joint inspection team of IA, IA's representative and MSEDCL. The bidder shall make test pits at the locations desired by the joint inspection team for conducting test checks without any extra payment. The bidder shall restore the pits after test measurements to its original shape. The bidder shall be responsible to provide test/ measurement tools and testers for conducting various tests.

4.3.2 Third Party Inspection:

TPQAA will also act as the IA's Representative for the purposes of quality assurance and quality control testing of the Plant, Equipment and Materials supplied by the Contractor, and shall notify the Contractor accordingly. The third-party inspector or agency, as appropriate, will be authorized to carry out inspections and acceptance tests at all important stages of the Works, including:

- (i) Inspection at the Site and during execution of the project Works;
- (ii) Inspection after installation and commissioning (erection) of the Plant, Equipment and Materials.
- (iii) 'IA will inspect or monitor the works, either itself or through Third party as and when it desires for assessing actual progress and quality of construction and any other aspects.

4.3.3 'Contractor' shall be responsible for redressing and complying with the observations of CTE/ CVC, Auditors, Statutory Authorities, Local Bodies, Municipal Corporation etc. pertaining to the work under intimation to IA. Providing all work-related information promptly to for replying to Parliament Questions, queries from various Constitutional & Statutory Authorities.

4.3.4 Rejection

- a. If, as a result of inspection, examination or testing, the IA's Representative/MSEDCL and/ or Third-Party Inspector decides that any Plant, Materials, design or workmanship is defective or otherwise not in accordance with the Contract, the IA's Representative/MSEDCL or Third-Party Inspector may reject such Plant, Materials, design or workmanship and shall notify the Contractor promptly, stating his reasons.

The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the Contract. If the IA's Representative or Third-Party Inspector requires such Plant, Materials, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If such rejection and retesting cause the IA to incur additional costs, such costs shall be recoverable from the Contractor by the IA, and may be deducted by the IA from any monies due, or to become due, to the Contractor.

- b. The additional costs will be calculated based on the direct cost of any labor, equipment, materials, superintendence and other services provided by the IA for carrying out such retesting, as certified by the IA's Representative, plus an administration fee of 15% (Fifteen percent) of the direct costs to cover overheads and other indirect costs.
- c. No payment will be made for goods/work rejected during testing.

4.4 Tests on completion

The Contractor shall give, to the IA's Representative, **10 days'** notice of the date after which the Contractor will be ready to carry out the Tests on Completion. Unless otherwise agreed, such Tests shall be carried out within 7 days after this date, on such day or days as the IA's Representative shall instruct.

In considering the results of the Tests on Completion, the IA's Representative shall make allowances for the effect of any use of the Works by the HOA on the performance or other characteristics of the Works. As soon as the Works, or a Section, have passed the Tests on Completion, the Contractor shall provide the IA's Representative and the IA with a certified report of the results of all such Tests.

Upon Successfully Testing of material/system completion, the Contractor will handover to MSEDCL for the use, care and custody of the Facilities or any relevant part thereof, together with the risk of loss or damage thereto.

4.5 Delayed Tests

If the Tests on Completion are being unduly delayed by the Contractor, the IA's Representative may by notice require the Contractor to carry out such Tests within 21 days after the receipt of such notice. The Contractor shall carry out such Tests on such day or days within that period as the Contractor may fix and of which he shall give notice to the IA's Representative.

If the Contractor fails to carry out the Tests on Completion within 21 days, the IA's Representative may himself proceed with such Tests. All such Tests so carried out by the IA's Representative shall be at the risk and cost of the Contractor. These Tests on Completion shall then be deemed to have been carried out in the presence of the Contractor and the results of such Tests shall be accepted as accurate.

5. Measurement of work

5.1 Measurement: The measurement books are to be maintained by the bidder. The entry shall be made in ink. No entry shall be erased. If a mistake is made, it should be corrected by crossing out the incorrect words or figures and inserting the corrections, the corrections thus made shall be initialed & dated by the bidder/sub bidder. The measurement books shall invariably be consulted at the time of making final payments to the bidder.

5.2 Responsibility of taking and recording measurements: The measurement of various items of work shall be taken and recorded in the measurement book. The measurements shall be taken and recorded by bidder and the authority appointed by IA. Bidder shall be directly responsible for supervision of work, shall be responsible for accuracy of 100% of measurements. IA Representative shall be responsible for conducting test check of the total measurements at different locations on a sample basis. In case the sample measured data will not match with the measurement book entry upto a lesser depth of 5 cm, penalty as given in contract on the complete route for each such default instance.

5.3 Method of recording of nomenclature of items: Complete nomenclature of items, as given in the agreement need not be reproduced in the measurement book for recording the measurement but corresponding item code as provided, shall be used.

5.4 Method of measurement: The measurement of the work shall be done for activity-wise as and when the item of work is ready for measurement. The methods of measurement of various items are enumerated as under.

5.5 Measurement of depth of trenches: The cable route shall be divided into a number of segments each of maximum 200 Meters length bounded by identifiable landmarks at both the ends of the segments. If landmarks are not available, length of segment may be maintained at 200 Meters. The measurement of depth shall be recorded at each point of measurement (POM) in the measurement book in Meters in the multiples of 5 cms. For example 97 cms will be recorded as 95 cms and 93 cms as 95 cms. The points of measurements shall be at a distance of 10 Meters starting from 0 (Zero) Meter. For example, if the length of segment is 75 Meters, the POMs shall be at 0 M, 10 M, 20 M, 30 M, 40 M, 50 M, 60 M, and 70 M. The last POM shall be at 75th M to be recorded against residual POM. The efforts required to excavate trenches is not proportionate especially with reference to depth. Therefore, normally the workers tend to dig shallow trenches. As standard depth of the trench is important for future life and protection of cables, this tendency has to be discouraged. In order to encourage the bidder to achieve best possible depth in the face of site constraints, the following scale of payment shall be applied for digging trenches of lesser depths, subject to condition that relaxation has been granted by the competent authority for lesser depths:

Payment = Approved rate {Installation and commissioning (erection) charges} x {Actual Depth / Full Depth}

Note 1: However, bidder shall take prior permission of IA/ IA representative for digging lesser depth based on site constraints such as, presence of pipelines, power cables etc.

Note 2: 1. Penalty due to lesser depth on cable current rating will also be applicable on pro rata basis linking with cable current rating and its cost.

2. Lesser depth without approval of client is not acceptable and also without any justified reasons is also not acceptable. IA will recover the cable cost from the contractor and no time extension is also allowed in this regards.

5.5.1 The depth of cables across all kinds of soil shall be maintained from top of cable to the ground surface as per the below mentioned manner. In case of inability to reach desired depth, the bidder shall take permission of Site In-charge and provide additional protection and the payment for such work shall be paid as per Contract conditions.

5.6 Measurement of lengths and profiles of strata and protection: The measurements of length of trenches are on running Meter basis, irrespective of type of soil encountered while digging. The type of protection provided (item code-wise) in a segment shall be recorded in the measurement book in the sheet provided for this purpose.

5.7 Measurement of length of cable: The payment for Services component shall be made as per the RODO Meter readings. The length should be cross-verified with the marking of lengths on the cables. The lengths shall be recorded in sheet provided in the measurement book.

5.8 Measurement of other items: The measurement/numerical details of other items shall be recorded in the sheets provided for respective items viz.

- (a) Digging of joint pit and preparation of joint chamber along with its type i.e. Pre-Cast RCC type.
- (b) Fixing, Painting and sign writing of route/joint indicators
- (c) Termination of Cable in equipment room and no. of joints.
- (d) Record joint loss details for each joint.
- (e) No payment will be made for damaged cable portion due to any reason while erection/laying/cutting etc.

5.8.1 The bidder shall sign all the measurement recorded in the measurement book. This will be considered as an acceptance by the bidder, of measurements recorded in the MB. In case bidder fails to attend at the measurements or fails to countersign or to record the difference within a week, then in any such events the measurements taken by Site In-charge or by the subordinate as the case may be shall be final and binding on the bidder and the bidder shall have no right to dispute the same.

5.8.2 Measurement of the work will be taken equal to the length of the pipe/ duct (as measured in the RODO meter) through which the cable has been pulled/ blown and not the total length of the cable pulled through pipe/duct.

5.9 Site Order Book: The site order book is one of the primary records to be maintained by the supervisor supervising the work during the course of execution of works. The noting made by supervisor will form as basis for operation of many contractual clauses. The bidder shall remove all the defects pointed out by the IA in the Site order book and also the EHS instructions in site order book. The site order book is to be maintained in the prescribed format. The bidder or their

authorized representatives shall also be at liberty to note their difficulties etc. in these books. The site order books shall invariably be consulted at the time of making final payments to the bidder.

6. Handing and Taking over certificate

6.1 Taking-Over Certificate

The Works shall be taken over by the MSEDCL, when it has been completed in accordance with the Contract, have passed the all Tests on Completion.

Taking-Over Certificate for the Works shall be issued by the MSEDCL. The Works are divided into Division wise; the Contractor is entitled to apply Taking-Over Certificate for each Division (DPR) after obtaining the test completion certificate from IA/IA representative. On the basis of completion certificate, MSEDCL will issue Taking Over certificate and contractor shall be responsible for taking the Taking Over Certificate from MSEDCL.

- a) MSEDCL will Issue Taking-Over Certificate to the Contractor, stating the date on which the Works or Division (DPR), were wholly/completely completed in accordance with the Contract (except for minor outstanding work that does not affect the use of the Works or Section for their intended purpose) including passing the Tests on Completion; or
- b) Reject the application, giving his reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued: the Contractor shall then complete such work before issuing a further notice under this Sub-Clause.
- c) DLP will be started w.e.f. from Taking-Over Certificate issued by MSEDCL for complete Division (DPR).

6.2 Handing Over Authority (MSEDCL) And Use of Completed System

6.2.1 Contractor shall raise a Request For Inspection (RFI) to the IA/PMA for work which is intended to be handed (to end user, hereinafter mentioned as MSEDCL) over on completion when about 90% of work has been completed or partial handover based on IA approval. IA however may decide more frequent RFI states depending upon the critical nature of certain components of the work. Contractor shall comply with points raised by HOA/MSEDCL during inspections and obtaining work Completion/ Occupancy Certificates & Clearances for completed Work and Facilities before final 10% payment. IA/ IA representative / client shall provide all assistance in this process. However, it will be contractor ultimate responsibility to rectify the work/ drawings & documents required.

6.2.2 Contractor' shall hand over to HOA/MSEDCL or its Authorized Representative completed Work including all Services and Facilities constructed in accordance with the Approved Plans, Specifications fulfilling all techno-functional requirements agreed/along with Inventory, As-built Drawings, Maintenance Manual/ Standard Operating Procedure (SOP) for Equipment's and Plants, all clearances /Certificates from Statutory Authorities, Local Bodies etc. Provision for separate hand over of functional standalone modules will be available.

6.2.3 The MSEDCL shall not use any part of the Works unless Taking-Over Certificate has been issued for such part.

- a) The part which is used shall be deemed to have been completed/provided it completes all contractual obligations and constructed as per approved drawings/documents.
- b) The Contractor shall cease to be liable for the care of such part from such date, when responsibility shall pass to the MSEDCL.

- c) Work will be taken up in hand after observing all facilities, as per rules and regulations of MSEDCL.

6.3 Failure to Remedy Defects or to Complete Part of Works

If the Contractor fails to remedy any defect in the Plant, Materials, design or workmanship or if the Contractor fails to complete any Works or part of the Works as deemed necessary by the IA within a reasonable time after being notified by the IA's Representative, the IA or the IA's Representative may fix a date on or by which to remedy the defect or damage or to execute part of the works to the satisfaction of the IA's Representative, and give the Contractor reasonable notice of such date.

If the Contractor fails to remedy the defect or damage or to complete the required Works by such date the IA may (at his sole discretion): carry out the work himself or by others, in a reasonable manner and at the Contractor's risk and cost. Such costs shall be recoverable from the Contractor by the IA, and may be deducted by the IA from any monies due, or to become due, to the Contractor.

The costs properly incurred by the IA in remedying the defect or damage or in executing part of the works shall be recoverable from the Contractor by the IA and will be calculated based on the direct cost of any labour, equipment, materials, superintendence and other services provided by the IA for carrying out such work, as certified by the IA's Representative, plus an administration fee of 15% (Fifteen percent) of the direct costs to cover overheads and other indirect costs;

6.4 Contractor to Search

The Contractor shall, if required by the IA's Representative, search for the cause of any defect, under the direction of the IA's Representative. Unless the defect is one for which the Contractor is liable, the Cost of such search, shall be added to the Contract Price.

6.5 Final Contract Completion Certificate

On completion of the (DLP) of the Contract, certified by IA, the Contractor ensure that all Facilities constructed under the Contract are in good operating condition (fair wear and tear excepted), that any necessary repairs to the civil, mechanical or electrical installations have been properly carried out, and that any and all defects or damages arising from the design, workmanship, materials or manufacturer's defects have been remedied, as. Upon successful completion of the Contractor's obligations, the IA shall issue a Final Contract Completion Certificate.

The Contract shall not be considered to be completed until the Contract Completion Certificate has been signed by the IA and delivered to the Contractor, stating the date on which the Contractor completed his obligations to the IA.

6.6 Unfulfilled Obligations

After the Contract Completion Certificate has been issued, the Contractor shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force.

6.7 Ownership of Plant and Materials

Each item of Plant and Materials shall become the property of the IA/HOA at on successful completion of the works or part of the works.

- a. When it is delivered to Site and accepted by the IA's Representative;
- b. When, the Contractor becomes entitled to payment of the value of the Plant and Materials.

The above notwithstanding, the Contractor shall remain liable for the safety and security of all Plant, Equipment and Materials delivered to the Site from the time of delivery until the date of taking over by the MSEDCL.

7. Facilities to be provided for the IA and it's representatives

The Contractor shall provide and upkeep the following facilities for the IA's Representative during the project and for so long a period of time during the defect's liability period. The running costs of providing these facilities are considered incidental to execution of the project and no separate payment will be made.

- (a) Office space airconditioned, at or near the Contractor's main project office, with a floor area not less than 15 square meters, with provision for toilets and pantry. The office shall be equipped with office furniture (at least 3 tables, 6 chairs, necessary filing and drawing cabinets, etc.), and provided with electricity, one telephone, one desk-top computer and one A4 photocopier cum printer. All office consumables are in contractor scope.
- (b) One office Peon & Security personnel for office is to be provided.
- (c) Security of office is contractor responsibility.
- (d) For Inspection and monitoring Contractor shall provide Four-wheeler along with driver and fuel round the clock.

8. Examination of work before covering up

No part of the Works shall be covered up or put out of view without the approval of the IA representative and the Contractor shall afford full opportunity for the IA representative to examine and measure any such part of the Works which is about to be covered up or put out of view and to examine foundations before any part of the Works is placed thereon. The Contractor shall give notice to the IA representative whenever any such part of the Works or foundations is or are ready or about to be ready for examination and the Engineer shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such part of the Works or of examining such foundations

9. Uncovering and making openings

The Contractor shall uncover any part of the Works or make openings in or through the same as the Engineer may from time to time instruct and shall reinstate and make good such part.

10 Instructions for cable laying and installation during project execution

10.1 Introduction for cable laying:

- 10.1.1 Cable as per scope indicated in this specification, shall be laid underground in flat formation throughout the route as per relevant IS and approved drawing. However, as per requirement of the field, the cables shall also have to be laid:

- I. In Hume pipe or HDPE or GI pipe or Half round cement pipe.
- II. In air at termination point

III. Varying depths due to obstructions.

10.1.2 The contractor shall prepare the route drawing based on the design and planning criteria as decided during detail engineering and get the same approved from IA before starting the cable laying work.

10.1.3 The bidder is advised to visit the site and acquaint themselves with the topography, infrastructure etc. The contractor shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the erection and successfully commissioning of cable in all respect.

10.2 Trenching:

The cable trench work involves earth excavation using for cable trench, back filling and removal of excess earth from site. The work site shall be left as clean as possible. The cable trench shall be excavated using method.

The trench shall be excavated using following methods including air compressor driven pneumatic drill as per field conditions.

- (a) Manual Excavation
- (b) Excavating with Mechanical Force
- (c) Thrust Bore
- (d) Trench Ploughing

Most main roads are of asphalt surface and some of the roads with cement concrete surface. Where paved footpaths are encountered, the pavement slabs shall be properly stored and reinstated. Identification markers of other services shall be properly stored and restored. The sides of the excavated trenches shall, wherever required, be well shored up with timber and sheeting.

Suitable wooden/ sheet steel barriers should be erected between the cable trench and pedestrian/ motorway to prevent accidents. The barrier could be made out of sheet steel or wood planks. These could be portable types of size 1.5 m long by 1.2 m (height). These should be painted with red and white coloured cross stripes or as per color & design approved during execution. Warning and caution boards should be conspicuously displayed. Red lights as warning signal should be placed along the trench during the nights.

The excavated material shall be properly stored to avoid obstruction to public and traffic movement.

The bottom of the excavated trench should be levelled flat and free from any object, which would damage the cables. Any gradient encountered shall be gradual.

Trial holes:

The bidder shall excavate trial holes, for alignment purpose at appropriate distance apart as warranted by the local conditions, keep a record of findings and close the trial holes properly to avoid hindrance / accidents to pedestrian traffic. The final route alignment of cable shall be decided based on the finding of the trial hole. It is the responsibility of the contractor to maintain the required statutory clearances from other utility services. Any damage caused, inadvertently to any utility services shall be the sole responsibility of the contractor.

10.3 Trenchless digging

The trench less digging methods shall generally conform to ITU-T L.38. The various methods of trenchless digging such as hand / manual auguring (up to 15m), impact moling (from 16m to about 40-50m) and HDD (Horizontal drilling device) (above 40-50m) shall be adopted based on the soil/site conditions and the requirement and exact method for trench less digging shall be finalised during detail engineering as per actual site/soil condition.

The equipment used for HDD shall be capable of drilling at least 100m at one go. The contractor shall propose the exact methods and procedures for implementation of trench less digging at various crossings taking into consideration the following guidelines, for approval by the IA.

- a) Excavation and backfilling of trial pits and verification of soil condition.
- b) Excavation of entry and Exit pits.
- c) Erection of drill machined. Drilling of pilot hole.
- d) Placement and driving hand augur.
- e) Placement and carrying out impact moling.
- f) Reaming and widening of bore holes in steps (if required).
- g) Pulling of product pipe.

10.4. Cable handling

The inspection of cable on receipt, handling of cables, paying out, flaking, cushioning with sand , back-filling, reinstatement of road surfaces, providing and fixing joint markers, route markers, joint pits, sump holes and all necessary precautions that are required shall be carefully planned and in general conform to IS 1255-1983 or its equivalent.

10.5. Damage to property

The contractor shall take all precautions while excavation of trench, trial pits etc., to protect the public and private properties and to avoid accidental damage. Any damage so caused shall be immediately repaired by contractor at his own cost and brought to the notice of the concerned persons and to the IA/IA representatives.

- Contractor shall arrange third party liability insurance for the above purpose.
- The contractor shall bear all responsibilities and liabilities and shall bear all costs of the damages so caused by him or by his workman or agents.
- At places where the cables cross private roads, gates of residential houses or buildings, the cables shall be laid in RCC hume pipes.

10.6. Cable route markers/cable joint markers

Permanent means of indicating the position of joints and cable route shall be fabricated, supplied and erected. Route Marker shall be provided at every 100 meter and at the turning points.

In addition, markers, if required shall be provided per the field requirement. If the route passes through open fields, markers should be conspicuously visible and above ground surface and particularly along the Road berm except on road & pavements where they may interfere in the movement of traffic or pedestrians.

The markers should incorporate the relevant information. The name of the owner, voltage shall be marked on the route marker. The markers shall be of PCC. The design shall be such that it cannot be pulled out.

Tile type marker shall be used along the pavement. PCC markers shall be used at other locations. The PCC markers shall be cut into proper size as per drawing, covered with cement plaster with engraving of the information required.

10.7. Depth of laying & spacing between cables:

Bidder has to follow practice/procedure mentioned in IS 1255 (latest Standard including amendments) : Code of Practice for Installation And Maintenance of Power Cables up to and including 33 kV Rating (as mentioned in Constructions Guidelines (Annexure-R)).

10.8. Laying out the cable

The excavated cable trench shall be drained of all water and the bed surface shall be smooth, uniform and fairly hard before paying out the cable. The cable shall be rolled in the trench on cable rollers, spaced out at uniform intervals. The laying out process must be smooth and steady without subjecting the cable to abnormal tension. The cable on being paid out shall be smoothly and evenly transferred to the ground after providing the sand cushion. The cables shall never be dropped. All snake bends shall be straightened. Suitable size cable stocking pulling eye shall be used for pulling the cable. While pulling the cable by winches or machines, the tension loading shall be by tension indicator and shall not exceed the permissible value for the cable. The cable laying shall be performed continuously at a speed not exceeding 600 to 1000 meter per hour.

The cable end seals shall be checked after laying and, if found damaged, shall immediately be resealed. Sufficient number of heat shrinkable cable end sealing caps shall be stocked at site stores for testing and jointing work. The integrity of the outer sheath shall be checked after the cable is laid in position.

10.9. Sand bedding and brick

The cable shall be completely surrounded by well-compacted sand to such a thickness and of such size that the cable is protected against damage. The thickness of the cable sand should normally be a minimum of 7.5 cm in all directions from the cable surface. Cable sand with a grain size less than 8 mm shall be preferred to offer good protection to cable. A brick (for LT cables) (of brick class designation 75) layer of thickness 70 mm brick shall be provided over the sand for protection of the cable as per enclosed drawing.

10.10. Flaking

The cables shall be flaked and left with slight extra lengths at jointing bays for expansion and flexibility.

10.11. Back filling

Normally back filling shall consist of the material earlier excavated. However, bigger stones or pieces of rock should be removed.

10.12. Prevention of damage due to sharp edges

After the cables have been laid in the trench and until the cables are covered with protective covering, no sharp metal tool shall be used in the trench or placed in such a position that may fall into the trench. Straight and curved rollers used shall have no sharp projecting parts liable to damage the cable.

While pulling through pipes and ducts, the cable shall be protected to avoid damage due to sharp edges. The cables shall never be bent, beyond the specified bending radius.

10.13. Road, Railway tracks, water pipe line crossings

RCC Hume pipe shall be used for crossing of Road and GI pipes for railway track and water pipe line. One spare pipe at each location of 33kV & 11 kV cable crossing shall be laid. Cable pipe

size/ laying details shall be as per IS 1255-1983. The road cutting for cable trench, whether cement concrete, asphalt or macadam road surface shall be undertaken after obtaining approval for cutting from the road owning authorities, traffic police, telephone authorities and work should be planned to be completed in the shortest possible time. Where necessary the work shall be planned during night or light traffic periods. The railway track crossing design shall be got approved from the railway authorities and the contractor shall do work in coordination with them.

In the excavated trench across the road the pipes shall be laid, excavation backfilled compacted and surface shall be redone in the shortest possible time.

Open Drain Crossing: Where ever the cable has to cross open drains, with long span, the cable shall be laid in suitable size G. I. pipe properly joined with suitable collars. The GI pipe shall be firmly supported on pillars, columns, or suitable support of RCC foundation.

10.14. Foot path cutting

The slabs, kerbstones, on the roads/ footpath shall be removed and reinstated without damage.

10.15. Reinstatement

After the cables and pipes have been laid and before the trench is backfilled, all joints and cable positions should be carefully plotted in drawing and preserved and provided to the Engineer of IA/IA representatives. The protective covers shall then be provided, the excavated soil riddled, sieved and replaced. It is advisable to leave a crown of earth not less than 50 mm and not more than 100 mm in the centre and tapering towards the sides of the trench.

The temporary reinstatement of roadways should be inspected at regular intervals, more frequently in rainy season and immediately after overnight rain for checking settlement and if required, the temporary reinstatement should be redone.

After the subsidence has ceased the trench may be permanently reinstated and the surface restored to the best possible condition.

In case of the road surface is cement concrete, asphalt or tarred macadam, resurfacing shall be done by the civic authorities against payment of the restoration charges to be made by contractor initially directly to concerned agency, which will be reimbursed by IA after receiving of the payment from client on back to back basis.

10.16. Tools and Plants

The successful bidder shall have all necessary tools, plant and equipment to carry out the survey and cable installation work.

The bidders are instructed to give all the details of equipment at their disposal, to carry out the work successfully and speedily.

10.17. Jointing and termination of cables

General: The cable jointing personnel and his crew shall have good experience in the type of joints and terminations that are used. The jointing work shall commence as soon as two or three lengths of cables have been laid. All care should be taken to protect the factory-plumbed caps/ seals on the cable ends, and the cable end shall be resealed whenever the end is exposed for tests.

Jointing of cables in carriage ways, drive ways under costly paving, under concrete or asphalt surfaces and in proximity to telephone cables and water mains should be avoided wherever possible.

Sufficient overlap (or loop) of cables (5 Meter) shall be allowed for making the joints which shall be paid to the contractor under supply. The contractor shall include the cost of erection of overlap cable in their bid.

The Joint chamber /Main holes should be of sufficient dimensions to allow the jointers to work with as much freedom of movement and comfort as possible. Sufficient space should be kept below the cable to be jointed. No additional for supply & erection of chamber shall be made/ paid (it cost is included in cost of straight through joint , bidder as to asses & plan/bid accordingly). Pre-cast RCC type Chamber shall be used.

The joints of different phases shall be staggered.

All jointing shall be done by joint manufacturer's jointers or under their supervision

10.18. Tents / covers

An enclosure or suitable protection cover shall be used in all circumstances wherever jointing work is carried out in the open irrespective of the weather conditions. The joint shall be made in dust free and clean atmosphere.

10.19. Precautions before making a joint/ end termination

The cable end seals should not be opened until all arrangement have been made for jointing and all necessary precautions have been taken to prevent circumstances arising out of rainy/ inclement weather conditions, which might become uncontrollable.

If the cable end seals or cable ends are found to have suffered damage the cables should not be jointed, without tests and rectification.

10.20. Identification

The identification of each phase shall be clearly and properly noted. The cables shall be jointed as per the design approved by the IA based on the proposal submitted by the Contractor. Each cable shall have identification for phase and circuit at joint bays.

10.21. Making a joint/ end termination

Comprehensive jointing instructions should be obtained from the manufacture of jointing/end kits and meticulously followed.

The materials used in the joints/ end kits like ferrules, screen/armour continuity bonds, lugs etc., shall be of good quality and conform to standards.

The jointing tools shall be appropriate and as per the requirement of jointing XLPE/PVC cables.

10.22. Cable terminations

The cable terminations used are to be of outdoor type.

The preparation of the cable end for installing the terminations and the precautions to be taken before fixing the terminations shall be followed as in the case of the cable jointing procedures.

The instructions furnished by the termination manufacturer shall be strictly followed.
All terminations shall be done by joint manufacturer's jointers or under their supervision.

At cable terminating end, the following provisions for supply and erection are to be included.

- A terminating structure should be provided where necessary for supporting the cable to be terminated (except at the ring main unit ends)
- A sufficient length of spare cable(5 Meter) shall be left in the ground, for future needs which shall be paid to the contractor under supply. The contractor shall include the cost of erection of spare cable in their bid.
- The rise / take off of the cable immediately from the ground shall be enclosed in 150 mm dia GI pipe to protect against direct exposure to the sun.
- The cable shall be properly fastened to the support using non-metallic clamps.
- Appropriate labels shall be fixed identifying the phase circuit, voltage and date of commissioning etc., on the cable supporting structure.
- The sealing end shall be mounted on insulators to isolate them from their supporting steel work.
- Protection from contact with the exposed metal work at the termination shall be provided by resin bonded glass fibre shroud.
- Providing earth stations with all required materials, like leads, connectors etc for earthing of armour and screen.

10.23. Bonding of screen / armour

The screens and armour at both ends shall be brought out and solidly bonded to the earth station.

All accessories and consumables used in the termination should be of good quality and compatible with the cable.

10.24. Erection of cable terminating structures.

The terminating structure should be designed as per the requirement of the cable end sealing, offered by bidder.

The mounting structure shall be of latticed GI suitably grouted to the ground.

After fixing the end termination, the cable shall be fixed to the support, with non-magnetic material clamps to the required height securely.

The mounting structure includes the supports for cable end boxes, link boxes and any other structure required for the intent of the contract.

All steel sections used shall be free from all imperfections, mill scales, slag intrusions, laminations, fillings, rust etc., which may impair their strength, durability and appearance. All materials shall be of tested quality only unless otherwise permitted by the IA/IA REPRESENTATIVES. The Contractor shall fabricate, provide and install the structures.

10.25. Warning Tape

A pre-warning, Red colour plastic/ PVC tape, of at least 250 mm wide 100 microns thick, shall be laid at approx. 0.4 m above the cable specified depth, throughout the cable route. The tape shall carry the legend printed in black continuously as under CAUTION; EMPLOYER, VOLTAGE CLASS of CABLES. NO extra payment in this regard is applicable. The cost of this included in tender price.

10.26 Tests after installation on cables.

All tests as prescribed in Clause-6 of IEC-840 shall be performed after installation of cable (or as per approved Field Quality Plans). Following minimum tests shall be carried out and final test be conducted will be as per approved Field Quality Plan (of respective equipment's).

- Insulation Resistance of each cable drum length after paying but before jointing.
- Serving insulation resistance after laying each cable length shall withstand a voltage of 5 kV DC between each reinforcement and external conducting surface for one minute. In addition, the serving insulation resistance shall be measured and checked with the values obtained in the routine factory test.
- On completion of the cable laying and jointing work, the complete installation shall be tested with a D.C. voltage (high Voltage Test) as per IS 1255.
- Conductor resistance of each cable of each complete circuit shall be measured and compared with the values obtained during routine factory tests.
- Test for 5 minutes with system voltage applied between the conductor and the armor/ screen earthed.
- Test for 24 hours with normal operating voltage of the system.

11. Documents**11.1 Documents on Site**

The Contractor shall keep all projects sites one complete set of the documents & approved GPS survey drawings and other drawings forming the Contract, the Construction Documents, and Variations, other communications given or issued. IA's Representative/client and assis-tants shall have the right to use such documents at all reasonable times.

11.2 Provision of Construction Documents

The Construction Documents shall be in the custody and care of the Contractor/IA,/client. Unless otherwise stated in the IA's Requirements, the Contractor shall provide five reproduc-ible original, one soft (electronic) copy, one full-size original copy and six printed copies of all designs and drawings prepared by the Contractor for the use of the IA's Representative and assistants.

11.3 Approved List of Suppliers/OEM(s) of M/s Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) and Material Technical Specifications

1. Please refer Link Given Below for MSEDCL approved Vendor List.

<https://www.mahadiscom.in/supplier/en/approved-vendor-list-all-schemes/>

2. Please refer Link mentioned below for Material Technical Specifications of all Equipment's/Items.

<https://www.mahadiscom.in/supplier/en/material-technical-specifications/>

The Technical Specifications provided at above link shall prevail in case of any ambiguity.

END OF SECTION-4

SECTION-5**PROJECT EXPERIENCE**

S. No	Item	Details
General Information		
1	Customer Name/Government Department	
2	Name of the Contact Person and Contact details for the Project	
Brief Description of scope of Project		
Size of the Project		
3	Contract Value of the Project (in crore) excluding taxes	
4	Contract Value of the Project (in crore) including Taxes	
Project Details		
5	Name of the Project	
6	Start Date &End Date	
7	Current Status (work in progress in %, completed)	
8	Contract Tenure	
9	Type of Project	

END OF SECTION-5

SECTION – 6**PART -A****PRICE BID SCHEDULE****(FILLED PRICE SCHEDULE TO BE SUBMITTED WITH FINANCIAL PROPOSAL ONLY)**

To:

Executive Director(IT&T-III)
Telecommunications Consultants India Limited
401, 4th Floor, TCIL Bhawan,
Greater Kailash-1, New Delhi-110048

Dear Sir,

We, the undersigned, offer to provide the [Insert title of assignment] against your NIT No. [Insert NIT No.] dated [Insert Date]. Our attached Financial Proposal is for the sum of [Insert amount(s) in words and figures1].

Yours
sincerely,

Authorized Signature [*In full and initials*]: _____
Name and Title of Signatory: _____
Name of Firm: _____
Address: _____

[Refer –Price Schedule]**Note 1:- The bidder to provide un-priced Price-Bid along with Technical bid.****Notes2:-**

- a) Lowest Bid will be on the basis of Grand Total.
- b) Bidder shall mandatorily mention the 8 digit / 6 digit applicable HSN / SAC code of all the Quoted items.
- c) In case of change in rate due to change in Taxes/Duties the rate shall be applicable on prorata basis based on actual nos. of applicable days.
- d) Before Submitting their Duly Filled “Price Bid Schedule & BOQ” the bidders should ensure that they do not enter any Comments in the above Table like “ As per Actuals, Will be Intimated Later on etc” . If Bidder uses these type of Comments while filling up the above Table for Price Bid Schedule & BOQ Or if the charges for any item is left blank the Charges for the Items wherever such comments are used or if left blank shall be Considered as “Zero” and the same shall be a binding on the bidder.
- e) If there is a discrepancy between the unit price and total price that is obtained multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected.
- f) Bidder can declare upto 3 Supplier(s)/ Original Equipment Manufacturers OEM(s) of HT/LT XLPE Cable, RMU, LT Feeder Pillar, Transformer, HDPE Pipe, RCC Pipe. One OEM shall be finalized for each item before placement of PO on the bidder. Any subsequent change in OEM can only be done with permission of IA by the bidder. IA is not bound to accept request of bidder for change of OEM and the decision of IA shall be final and binding on bidder in this regard.

- g) The requirement / Quantity mentioned above are indicative & may vary as per the actual requirements.

PART – B

Financial Bid

(ON THE BIDDER'S LETTER HEAD)

To

Executive Director(IT&T-III)
Telecommunications Consultants India Limited
401, 4th Floor, TCIL Bhawan,
Greater Kailash-1, New Delhi-110048

Sub:

NIT NO:

Sir,

We offer to perform the Works described above in accordance with the Conditions of Contract accompanying this Bid with Rs. (In figures) and Rupees _____ (In words).

Our Offered cost is inclusive of all levies & duties as applicable but excluding GST, as per the conditions of the proposal. Payment shall be paid subject to receipt of the same by client on back to back basis.

This Bid along with addendums/ corrigendum and written acceptance of it shall constitute a binding Contract with TCIL. We understand that you are not bound to accept the lowest or any Bid you receive.

We hereby confirm that this Bid complies with the Bid Validity, Tender Fee and Earnest Money Deposit required as per bidding documents.

Yours faithfully,

Authorized Signatory.....
Name and Title of Signatory.....
Name of bidder.....
Address:
Date:

END OF SECTION-6

SECTION-7**MANUFACTURER'S AUTHORISATION FORM (NOT APPLICABLE)**

(Note for User Division:- (MA F can be modified as per Client's requirements)

[Head of Department]
Telecommunications Consultants India
Limited. TCIL Bhawan, Greater Kailash-I
New Delhi-110048 (INDIA)

Dear

Sir,

Ref: Your [document No] _____ dated _____

We, _____ who are proven and reputable manufacturers of (name and description of the factories at goods offered in the bid) having, hereby authorize M/s (name and address of the agent) to submit a bid, process the same further and enter into a contract with you against your requirement as contained in the above referred documents for the above goods manufactured by us.

We also state that we are not participating directly in this bid for the following reason(s):

_____ (Please
provide reason here).

We also hereby extend our full warranty, CAMC as applicable as per Client's [tender No.] and [tender name], read with modification, if any, for the goods and services offered for supply by the above firm against this NIT document.

We also hereby confirm that we would be responsible for the satisfactory execution of contract placed on the authorized agent and the spares for the equipment shall be available for at least 10 years from the date of supply of equipment.

We also confirm that the price quoted by our agent shall not exceed the price which we would have quoted directly"

Yours faithfully, [Signature with date,
name and designation]

for and on behalf of M/s _____
[Name & address of the manufacturers]

Note: 1. This letter of authorization should be on the letter head of the manufacturing firm and should be signed by a person competent and having the Authorization letter / Board Resolution to legally bind the manufacturer.

2. Original letter may be sent.

END OF SECTION-7

SECTION - 8**BID SECURITY BANK GUARANTEE (EMD) FORMAT**

Whereas (hereinafter called "the Bidder") has submitted its bid dated For the supply of Vide Tender No. dated KNOW ALL MEN by these presents that WE OF Having our registered office at (hereinafter called "the Bank") are bound unto Telecommunications Consultants India Limited (hereinafter called "the IA") in the sum of Rs. for which payment will and truly to be made of the said IA, the Bank binds itself, its successors and assigns by these present.

THE CONDITIONS of the obligation are:

1. If the Bidder withdraws his bid during the period of bid validity specified by the Bidder on the Bid form or
2. If the Bidder, having been notified of the acceptance of his bid by the IA during the period of bid validity
 - (i) fails or refuses to execute the Contract, if required; or
 - (ii) The successful bidder fails to submit performance security within the prescribed time. or
 - (iii) The proceed of EMD shall be payable to TCIL in case of breach of any of the terms and conditions of the contract/PO/tender by the vendor.

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

This guarantee will remain in force upto and including THIRTY (30) days after the Period of bid validity and any demand in respect thereof should reach the Bank not later than the specified date/dates.

Signature of the Bank Authority.

Name

Signed in Capacity of

Name & Signature of witness

Full address of Branch

Address of witness

Tel No. of Branch

Fax No. of Branch

END OF SECTION-8

SECTION-9

INTEGRITY PACT

[As per format given in TCIL Website – Link https://www.tcil.net.in/public/pdf/integrity_pact.pdf

END OF SECTION-9

SECTION-10**AUTHORIZATION LETTER****Format for Authorization letter to be submitted by Bidder**

Know all men by these presents that we (name of Company) _____, incorporated in India under the Companies Act, 1956 and having its Registered Office at _____. (India) ("Hereinafter called the Company") DOTH hereby nominate, constitute and appoint (Name, Designation) _____, S/o _____ to be true and lawful authorized signatory in fact and at law of the Company for and in the name and on behalf of the Company, to do, execute and perform all or any of the following acts, deeds, matters and things namely:-

1. To represent the Company to all intents and purposes in connection with the matters pertaining to signing & submission of (EOI No, EOI Date, EOI Description) _____, _____, _____ and all affairs ancillary or incidental thereto.
2. AND the Company hereby agrees that all acts, deeds and things lawfully done by the said authorized signatory shall be construed as acts, deeds and things done by the Company itself and the Company hereby undertakes to ratify and confirm all and whatever its authorized signatory shall lawfully do or cause to be done for and on behalf of the Company by virtue of the powers hereby given.

In witness whereof (Name , Designation) _____, _____ of the Company acting for and on behalf of the Company under the authority conferred by the Board of Directors of the Company in its _____ meeting held on (Date) _____ has signed this Authorization Letter at (place) _____ on this (Date) _____.

The signatures of (Name , Designation) _____ given below are hereby certified.

Signature : _____

SIGNATURES OF (Name , Designation) _____

CERTIFIED

Signature : _____

WITNESS:-

Signature: _____

(Name , Designation): _____

END OF SECTION-10

SECTION-11**CALCULATION OF LOCAL CONTENT:**

				Basic Rate W/0 Tax		Total Cost W/0 Tax (INR)		
Sl. No.	Description of the Item	Qty	Unit	Domestic (Excluding net Domestic indirect Taxes)	Imported (Including All Custom Duties)	Domestic (Excluding net Domestic indirect Taxes)	Imported (Including All Custom Duties)	Domestic + Imported
			a	B	C	d=a*b	e=a*c	f=d+e
1	Item Description	1	Nos					
2	Item Description	1						
3	Total				-		-	

% of Local Content = (Total Cost Domestic 3(d) / Total Cost (domestic + Imported) (3 (f))) * 100
(To be used by bidder for their internal calculation and to submit if demanded by TCIL at any stage)

END OF SECTION-11

SECTION-12**NO-CONVICTION CERTIFICATE****[To be submitted on the Letterhead of the Bidder]**

Offer No.: _____

Date: _____

To

[Head of Department]

Telecommunications Consultants India
Limited, TCIL Bhawan, Greater Kailash-I,
New Delhi-110 048 (INDIA)

Sub: Self Declaration of not been blacklisted for [NIT No.]dated[NIT date]

Dear Sir,

This is to notify you that our Firm /Company/ Organization <provide Name of the Firm/
Company/ Organization> intends to submit a proposal in response to [NIT No.] dated [NIT
date]for [NIT Name].

In accordance with the above, we declare that:

- a. We are not involved in any major litigation that may have an impact of affecting or compromising the delivery of goods / services as required under this [NIT No] dated [NIT date].
- b. We are neither banned/ debarred/ blacklisted/ put on holiday list nor action for banning / debarment / blacklisting / holiday listing has been initiated by any Central/ State Government/ agency of Central/ State Government of India or any other country in the world/ Public Sector Undertaking/ any Regulatory Authorities in India or any other country in the world for any kind of fraudulent activities on any ground including but not limited to indulgence in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice as on date of submission of the Bid.

Yours sincerely,

(Signature of the Authorized signatory of the Bidding
Organisation) Name:

Designation:

Contact details (including E-
mail): Business Address:

Date:

Seal:

END OF SECTION-12

SECTION-13**BID SUBMISSION FORM**

Offer No.:

Date: To: [Head of Department], TCIL

Dear Sir,

In response to your Tender No. _____, we hereby submit our offer herewith.

1. Bidder Name : _____

2. Website Address : _____

3. Email Address : _____

4. Address for Communication : _____

5. Telephone Number : _____

6. Fax/Telefax Number : _____

7. Authorised Person - Name : _____

Designation : _____

Mobile No. : _____

: Email ID : _____

:

8. Alternate Person- Designation : Name: _____

Mobile No. : _____

Email ID : _____

9. PAN Number : _____

10. GST Regn. No. with Address : _____

11. Beneficiary's complete Bank Details.

Bank Account No.

IFSC / NEFT Code

Name of the Bank

Address of the Branch

: _____

: _____

: _____

12. Particulars of EMD

Amount

Mode of Payment (DD/BG)

DD/BG No.

Date

Name of the Bank

Address of the Bank

Validity of BG

: Rs. _____

: _____

: _____

: _____

: _____

: _____

: _____

13. Particulars of Tender Fee

Amount

: Rs. _____

DD No. : _____
 Date _____
 : Name of the Bank _____
 : Address of the Bank _____
 :

14. Turnover of the Bidder in last 3 years:-

Year	Year Annual Report attached at Page No.	Turnover in Rs. (Lakh)
Average Turnover		

15. Are you a MSME Unit. If yes, please furnish Registration Details, Name of the DIC/State.

16. If you are MSME, is it owned by SC/ST Entrepreneurs or Women Entrepreneurs? If Yes, please specify the Name of the Owner who is SC or ST or Women Entrepreneur (as applicable).

17. Following Documents are submitted to substantiate other eligibility criteria.

- i) _____
- ii) _____
- iii) _____

DECLARATION

1. We have read and understood the terms & conditions of the above-mentioned tender and comply to all Terms & Conditions of the Tender.
 (In case of any deviation, the Bidder must attach a separate sheet clearly mentioning the Clause No. of the Tender and Deviation thereto)

2. We certify that the information mentioned above are true and correct to best of our knowledge.

Place:
Seal
Date:

Signature of Authorised Signatory with

 Name:
Designation
:

END OF SECTION -13

SECTION-14**MAKE IN INDIA UNDERTAKING****A. Bidder shall furnish following self-certificate on its letter head along with their techno- commercial bid.**

"We M/s _____ (Name of bidder) hereby certify that we meet the
 mandatory minimum Local Content requirements of the Tender of equal to or more than 50% (for Class-I) / greater than 20% and less than 50% (for Class-II) (in value terms) quoted vide our offer No _____ dated _____ against TCIL Tender No. ----- dated
 . Given below are the list of items (goods and services) which meets the Local Content Criteria. along with details of the location(s) at which the local value addition is made in respective items (goods and services)"

S#	Description of Items / Products / services	Make	Model	location(s) at which the local value addition is made

B. If value of procurement is more than INR 10 Crore, above undertaking shall be supported by the following certificate from Statutory Auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies giving the percentage of local content, on the letter head of such Statutory Auditor.

"We _____ the statutory auditor of M/s. _____ (name of the bidder) hereby certify that M/s. _____ (name of bidder) meet the mandatory Local Content requirements of the Project Work under this Tender i.e. equal to or more than 50% (for Class-I) / greater than 20% and less than 50% (for Class-II) (in value terms) quoted vide offer No. _____ dated _____ against TCIL Tender No. ----- dated ---- by M/s. _____ (Name of the bidder).

(Note: In case of bidder(s) for whom Statutory Auditor is not required as per law, required certificates shall be provided by a practicing Chartered Accountant.)

END OF SECTION-14

SECTION-15**NIT CHECKLIST**

S.No	Document	Submitted (Yes or No)
1	Tender Fee	
2	EMD (BG/DD/NEFT etc.)	
3	For MSME Exemption, Udyam Registration Certificate and Statutory	
4	For StartUp DPIIT certificate	
5	Authorization Letter/Board Resolution	
6	MAKE IN INDIA Undertaking	
7	Certificate of Incorporation/ Registration/ Partnership Deed or any	
8	Financial criteria	
9	Similar Experience Criteria	
10	Pan & GST	
11	MAF(Not applicable)	
12	Insolvent Undertaking	
13	No-Conviction Certificate	
14	Land Border Sharing Declaration	
15	Unpriced BOQ	
16	Undertaking from Vendors for non-cancellation of Purchase Order(s) on risk and cost on risk & cost basis or non-performance.	
17	PF Registration	
18	Local Office Undertaking	
17	Labor Laws Compliance Undertaking	
18	Consortium Agreement (if applicable)	
19	Genuine Documents Undertaking	
20	No-Deviation Certificate/ Clause-by Clause Compliance	
21	Technical Brochure and Data Sheet	
22	Integrity Pact document as applicable	
23	Bid Submission Form	
24	NDA not applicable	
25	Any Other Undertaking/ document as per NIT.	
26	Annexure-C (Financial Data)	
27	Annexure-D (Bid capacity)	
28	Annexure-E (Non-Relationship)	
29	Annexure-F - Form of Certificate of Financial Parameters for	
30	Annexure-G - (Format for Evidence of Access to or Availability of Credit/Facilities.	

END OF SECTION-15

SECTION-16**RATE CONTRACT – NOT APPLICABLE**

**[The following terms and conditions need to be included in Rate Contracts only.
Other terms and conditions shall be as per EOI format.]**

1. The quantity to be supplied during the currency of the rate Contract is not fixed and will be decided based on their actual requirement as per approved Budget/ Indent on “as and when” required basis.
2. The Company can place the orders during the validity of the rate contract period at the same rate, terms and conditions.
3. Normally, no variation is allowed except statutory variations in Sales Tax and Excise Duties. Sometimes, there are significant variations in the raw-material prices during the rate contract period. If there are downward variations and the client insists for revised quotations, the earlier rate contract is cancelled and new tenders are invited.

4. **FALL CLAUSE (applicable for Rate Contract)**

- a) The prices once fixed will remain valid during currency of rate contract. Further, if at any time during the contract
 - i. It comes to the notice of purchaser regarding reduction of price by the supplier/vendor for the same or similar equipment/ service;
And/or
 - ii. The prices received in a new tender for the same or similar equipment/service are less than the prices chargeable under the contract.

The purchaser, for the purpose of rate contract, if any, will determine and intimate the new price, taking into account various related aspects such as quantity, geographical location etc., and the date of its effect for the balance quantity/ service to the vendor. In case the vendor does not accept the new price to be made applicable during the extended delivery period and the date of its effect, the purchaser shall have the right to terminate the contract without accepting any further supplies. This termination of the contract shall be at the risk and responsibility of the supplier/vendor/contractor and the purchaser reserves the right to purchase the balance unsupplied quantity/ service at the risk and cost of the defaulting vendor besides considering the forfeiture of his performance security.

- b) The vendor during any time of the currency of the rate contract, shall have to provide an undertaking as “We have not reduced the sale price, and/ or offered to sell the same or similar equipment/ service to any person/organization including Department of central/state Government or any central/state PSU at a price lower than the price chargeable under the contract for scheduled delivery period.”

In case clarification is required by TCIL, the vendor supplier shall produce related documents such as PO/Agreement etc.

END OF SECTION -16

SECTION-17**PERFORMANCEBANK GUARANTEE (PBG Format)**

**(TO BE ISSUED BY A DELHI BRANCH) M/s Telecommunications Consultants India Ltd.,
TCIL Bhawan, Greater Kailash-I
New Delhi – 110 048 (INDIA)**

(With due stamp duty if applicable)

OUR LETTER OF GUARANTEE No. : _____

In consideration of TELECOMMUNICATIONS CONSULTANTS INDIA LIMITED, having its office at TCIL Bhawan, Greater Kailash-I, New Delhi – 110 048 (INDIA) (hereinafter referred to as "TCIL" which expression shall unless repugnant to the content or meaning thereof include all its successors, administrators and executors) and having entered into an agreement dated

_____/issued Purchase Order No. _____ dated _____ with/on M/s _____ (hereinafter referred to as "The Supplier" which expression unless repugnant to the content or meaning thereof, shall include all the successors, administrators, and executors).

WHEREAS the Supplier having unequivocally accepted to supply the materials/Services as per terms and conditions given in the Agreement dated _____ /Purchase Order No. _____ dated _____ and TCIL having agreed that the Supplier shall furnish to TCIL a Performance Guarantee for the faithful performance of the entire contract, to the extent of 10% (ten percent) of the value of the Purchase Order i.e. for

_____.
We, _____ ("The Bank") which shall include OUR successors, administrators and executors herewith establish an irrevocable Letter of Guarantee No. _____ in your favour for account of _____ (The Supplier) in cover of performance guarantee in accordance with the terms and conditions of the Agreement/Purchase Order.

Hereby, we undertake to pay upto but not exceeding _____ (say _____ only) upon receipt by us of your first written demand accompanied by your declaration stating that the amount claimed is due by reason of the Supplier having failed to perform the Agreement and despite any contestation on the part of above named supplier.

The proceed of performance security shall be payable to TCIL in case of breach of any of the terms and conditions of the contract/PO/tender by the vendor.

This Letter of Guarantee will expire on _____ including 30 days of claim period and any claims made hereunder must be received by us on or before expiry date after which date this Letter of Guarantee will become of no effect whatsoever whether returned to us or not.

Authorized Signature
Manager
Seal of Bank
Contact details

END OF SECTION-17

SECTION-18**FORM OF AGREEMENT**

THE AGREEMENT made on _____ day of _____ 20____ between the TELECOMMUNICATIONS CONSULTANTS INDIA LIMITED, NEW DELHI (hereinafter called the "TCIL") of one part and M/s _____ (hereinafter called the Contractor") or the other part.

Whereas TCIL is desirous that Contractor shall execute the work vide tender No.

NOW THIS AGREEMENT WITNESSETH as follow:

1. In the Agreement words and expressions have the same meanings as are respectively assigned to them in the conditions of contract thereafter referred to.

2. The following standard documents in addition to the documents attached with NIT, shall be deemed to form and be read and construed as part of Agreement viz.

- The Letter of Acceptance.
- Tenderer's offer & corrigendum's.
- The Conditions and Specifications .

3. In consideration of the payments to be made by selected bidder to the TCIL , the Selected bidder here by covenants with TCIL to execute complete and maintain the works in conformity in all respects with the provisions of the contract.

IN WITNESS whereof parties have hereunto set their respective hands and seals the day and year first above written.

For & on behalf of the TCIL

For & on behalf of the Tenderer

Witness

- 1.
- 2.

- 1.
- 2.

END OF SECTION-18

SECTION-19**Annexure-A to Dispute Resolution Clause****Establishment of a Conciliation & Settlement Mechanism (CSM) for Contractual Disputes under the contract agreements with the Contractors / Concessionaires / Consultants in TCIL.****1. Objective:**

The TCIL has been entering into various contract agreements with the Contractors/ Concessionaires/ Consultants for implementing projects and obtaining services in various modes. Several disputes have been arising under these contract agreements. The associated legal costs and diversion of manpower of both parties are enormous. The early resolution/ settlement of claim, preferably through an out-of-court settlement process, is in the interest of all the stakeholders.

2. The Standing Operating Procedure (SOP)

The procedure given hereunder will be implemented for resolving disputes through conciliation mechanism:

- 1) If any commercial/contractual dispute arises between TCIL and Bidder/MoU partner/Vendor/Contractor, then any of the party shall send a reference about the dispute containing a written brief identifying the subject of the dispute to the CMD, TCIL along with a copy of such reference to other party for resolution of dispute through conciliation.
- 2) CMD, TCIL or his authorized representative shall, within seven days of receipt of such a reference, nominate an officer of TCIL to act as the conciliator and shall arrange to issue necessary intimation to both the parties.
- 3) Within three days of appointment of conciliator by CMD, TCIL both the parties shall intimate to the conciliator, the name of their respective officer(s) who shall be representing such a party in the conciliation proceedings. The maximum number of such officer(s) shall not be more than three and no legal practitioner/advocate shall be part of such a team.
- 4) Thereafter, both the teams of the parties shall meet on the dates as fixed by the conciliator, discuss the agenda and explore the possibilities of conciliation/settlement. First such meeting shall be held within Seven (7) days of the nomination of the conciliation team by both the parties. The venue for conducting conciliation proceedings will be TCIL Bhawan, Greater Kailash-I, New Delhi 110048.
- 5) The conciliator shall assist the parties in an independent and impartial manner in their attempt to reach an amicable settlement of their dispute.
- 6) The conciliator shall be guided by principles of objectivity, fairness and justice, giving consideration to, among other things, the rights and obligations of the parties, the usages of the trade concerned and the circumstances surrounding the dispute, including any previous business practices between the parties.
- 7) The conciliator may conduct the conciliation proceedings in such a manner as he considers appropriate, taking into account the circumstances of the case, the wishes the parties may express, including any request by a party that the conciliator hear oral statements, and the need for a speedy settlement of the dispute.
- 8) The conciliator may, at any stage of the conciliation proceedings, make proposals for a settlement of the dispute. Such proposals need not be in writing and need not be accompanied by a statement of the reasons therefor.
- 9) The teams thereafter can meet any number of times under the guidance and supervision of Conciliator and will try to find a solution that is acceptable to both the parties. The

conciliation may be successful or partially successful. On the points of dispute or part of a dispute wherein parties have agreed for a common ground, the officers representing each party shall seek approval of their respective company/entity. After that a settlement deed shall be drafted and signed by the authorized representatives of the parties. When the parties sign the settlement agreement, it shall be final and binding on the parties and persons claiming under them respectively and this shall not be challenged by any of the party in any court or under any law. The parties shall unequivocally affirm, declare and confirm in the settlement agreement that they have signed the agreement without any coercion, duress, inducement and were fully competent to sign the said agreement.

- 10) The conciliator shall endorse and authenticate the settlement agreement and furnish a copy thereof to each of the parties.
- 11) The conciliation process shall be concluded within 60 days of nomination of its representatives by the second party. However, the parties, with mutual consent can extend this period and then the conciliation proceedings shall be concluded in this extended period.
- 12) If no settlement is arrived between the parties in the time mentioned in clause 5) above, then the conciliation proceedings shall be deemed to have been failed.
- 13) The conciliator shall intimate the appointing authority the final outcome of the conciliation proceedings.

3. **Resort to arbitral or judicial proceedings:**

The parties shall not initiate, during the conciliation proceedings, any arbitral or judicial proceedings in respect of a dispute that is the subject-matter of the conciliation proceedings except that a party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights.

4. **Admissibility of evidence in other proceedings.**

- 1) The parties shall not rely on or introduce as evidence in arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of the conciliation proceedings,—
 - (a) views expressed or suggestions made by the other party in respect of a possible settlement of the dispute;
 - (b) admissions made by the other party in the course of the conciliation proceedings;
 - (c) Proposals made by the parties or conciliator;
 - (d) The fact that the other party had indicated his willingness to accept a proposal for settlement made by the other party.

5. **Confidentiality.**

Notwithstanding anything contained in any other law for the time being in force, the parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement, except where its disclosure is necessary for purposes of implementation and enforcement.

6. **Termination of conciliation proceedings.**

The conciliation proceedings shall be terminated on happening of any of the conditions below:-

- 1) by the signing of the settlement agreement by the parties, on the date of the agreement; or
- 2) by a written declaration of the conciliator, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or
- 3) by a written declaration of the parties addressed to the conciliator to the effect that the conciliation proceedings are terminated, on the date of the declaration; or
- 4) by a written declaration of a party to the other party and the conciliator, if appointed, to the effect that the conciliation proceedings are terminated, on the date of the declaration; or

- 5) by the lapse of time or extended time as provided in clause 2(12) above

END OF SECTION – 19

SECTION-20

F.No.6/18/2019-PPD
Ministry of Finance
Department of Expenditure
Public Procurement Division


161, North Block,
New Delhi
23rd July, 2020

Office Memorandum

Subject: Insertion of Rule 144 (xi) in the General Financial Rules (GFRs), 2017

Rule 144 of the General Financial Rules 2017 entitled 'Fundamental principles of public buying', has been amended by inserting sub-rule (xi) as under:

Notwithstanding anything contained in these Rules, Department of Expenditure may, by order in writing, impose restrictions, including prior registration and/or screening, on procurement from bidders from a country or countries, or a class of countries, on grounds of defence of India, or matters directly or indirectly related thereto including national security; no procurement shall be made in violation of such restrictions.


(Sanjay Prasad)
Joint Secretary (PPD)
Email ID: js_pfc2.doe@gov.in
Telephone: 011-23093882

To,
(1) Secretaries of All Ministries/ Departments of Government of India
(2) Chief Secretaries/ Administrators of Union Territories/ National Capital Territory of Delhi

1/1

F.No.6/18/2019-PPD
Ministry of Finance
Department of Expenditure
Public Procurement Division

161, North Block,
New Delhi
23rd July, 2020

Order (Public Procurement No. 1)

Subject: Restrictions under Rule 144 (xi) of the General Financial Rules (GFRs), 2017

Attention is invited to this office OM no. 6/18/2019-PPD dated 23rd July 2020 inserting Rule 144 (xi) in GFRs 2017. In this regard, the following is hereby ordered under Rule 144 (xi) on the grounds stated therein:

Requirement of registration

1. Any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with the Competent Authority, specified in **Annex I**.
2. This Order shall not apply to (i) cases where orders have been placed or contract has been concluded or letter/notice of award/ acceptance (LoA) has been issued on or before the date of this order; and (ii) cases falling under **Annex II**.

Transitional cases

3. Tenders where no contract has been concluded or no LoA has been issued so far shall be handled in the following manner: -
 - a) *In tenders which are yet to be opened, or where evaluation of technical bid or the first exclusionary qualificatory stage (i.e. the first stage at which the qualifications of tenderers are evaluated and unqualified bidders are excluded) has not been completed:* No contracts shall be placed on bidders from such countries. Tenders received from bidders from such countries shall be dealt with as if they are non-compliant with the tender conditions and the tender shall be processed accordingly.
 - b) *If the tendering process has crossed the first exclusionary qualificatory stage:* If the qualified bidders include bidders from such countries, the

3/12

entire process shall be scrapped and initiated *de novo*. The *de novo* process shall adhere to the conditions prescribed in this Order.

- c) As far as practicable, and in cases of doubt about whether a bidder falls under paragraph 1, a certificate shall be obtained from the bidder whose bid is proposed to be considered or accepted, in terms of paras 8, 9 and 10 read with para 1 of this Order.

Incorporation in tender conditions

4. In tenders to be issued after the date of this order, the provisions of paragraph 1 and of other relevant provisions of this Order shall be incorporated in the tender conditions.

Applicability

5. Apart from Ministries / Departments, attached and subordinate bodies, notwithstanding anything contained in Rule 1 of the GFRs 2017, this Order shall also be applicable
- a. to all Autonomous Bodies;
 - b. to public sector banks and public sector financial institutions; and
 - c. subject to any orders of the Department of Public Enterprises, to all Central Public Sector Enterprises; and
 - d. to procurement in Public Private Partnership projects receiving financial support from the Government or public sector enterprises/ undertakings.
 - e. Union Territories, National Capital Territory of Delhi and all agencies/ undertakings thereof

Definitions

6. "Bidder" for the purpose of this Order (including the term 'tenderer', 'consultant' 'vendor' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency, branch or office controlled by such person, participating in a procurement process.
7. "Tender" for the purpose of this Order will include other forms of procurement, except where the context requires otherwise.
8. "Bidder from a country which shares a land border with India" for the purpose of this Order means

3/12

- a) An entity incorporated, established or registered in such a country; or
 - b) A subsidiary of an entity incorporated, established or registered in such a country; or
 - c) An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - d) An entity whose *beneficial owner* is situated in such a country; or
 - e) An Indian (or other) agent of such an entity; or
 - f) A natural person who is a citizen of such a country; or
 - g) A consortium or joint venture where any member of the consortium or joint venture falls under any of the above
9. "Beneficial owner" for the purpose of paragraph 8 above will be as under:
- (i) In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person(s), has a controlling ownership interest or who exercises control through other means.
Explanation—
 - a. "Controlling ownership interest" means ownership of, or entitlement to, more than twenty-five per cent of shares or capital or profits of the company;
 - b. "Control" shall include the right to appoint the majority of the directors or to control the management or policy decisions, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;
 - (ii) In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;
 - (iii) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
 - (iv) Where no natural person is identified under (i) or (ii) or (iii) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

4/12

(v) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

10. "Agent" for the purpose of this Order is a person employed to do any act for another, or to represent another in dealings with third persons.

Sub-contracting in works contracts

11. In works contracts, including turnkey contracts, contractors shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of "contractor from a country which shares a land border with India" shall be as in paragraph 8 above. This shall not apply to sub-contracts already awarded on or before the date of this Order.

Certificate regarding compliance

12. A certificate shall be taken from bidders in the tender documents regarding their compliance with this Order. If such certificate given by a bidder whose bid is accepted is found to be false, this would be a ground for immediate termination and further legal action in accordance with law.

Validity of registration

13. In respect of tenders, registration should be valid at the time of submission of bids and at the time of acceptance of bids. In respect of supply otherwise than by tender, registration should be valid at the time of placement of order. If the bidder was validly registered at the time of acceptance / placement of order, registration shall not be a relevant consideration during contract execution.

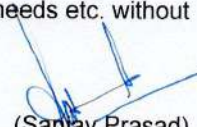
Government E-Marketplace

14. The Government E-Marketplace shall, as soon as possible, require all vendors/ bidders registered with GeM to give a certificate regarding compliance with this Order, and after the date fixed by it, shall remove non-compliant entities from GeM unless/ until they are registered in accordance with this Order.

5/12

Model Clauses/ Certificates

15. Model Clauses and Model Certificates which may be inserted in tenders / obtained from Bidders are enclosed as **Annex III**. While adhering to the substance of the Order, procuring entities are free to appropriately modify the wording of these clauses based on their past experience, local needs etc. without making any reference to this Department.


(Sanjay Prasad)
Joint Secretary (PPD)
Email ID: js.pfc2.doe@gov.in
Telephone: 011-23093882

To

- (1) Secretaries of All Ministries/ Departments of Government of India for information and necessary action. They are also requested to inform these provisions to all procuring entities.
- (2) Secretary, Department of Public Enterprises with a request to immediately reiterate these orders in respect of Public Enterprises.
- (3) Secretary DPIIT with a request to initiate action as provided under Annex I
- (4) Chief Secretaries/ Administrators of Union Territories/ National Capital Territory of Delhi

6/12

Annex I: Competent Authority and Procedure for Registration

- A. The Competent Authority for the purpose of registration under this Order shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT)*.
- B. The Registration Committee shall have the following members*:
- i. An officer, not below the rank of Joint Secretary, designated for this purpose by DPIIT, who shall be the Chairman;
 - ii. Officers (ordinarily not below the rank of Joint Secretary) representing the Ministry of Home Affairs, Ministry of External Affairs, and of those Departments whose sectors are covered by applications under consideration;
 - iii. Any other officer whose presence is deemed necessary by the Chairman of the Committee.
- C. DPIIT shall lay down the method of application, format etc. for such bidders as stated in para 1 of this Order.
- D. On receipt of an application seeking registration from a bidder from a country covered by para 1 of this Order, the Competent Authority shall first seek political and security clearances from the Ministry of External Affairs and Ministry of Home Affairs, as per guidelines issued from time to time. Registration shall not be given unless political and security clearance have both been received.
- E. The Ministry of External Affairs and Ministry of Home Affairs may issue guidelines for internal use regarding the procedure for scrutiny of such applications by them.
- F. The decision of the Competent Authority, to register such bidder may be for all kinds of tenders or for a specified type(s) of goods or services, and may be for a specified or unspecified duration of time, as deemed fit. The decision of the Competent Authority shall be final.
- G. Registration shall not be granted unless the representatives of the Ministries of Home Affairs and External Affairs on the Committee concur*.
- H. Registration granted by the Competent Authority of the Government of India shall be valid not only for procurement by Central Government and its agencies/ public enterprises etc. but **also for procurement by State Governments and their agencies/ public enterprises etc. No fresh registration at the State level shall be required.**

7/12

- I. The Competent Authority is empowered to cancel the registration already granted if it determines that there is sufficient cause. Such cancellation by itself, however, will not affect the execution of contracts already awarded. Pending cancellation, it may also suspend the registration of a bidder, and the bidder shall not be eligible to bid in any further tenders during the period of suspension.
- J. For national security reasons, the Competent Authority shall not be required to give reasons for rejection / cancellation of registration of a bidder.
- K. In transitional cases falling under para 3 of this Order, where it is felt that it will not be practicable to exclude bidders from a country which shares a land border with India, a reference seeking permission to consider such bidders shall be made by the procuring entity to the Competent Authority, giving full information and detailed reasons. The Competent Authority shall decide whether such bidders may be considered, and if so shall follow the procedure laid down in the above paras.
- L. Periodic reports on the acceptance/ refusal of registration during the preceding period may be required to be sent to the Cabinet Secretariat. Details will be issued separately in due course by DPIIT.

[*Note:

- i. In respect of application of this Order to procurement by/ under State Governments, all functions assigned to DPIIT shall be carried out by the State Government concerned through a specific department or authority designated by it. The composition of the Registration Committee shall be as decided by the State Government and paragraph G above shall not apply. However, the requirement of **political and security clearance as per para D shall remain and no registration shall be granted without such clearance.**
- ii. Registration granted by State Governments shall be valid only for procurement by the State Government and its agencies/ public enterprises etc. and shall not be valid for procurement in other states or by the Government of India and their agencies/ public enterprises etc.]

8/12

Annex II: Special Cases

- A. Till 31st December 2020, procurement of medical supplies directly related to containment of the Covid-19 pandemic shall be exempt from the provisions of this Order.
- B. *Bona fide* procurements made through GeM without knowing the country of the bidder till the date fixed by GeM for this purpose, shall not be invalidated by this Order.
- C. *Bona fide* small procurements, made without knowing the country of the bidder, shall not be invalidated by this Order.
- D. In projects which receive international funding with the approval of the Department of Economic Affairs (DEA), Ministry of Finance, the procurement guidelines applicable to the project shall normally be followed, notwithstanding anything contained in this Order and without reference to the Competent Authority. Exceptions to this shall be decided in consultation with DEA.
- E. This Order shall not apply to procurement by Indian missions and by offices of government agencies/ undertakings located outside India.

9/12

Annex III**Model Clause /Certificate to be inserted in tenders etc.**

(While adhering to the substance of the Order, procuring entities and GeM are free to appropriately modify the wording of the clause/ certificate based on their past experience, local needs etc.)

Model Clauses for Tenders

- I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.
- II. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.
- III. "Bidder from a country which shares a land border with India" for the purpose of this Order means: -
 - a. An entity incorporated, established or registered in such a country; or
 - b. A subsidiary of an entity incorporated, established or registered in such a country; or
 - c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - d. An entity whose *beneficial owner* is situated in such a country; or
 - e. An Indian (or other) agent of such an entity; or
 - f. A natural person who is a citizen of such a country; or
 - g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above
- IV. The *beneficial owner* for the purpose of (iii) above will be as under:
 1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

Explanation—

 - a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. of shares or capital or profits of the company;

10/12

- b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;
2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;
 3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
 4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
 5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.
- V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.
- VI. *[To be inserted in tenders for Works contracts, including Turnkey contracts]* The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

Model Certificate for Tenders (for transitional cases as stated in para 3 of this Order)

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I hereby certify that this bidder is not from such a country and is eligible to be considered."

Model Certificate for Tenders

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the

"/s/

Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Model Certificate for Tenders for Works involving possibility of sub-contracting

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Model Certificate for GeM:

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this vendor/ bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this vendor/ bidder fulfills all requirements in this regard and is eligible to be considered for procurement on GeM. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

12/12

Annexure-B

Note:- To be submitted on Company Letter Head

To

Executive Director(IT&T-III)
Telecommunications Consultants India Limited
401, 4th Floor, TCIL Bhawan,
Greater Kailash-1, New Delhi-110048

Sub:- Undertaking regarding non-performance / Non-Cancellation of P.O

I/We Undertake that our Purchase Order(s) for any Project of TCIL/ State Govt/Central Govt/any Govt entites was/were not cancelled on risk & cost basis for non-performance or non- submission of performance guarantee in last 2 years.

(Signature of Bidder)
Name, Designation

ANNEXURE-CFINANCIAL DATANAME OF THE BIDDER:-

S. No.	Description	Financial Data for last 7 Financial Years						
		2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17
1.	Total value of Construction works as per Audited Financial Statements							

NOTE:-

- (i) Attach all copies of Audited Financial Statements of the last Seven Financial Years, as mentioned above.
- (ii) The Financial data as per above annexure shall be certified by the Chartered Accountant/ Statutory Auditor in original under his signature, stamp and membership number.
- (iii) Historic Financial Statement must be complete, including all notes to the financial statements.
- (iv) If Audited Balance Sheet of any Financial Year is not submitted, the bid of such bidders will be considered as non- responsive.

ANNEXURE- D**Calculation of bidding capacity****Details of existing commitments and ongoing works.**

S. No.	Name of work/ project and location	Owner or sponsoring organization	Contract value in crore of rupees	Date of commencement as per contract	Stipulated date of completion	Progress of work Upto date	Remaining work in percentage	Existing commitment including awarded LOI if any	Name and address/ telephone	Remarks
	2	3	4	5	6		8	9	10	11

Total (B) =
Maximum turnover in last seven years = Rs.....
Updated value of turnover (A) = Rs.....
No. of years (N) =
Bidding Capacity= {[AxMxN]-B} =

Certificate:
I certify that all the awarded and ongoing works have been included in the above list.

(Signature of Bidder(s))

The bidding capacity shall be worked out by the following formula:

$$\text{Bid capacity} = \{[AxMxN]-B\}$$

Where,

A = Maximum value of engineering (Civil/ Electrical/ Mechanical as relevant to work being procured) works executed in any one year during the last Seven years (updated at the current price level), taking into account the completed as well as works in progress

M = Multiplier Factor = 1.5

N = Numbers of years prescribed for completion of work for which bids has been invited;

B = Value (updated at the current price level) of the existing commitments and ongoing works to be completed in the next 'N' years

Note:- This certificate should be duly signed by Statutory Auditor/Chartered Accountant

ANNEXURE-E

Note:- Undertaking will be given on company letterhead

NON-RELATIONSHIP CERTIFICATE

I..... s/o.....r/o..... hereby certify that none of my relative(s) as defined in the tender document is/are employed in TCIL unit as per details given in tender document. In case at any stage, it is found that the information given by me is false/incorrect, TCIL shall have the absolute right to take any action as deemed fit/without any prior intimation to me.”

Date:-

Signature of Tenderer

Place:

Name of Tenderer- Along with date & Seal

Instructions:-

In case of proprietorship firm certificate will be given by the proprietor.

For partnership firm certificate will be given by all the partners. In case of limited company by all the Directors of the company excluding Government of India/Financial institution nominees and independent non-Official part time Directors appointed by Govt. of India or the Governor of the state and full time Directors of PSUs both state and central.

Due to any breach of these conditions by the company or firm or any other person the tender will be cancelled and Bid Security will be forfeited at any stage whenever it is noticed and TCIL/ MSEDCL will not pay any damage to the company or firm or the concerned person.

The company or firm or the person will also be debarred for further participation in the concerned unit.

The near relatives for this purpose are defined as:-

- (a) Members of a Hindu undivided family.
- (b) They are husband and wife.
- (c) The one is related to the other in the manner as father, mother, son(s) & Son's wife (daughter in law), Daughter(s) and daughter's husband (son in law), brother(s) and brother's wife, sister(s) and sister's husband (brother in law)

Annexure-F**FORM OF CERTIFICATE OF FINANCIAL PARAMETERS FOR ELIGIBILITY****(as per Clause 1.2 Section 1)****(Rupees in Lakhs)**

S. No.	Financial parameters	2023-22	2022-21	2021-20
1.	Net Worth			
a)	Paid up Capital			
b)	Free Reserves and Surplus*			
c)	Misc. expenses to the extent not written off			
	Net Worth (a+b-c)			
2.	Annual Turnover **			
3.	Liquid Asset (TotalCurrent Asset -			

* Free Reserve and Surplus should be Exclusive of Revaluation Reserve, written back of Depreciation Provision and Amalgamation.

** Annual total Income/ turnover as incorporated in the Profit and Loss Account excluding non-recurring income, i.e., sale of fixed asset etc.

It is certified that all the figures are based on audited accounts read with auditors report and notes to Accounts etc.

Date

Certified By

Place

(Chartered Accountants)
Membership No.
Seal

Annexure-G**FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF
CREDIT/FACILITIES****BANK
CERTIFICATE**

This is to certify that M/s. _____ (*insert Name & Address of the Contractor*) who have submitted their bid to (*insert name of the Employer*) against their tender specification Vide ref. No. for (*insert name of the package along with the project name*) is our customer for the past years.

Their financial transactions with our Bank have been satisfactory. They enjoy the following fund based and non-fund-based limits including for guarantees, L/C, and other credit facilities with us against which the extent of utilization as on date is also indicated below:

Sl. No.	Type of Facility	Sanctioned Limit as on Date	Utilisation as on Date

This letter is issued at the request of M/s. _____.

Signature _____

Name of Bank _____

Name of Authorised Signatory _____

Designation _____

Phone No. _____

Address _____

SEAL OF THE BANK

Annexure-H

PRICE ADJUSTMENT

The prices for execution of the entire works covered under the scope of this work shall be quoted by the Bidder in the manner specified, in the BPS. The Ex-works price component, less advance will be subject to price adjustment, only for equipment/materials/items of work specifically stated under clause 1.0 below, (for which the bidder shall quote a base price), based on separate formulae as per price adjustment provisions given herein. However, it shall be noted that the Price Adjustment clause will be effective from the contract signing date. The "IA" shall ensure that all the Price Adjustment would be governed as per the approved L-2 schedule signed by "IA" and Contractor, which would be included in the contract.

Prices for Ex-works price component for all other equipment/items except specified at Clause 1.0 below, Charges for Erection, Inland Freight & Insurance etc. shall be FIRM and no price adjustment shall be applicable for these components for the entire duration of the Contract.

No price adjustment shall be applicable on the portion of the Contract Price payable to the Contractor as advance payment. However, if a Contractor opts for no advance then Price Adjustment would be applicable on 100% contract value.

Note :- Positive Price Variation will be applicable for works executed during original contract period only but negative Price Variation will be applicable till Completion of the works.

1.0 Materials and Labour portion:

i. For ACSR Conductor

The price quoted/confirmed for Aluminum Conductor is based on the input cost of raw materials as on the date of quotation. It is deemed to be related to the prices of the raw materials, as specified in the price variation clauses mentioned below. In case of any variation in these prices, the prices payable shall be subject to adjustment up or down in accordance with the following formula:

For Excise duty units:

$$P = P_o + WA (AL - ALo) + WF (FE - FE_o)$$

For Excise duty exempted units:

$$P = P_o + WA (AL_e - AL_{oe}) + WF (FE_e - FE_{oe})$$

Wherein,

P = Ex-works price payable in Rs. Per km as adjusted in accordance with the price variation clause

P_o = Ex-works price quoted/confirmed in Rs. Per km.

WA = Weight of Aluminium in ACSR conductor in MT per km. (As per IS: 398) WF = Weight of Steel content in the ACSR conductor in MT per km. (As per IS:398)

AL = Price of EC Grade Aluminium Ingot/Rod (as per contract) exclusive of excise duty in Rs./MT for the conductor. This price is applicable prevailing as on 30 days prior to the date of delivery.

AL_e = Price of EC Grade Aluminium Ingot/Rod (as per contract) inclusive of excise duty in Rs./MT for the conductor. This price is applicable prevailing as on 30 days prior to the date of tender delivery.

AL_o = Price of EC Grade Aluminium Ingot/Rod (as per contract) exclusive of excise duty in Rs./MT for the conductor. This price is applicable prevailing as on 30 days prior to the date of tender opening.

ALoe = Price of EC Grade Aluminium Ingot/Rod (as per contract) inclusive of excise duty in Rs./MT for the conductor. This price is applicable prevailing as on 30 days prior to the date of tender opening.

FE = Price (exclusive of excise duty) of high tensile galvanized steel wire in Rs./MT of appropriate size. This price is applicable prevailing as on 30 days prior to the date of delivery.

FEe = Price (exclusive of excise duty) of high tensile galvanized steel wire in Rs./MT of appropriate size. This price is applicable prevailing as on 30 days prior to the date of delivery.

FEo = Price (exclusive of excise duty) of high tensile galvanized steel wire in Rs./MT of appropriate size. This price is applicable prevailing as on 30 days prior to the date of tender opening.

FEoe = Price (exclusive of excise duty) of high tensile galvanized steel wire in Rs./MT of appropriate size. This price is applicable prevailing as on 30 days prior to the date of tender opening.

Note : In case of any clarifications in the above formula kindly refer the IEEMA price variation formula for ACSR conductors given in circular IEEMA/PVC/CONDUCTOR/2012 effective from 1 st April 2012, In case of any discrepancies the IEEMA circular mentioned shall prevail.

ii. For Station/ Power Transformer

The price adjustment on the Ex-works price component, less advance, of Transformers shall be as follows:

1. The price variation clause for 'Power Transformers'

The price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = 0.01 \times P_o (6 + 32 \times (C / C_o) + 27 \times (ES / ESo) + 12 \times (IS / ISo) + 4 \times (IM / IMo) + 9 \times (TO / TOo) + 10 \times (W/W_o))$$

Wherein,

P = Price payable as adjusted in accordance with the above formula. P_o = Price quoted / confirmed.

C_o = Price of CC copper rods (as published by IEEMA) This price is applicable for the month, one month prior to the date of tendering.

ES_o = Price of CRGO Electrical steel lamination (as published by IEEMA) This price is applicable for the month, one month prior to the date of tendering.

IS_o = Average price of steel Plates 10 mm thick (as published by IEEMA) This price is applicable for the month, one month prior to the date of tendering.

IM_o = Price of Insulating Material (as published by IEEMA) This price is applicable for the month, one month prior to the date of tendering

TO_o = Price of Transformer oil (as published by IEEMA) This price is applicable for the month, one month prior to the date of tendering.

W_o = All India average consumer price index number for industrial workers, as published by the labour bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100) This index number is applicable for the month, three months prior to the date of tendering.

C = Price of CC copper rods (as published by IEEMA) This price is applicable for the month, two months prior to the date of delivery.

ES = Price of CRGO Electrical steel lamination (as published by IEEMA) This price is applicable for the month, two months prior to the date of delivery.

IS = Average price of Steel Plates 10 mm thick (as published by IEEMA) This price is applicable for the month, one month prior to the date of delivery.

IM = Price of Insulating Material (as published by IEEMA) This price is applicable for the month, two months prior to the date of delivery.

TO = Price of Transformer oil (as published by IEEMA) This price is applicable for the month, one month prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the labour bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100) This index number is as applicable for the month, three months prior to the date of delivery.

Note : In case of any clarifications in the above formula kindly refer the IEEMA price variation formula given in circular IEEMA/PVC/PWR TRF_upto 400 KV/2021 effective from 1 st September 2021, In case of any discrepancies the IEEMA circular mentioned shall prevail.

iii. Station / Distribution Transformer (Aluminum/Copper wound)

The price adjustment on the Ex-works price component, less advance, of Transformers shall be as follows:

1. The price variation clause for Aluminium wound distribution transformers (Single & Three phase of ratings upto and including 2,500kVA and voltage upto 33kV) complete with all accessories and components.

The price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = 0.01 \times P_o (8 + 22 \times (AL / ALo) + 36 \times (ES / ESo) + 12 \times (IS / ISo) + 5 \times (IM / IMo) + 10 \times (TO / TOo) + 7 \times (W / Wo))$$

Wherein,

P = Price payable as adjusted in accordance with the above formula. P_o = Price quoted / confirmed.

ALo = LME CSP Average of Aluminium (as published by IEEMA) This price as applicable for the month, one month prior to the date of tendering.

ESo = Price of CRGO Electrical steel lamination (as published by IEEMA) This price as applicable for the month, one month prior to the date of tendering.

ISo = Price of the HR coil of 3.15 mm thickness (as published by IEEMA) This price is as applicable for the month, one month prior to the date of tendering.

IMo = Price of Insulating Material (as published by IEEMA) This price is as applicable for the month, month prior to the date of tendering.

TOo = Price of Transformer oil (as published by IEEMA) This price is as applicable for the month, one month prior to the date of tendering.

Wo = All India average consumer price index number for industrial workers, as published by the labour bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) This index number is as applicable for the month, three months prior to the date of tendering.

AL = LME CSP Average of Aluminium (as published by IEEMA) This price as applicable for the month, one month prior to the date of delivery.

ES = Price of CRGO Electrical steel lamination (as published by IEEMA) This price as applicable for the month, one month prior to the date of delivery.

IS = Price of the HR coil of 3.15 mm thickness (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

IM = Price of Insulating Material (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

TO = Price of Transformer oil (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the labour bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100) This index number is as applicable for the month, three months prior to the date of delivery.

Note : In case of any clarifications in the above formula kindly refer the IEEMA price variation formula given in circular IEEMA/PVC/DIST_AL_upto 2.5 MVA/2021 effective from 1st September 2021, In case of any discrepancies the IEEMA circular mentioned shall prevail.

2. The price variation clause for Copper wound distribution transformers (Single & Three phase of ratings upto and including 2,500kVA and voltage upto 33kV) complete with all accessories and components.

The price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = 0.01 \times P_o (7 + 41 \times (C / C_o) + 23 \times (ES / ESo) + 10 \times (IS / ISo) + 5 \times (IM / IMo) + 8 \times (TO / TOo) + 6 \times (W / Wo))$$

Wherein,

P = Price payable as adjusted in accordance with the above formula. P_o = Price quoted / confirmed.

C_o = Price of CC copper rods (as published by IEEMA) This price as applicable for the month, one month prior to the date of tendering.

ESo = Price of CRGO Electrical steel lamination (as published by IEEMA) This price as applicable for the month, one month prior to the date of tendering.

ISo = Price of the HR coil of 3.15 mm thickness (as published by IEEMA) This price is as applicable for the month, one month prior to the date of tendering.

IMo = Price of Insulating Material (as published by IEEMA) This price is as applicable for the month, one month prior to the date of tendering.

TOo = Price of Transformer oil (as published by IEEMA) This price is as applicable for the month, one month prior to the date of tendering.

Wo = All India average consumer price index number for industrial workers, as published by the labour bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) This index number is as applicable for the month, three months prior to the date of tendering.

C = Price of CC copper rods (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

ES = Price of CRGO Electrical steel lamination (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

IS = Price of the HR coil of 3.15 mm thickness (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

IM = Price of Insulating Material (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

TO = Price of Transformer oil (as published by IEEMA) This price is as applicable for the month, one month prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the labour bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) This index number is as applicable for the month, three months prior to the date of delivery.

Note : In case of any clarifications in the above formula kindly refer the IEEMA price variation formula given in circular IEEMA/PVC/DIST_CU_upto 2.5 MVA/2021 effective from 1st September 2021, In case of any discrepancies the IEEMA circular mentioned shall prevail.

iv. Cables

The price adjustment on the Ex-works price component, less advance, of Cables shall be as follows:

Terms used in price variation formula :

P = Price payable as adjusted in accordance with the appropriate formula (inRs/km)

Po = Price quoted/confirmed (in Rs/km)

Aluminium

AIF = Variation factor in Aluminium (as published by IEEMA)

Al = Price of EC grade aluminum rods (Properzi rods) (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of delivery.

Alo = Price of EC grade aluminum rods (Properzi rods) (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of tendering.

Copper

CuF = Variation factor for copper

Cu = Price of CC copper rods (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of delivery.

Cuo = Price of CC copper rods (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of tendering.

PVC Compound Polymer

PVCc = Price of PVC compound (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of delivery.

PVCco = Price of PVC compound (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of tendering.

CCFAI = Variation factor for PVC Compound/ Polymer for aluminum conductor cable (as published by IEEMA)

CCFCu = Variation factor for PVC Compound/ Polymer for copper conductor cable (as published by IEEMA)

XLPE COMPOUND

Cc = Price of XLPE compound. This price is as applicable on first working day of the month, one month prior to the date of delivery.

Cco = Price of XLPE compound. This price is as applicable on first working day of the month, one month prior to the date of tendering.

XLFAL = Variation factor for XLPE compound for aluminum conductor cable.

XLFCU = Variation factor for XLPE compound for Copper Conductor cable.

Steel

FeF = Variation factor for steel (as published by IEEMA)

FeW = Variation factor for round wire steel armouring (as published by IEEMA)

Fe = Price of steel strips / steel wire (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of delivery.

Feo = Price of steel strips / steel wire (as published by IEEMA). This price is as applicable on the first working day of the month, one month prior to the date of tendering. The prices and indices mentioned

above are published by IEEMA vide circular reference IEEMA(PVC)/Cable/--/-- prevailing as on 1st working day of the month i.e., one month prior to the date of tendering.

Price variation formulae for Power Cables

A. Aluminium conductor PVC insulated 1.1kV power cables

$P = P_o + AIF (AL - ALo) + CCFAI (PVCC - PVCco) + FeF (Fe - Feo)$ For unarmoured multicore cables (without steel armour); $FeF = 0$

B. Copper conductor PVC insulated 1.1kV power cables

$P = P_o + CuF (Cu - Cuo) + CCFCu (PVCC - PVCco) + FeF (Fe - Feo) + AIF (AL - ALo)$

For steel armoured cables; $AIF = 0$ For aluminium armoured cables ; $FeF = 0$ For unarmoured cables ; $FeF, AIF = 0$

C. Copper conductor PVC insulated 1.1kV control cables

$P = P_o + CuF (Cu - Cuo) + CCFCu (CC - Cco) + FeF (Fe - Feo)$

For unarmoured cables; $FeF = 0$

D. Aluminium conductor XLPE insulated 1.1kV power cables

$P = P_o + AIF (AL - ALo) + XLFAL (CC - Cco) + CCFAI (PVCC - PVCco) + FeF (Fe - Feo)$

For unarmoured cables; $FeF = 0$

E. Copper conductor XLPE insulated 1.1kV power cables

$P = P_o + CuF (Cu - Cuo) + XLFCU (CC - Cco) + CCFCu (PVCC - PVCco) + FeF (Fe - Feo) + AIF (AL - ALo)$

For steel armoured cables; $AIF = 0$

For aluminium armoured cables ; $FeF = 0$

For unarmoured cables ; $FeF, AIF = 0$

F. Copper conductor XLPE insulated 1.1kV control cables

$P = P_o + CuF (Cu - Cuo) + XLFCU (CC - Cco) + CCFCu (PVCC - PVCco) + FeF (Fe - Feo)$

For unarmoured cables; $FeF = 0$

G. For Aluminium conductor XLPE insulated 3.3 to 33kV power cables

$P = P_o + AIF (AL - ALo) + XLFAL (CC - Cco) + CCFAI (PVCC - PVCco) + FeF (Fe - Feo)$

For unarmoured multicore cables (without steel armour); $FeF = 0$

H. Copper conductor XLPE insulated 3.3 to 33kV power cables

$P = P_o + CuF (Cu - Cuo) + XLFCU (CC - Cco) + CCFCu (PVCC - PVCco) + FeF (Fe - Feo) + AIF (AL - ALo)$

For steel armoured cables; $AIF = 0$

For aluminium armoured cables; $FeF = 0$

For unarmoured cables; $FeF, AIF = 0$

Note : In case of any clarifications in the above formula kindly refer the IEEMA price variation formula given in circular IEEMA/DIV/CAB/05 dated 24.04.2018 effective from 1 st November 2017, In case of any discrepancies the IEEMA circular mentioned shall prevail.

v. **A. Steel Structure**

Steel structure (excluding nuts, bolts) used in fabrication work at various places in Sub Transmission and Distribution network (such as lattice structure used in ST&D network/line, switchyard etc.), which are billable items in the Bill of quantity (BOQ) shall be covered under this head. The price adjustment formula for such structural steel items shall be as mentioned hereinafter.

The price component of the structural steel for any shipment/ dispatch comprises of a fixed portion (designated as 'F' and the value of which is specified hereunder) and a variable portion linked with the indices for respective materials and labour (description and co-efficient as enumerated below).

The amount of price adjustment towards variable portion payable/recoverable on each shipment/dispatch shall be computed as under:

EC = EC1 - EC0

EC1 will be computed as follows in any of appropriate manner as applicable (a or b or c):

a) For structure using both heavy and lighter angles: $EC1 = EC0 * [F + 0.18 * (HA1/HA0) + 0.40 * (LA1/LA0) + 0.16 * (Zn1/Zn0) + 0.11 * (L1/L0)]$

b) For structure using only heavy angles:

$EC1 = EC0 * [F + 0.58 * (HA1/HA0) + 0.16 * (Zn1/Zn0) + 0.11 * (L1/L0)]$

c) For structure using only lighter angles:

$EC1 = EC0 * [F + 0.58 * (LA1/LA0) + 0.16 * (Zn1/Zn0) + 0.11 * (L1/L0)]$

d) Steel Pole Tower (including Bolts, Nuts & structural component etc.)

$EC1 = EC0 [0.15 + 0.58 * (HA1/HA0) + 0.16 * (Zn1/Zn0) + 0.11 * (L1/L0)] - EC0$

Where

EC = Adjustment to Ex-Works price component payable to Contractor for each shipment/dispatch

EC1 = Adjusted amount of Ex-works price component of Contract payable to Contractor for each shipment / dispatch.

EC0 = Ex-works price for the respective item of the Contract, Shipment/dispatch wise (quoted price).

F = Fixed portion of the ex-works/FOB component of the Contract Price (F) shall be 0.15.

HA = Price of Heavy angle steel, as published by IEEMA LA = Price of Lighter angle steel, as published by IEEMA

Zn = Price of electrolytic high grade zinc, as published by IEEMA

L = All India average Consumer Price Index Number for Industrial Workers (base 2001=100) as published/declared by Labour Bureau, Shimla, Government of India and circulated by IEEMA.

For the indices, subscript 'o' refers to indices as on 30 days prior to date set for opening of bids.

Subscript '1' refers to indices as of

(a) two months/sixty (60) days prior to the date of shipment/dispatch for labour, and

(b) at the expiry of two third (2/3) period from the date of Notification of Award to the date of shipment/dispatch, for material.

For the purpose of this clause the date of shipment/ dispatch shall mean the Schedule date of shipment/dispatch or actual date of shipment/dispatch, whichever is earlier. The schedule date of shipment/dispatch shall be as identified in line with provisions of Time Schedule in the Contract Agreement.

In case of shipments/ dispatches which are delayed beyond the schedule date of shipment/dispatch for reasons attributable to the Contractor, the price adjustment provision shall not be applicable for the period of time between the schedule date of shipment/dispatch and the actual date of shipment/dispatch.

Note: As per IEEMA Circular No. IEEMA(PVC)/TLT/(R)/02/2007-

1) Heavy Steel Angles of size 150mm*150mm*12mm as per IS-2062 has been categorized as Heavy Angles (HA).

2) Re-rolled steel angles of size 50mm*50mm*4 mm Lighter has been categorized as Lighter Angles (LA).

3) Input costs for all heavy angles of size above 110mm*110mm are deemed to be related to the price under Sr No.1.

4) Input costs for all lighter angles of size below & including 110mm*110mm are deemed to be related to the price under Sr No.2.

Steel Tubular Poles: PRICE VARIATION CLAUSE FOR POLES: The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

(A) Steel Tubular Poles

$$P = P_0 (7 + 70 IS IS_0 + 13 Zn Zn_0 + 10 W W_0)$$

(B) Polygonal Poles

$$P = P_0 (+ 64 IS IS_0 + 13 Zn Zn_0 + 14 W W_0)$$

Wherein,

P = Price payable as adjusted in accordance with the above formula. P₀ = Price quoted/confirmed.

ISO = Price of HR Coil of 3.15 mm thickness (refer notes) This price is as applicable for the month, ONE month prior to the date of tendering.

Zn₀ = Price of Electrolytic high grade zinc (refer notes) This price is as applicable on the 1st working day of the month, ONE month prior to the date of tendering.

W₀ = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) (Refer notes)

This index number is as applicable for the month, THREE months prior to the date of tendering.

For example, if date of tendering falls in May 2022, the applicable prices of HR Coil (ISO) should be for the month March 2022, Zinc (Zn₀) should be for the month April 2022 and all India average consumer price index number (W₀) should be for the month of February 2022.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA (PVC)/TLT-2014 (R-1)/_/ _ ONE month prior to the date of tendering.

IS = Price of HR Coil of 3.15 mm thickness (refer notes) This price is as applicable for the month, FOUR month prior to the date of delivery.

Zn = Price of Electrolytic high grade zinc (refer notes) This price is as applicable on the 1st working day of the month, ONE month prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) (Refer notes) This index number is as applicable on the first working day of the month, THREE months prior to the date of delivery.

For example, if date of delivery falls in December 2022, the applicable prices of HR Coil (IS) should be for August 2022 and Zinc (Zn) should be for the month November 2022 and all India average consumer price index number

(W) should be for the month of September 2022.

The date of delivery is the date on which Poles are notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

Notes: (a) All prices of raw materials are exclusive of GST and any other central, state or local taxes etc.

(b) The details of prices are as under:

1. Price of steel is the average retail price of HR Coil 3.15 mm thickness as published by Joint Plant Committee (JPC) in Rs./MT.

2. The price of Electrolytic high grade zinc (in Rs/MT) is ex-works price as quoted by a primary producer.

(C) Note : In case of any clarifications in the above formula kindly refer the IEEMA price variation formula given in circular 10/PVC/T & D Project/05 effective from 1 st April 2022, In case of any discrepancies the IEEMA circular mentioned shall prevail.

vi. **66/11 KV & 33/11 KV Switchgear (indoor/outdoor) including 66/33/11 KVCircuit Breakers and Isolators:**

The Contract Price shall be subject to price adjustment during performance of the Contract to reflect changes in the cost of labour and material components in accordance with the provisions described below.

The Ex-Works price of 66/11 KV & 33/11 KV Switchgear (Indoor/Outdoor), Circuit Breakers, and Isolators excluding Mandatory Spares and Type Tests Charges (if any) will be subject to Price adjustment. The price adjustment formula for the components of the Contract Price, as mentioned above shall be as stipulated hereinafter.

The price component of the equipment for any shipment/ dispatch comprises of a fixed portion (designated as 'F' and the value of which is specified hereunder) and a variable portion linked with the indices for various materials and labour (description and co-efficient as enumerated below).

The amount of price adjustment towards variable portion payable/recoverable on each shipment/dispatch shall be computed as under:

$$P = 0.01 \times P_o (20 + 28 (IS / ISo) + 26 (C / Co) + 4 (AL / ALo) + 9 (In / Ino) + 13 (W / Wo))$$

Wherein,

P = Price payable as adjusted in accordance with the above formula
Po = Price quoted/confirmed

ISo = Wholesale price index number for 'Manufacture of Basic Metals'(Base: 2011-12 = 100) (as published by IEEMA). This price index number for the month, Three month prior to the date of tendering

Co = Average LME settlement price of copper wire bars (as published by IEEMA). This price is applicable for the month, One month prior to the date of tendering

ALo = Price of busbar grade aluminum (as published by IEEMA). This price is applicable on the 1st working day of the month, One month prior to the date of tendering

Ino = Price of epoxy resin for indoor circuit breakers and switch gear (as published by IEEMA). This price is applicable on the 1st working day of the month, One month prior to the date of tendering

Or wholesale price index of insulator for outdoor circuit breakers (VBF and SDB) (as published by IEEMA). This index number is as applicable for the month, Three month prior to the date of tendering

Wo = All India average consumer price index number for industrial workers, as published by the Labour bureau, Ministry of Labour, Government of India (Base : 2001 = 100)

This index number is as applicable for the month, Four month prior to the date of tendering. (as published by IEEMA)

ISo = Wholesale price index number for 'Manufacture of Basic Metals'(Base: 2011-12 = 100) (as published by IEEMA).

This price index number for the month, Three month prior to the date of tendering

Co = Average LME settlement price of copper wire bars (as published by IEEMA). This price is applicable for the month, One month prior to the date of tendering

ALo = Price of busbar grade aluminum (as published by IEEMA). This price is applicable on the 1st working day of the month, One month prior to the date of tendering

Ino = Price of epoxy resin for indoor circuit breakers and switch gear (as published by IEEMA). This price is applicable on the 1st working day of the month, One month prior to the date of tendering

Or wholesale price index of insulator for outdoor circuit breakers (VBF and SDB) (as published by IEEMA). This index number is as applicable for the month, Three month prior to the date of tendering

Wo = All India average consumer price index number for industrial workers, as published by the Labour bureau, Ministry of Labour, Government of India (Base : 2001 = 100) (as published by IEEMA). This index number is as applicable for the month, Four month prior to the date of tendering

Note : In case of any clarifications in the above formula kindly refer the IEEMA price variation formula given in circular IEEMA/PVC/MVSWGR/2019 (R-2) effective from 1st January 2019, In case of any discrepancies the IEEMA circular mentioned shall prevail.

vii. Aerial Bunched Cables

The price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

P = Price payable as adjusted in accordance with above appropriate formula (inRs/Km)

Po = Price quoted/confirmed (in Rs/Km)n = No. of phase conductor ALUMINIUM

Alph= Aluminium factor for phase conductor (as published by IEEMA)

Alm= Aluminium factor for messenger conductor (as published by IEEMA)

Alsl= Aluminium factor for street light conductor (as published by IEEMA)

Aln= Aluminium factor for neutral conductor (as published by IEEMA)

AI = Price of LME average Cash SELLER Settlement price of Primary Aluminium in US\$ per MT as published by London Metal Bulletin (LME) including Premium for Aluminium Ingot in US\$ per MT converted in Rs./MT This price is as applicable of first working day of the month, one month prior to the date of delivery.

Alo = Price of LME average Cash SELLER Settlement price of Primary Aluminium in US\$ per MT as published by London Metal Bulletin (LME) including Premium for Aluminium Ingot in US\$ per MT converted in Rs./MT This price is as applicable on first working day of the month, one month prior to the date of tendering.

XLPE COMPOUND

CCFAlph = XLPE factor for phase conductor (For LV AB Cables) (as published by IEEMA)

CCF1Alph= XLPE factor for phase conductor (For MV_HV AB Cables) (as published by IEEMA)

CCFAlm= XLPE factor for messenger conductor (as published by IEEMA) CCFAlsl= XLPE factor for street light conductor (as published by IEEMA)

CCFAln= XLPE factor for neutral conductor (as published by IEEMA)

Cc = Price of LV/HV XLPE Compound in Rs/MT of a representative grade applicable for LV /HV Aerial Bunch Cables respectively; as quoted by supplier/s. (as published by IEEMA) This price is as applicable of first working day of the month, one month prior to the date of delivery

Cco = Price of LV/HV XLPE Compound in Rs/MT of a representative grade applicable for LV /HV Aerial Bunch Cables respectively; as quoted by supplier/s.

This price is as applicable of first working day of the month, one month prior to the date of tendering

PVC/PE Compound

CCF2Alph= PVC/ PE factor for phase conductor (For MV_HV AB Cables)

PVCc price of PVC compound (equivalent to CW-22 grade) in Rs/MT; as quoted by supplier/s. This price is as applicable on first working day of the month, one month prior to the date of delivery

PVCco Price of PVC compound (Equivalent to CW-22 Grade) in Rs/MT; as quoted by supplier/s. This price is as applicable on first working day of the month, one month prior to the date of tendering

Copper

CuFtph= Cu tape factor for phase conductor

CU = The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with average exchange rate of the month. This price is the landed cost, inclusive of applicable customs duty only. This price is as applicable of first working day of the month, one month prior to the date of delivery.

CU0 = The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with average exchange rate of the month. This price is the landed cost, inclusive of applicable customs duty only.

This price is as applicable of first working day of the month, one month prior to the date of tendering. The above prices and indices are as published by IEEMA vide Circular reference IEEMA(PVC)/CABLE(R-1)/--/-- prevailing as on 1st working day of the month i.e. one month prior to the date of tendering.

Price variation formulae for 'LV & HV Aerial Bunch Cables'

1.LV Aerial Bunched Cables with Aluminium Conductor , XLPE Insulated and Aluminium Magnesium-Silicon Alloy Messenger Conductor

$$P = P_0 + \text{Alph} * n * (\text{Al}-\text{Al}_0) + \text{Alm}(\text{Al}-\text{Al}_0) + \text{Alsl}(\text{Al}-\text{Al}_0) + \text{Aln}(\text{Al}-\text{Al}_0) + \text{CCFAlph} * n * (\text{CC}-\text{CC}_0) + \text{CFAlm}(\text{CCCC}_0) + \text{CCFAlsl}(\text{CC}-\text{CC}_0) + \text{CCFAln}(\text{CC}-\text{CC}_0)$$

In case messenger is bare; XLPE factor CCFAlm= 0

3. HV Aerial Bunched Cables with Aluminium Conductor, Conductor screened, XLPE Insulated, insulation screened followed by copper tape and over all PVC/PE sheathe cores twisted around Bare Aluminium Magnesium-Silicon Alloy Messenger Conductor

$$P = P_0 + \text{Alph} * n * (\text{Al}-\text{Al}_0) + \text{Alm}(\text{Al}-\text{Al}_0) + \text{CUFtph} * n * (\text{Cu}-\text{Cu}_0) + \text{CCF1Alph} * n * (\text{CC}-\text{CC}_0) + \text{CCF2Alph} * n * (\text{PVCc}-\text{PVCc}_0) + \text{CCFAlm}(\text{CC}-\text{CC}_0)$$

Note- In case of any clarifications in the above formula kindly refer the IEEMA price variation formula given in circular IEEMA(PVC)/AB CABLE/2017 effective from 1 st November 2017, In case of any discrepancies the IEEMA circular mentioned shall prevail.

1.0.8 The "IA" shall use the recent formula/ revisions published by IEEMA to calculate the Price adjustment on supply of plants and facilities.

1.0.9 The price adjustment amount towards the price components of materials shall be as per the price variation formulas mentioned in para 1.0.1 to 1.0.8 without any ceiling.

1.0.10 For the purpose of price adjustment for Ex-works price component, the date of shipment for goods shall mean the scheduled date of shipment or actual date of shipment, whichever is earlier. Scheduled date of shipment will be ex-works date of dispatch, governed by the approved PERT Chart as per Appendix- 4 TimeSchedule.

1.0.11 No price increase shall be allowed beyond the original delivery dates unless specifically stated in the Time Extension letter, if any, issued by the "IA". The "IA" will, however, be entitled to any decrease in the Contract price which may be caused due to lower price adjustment amount in case of delivery beyond the original delivery dates. In such event where the time extension is agreed by the "IA", a revised L2 schedule is to be released by the "IA" for the extended period in which price variation would also be allowed.

1.0.12 In case of non-publication of applicable indices on a particular date, which happens to be the applicable date for price adjustment purposes, the published indices prevailing immediately prior to the particular date shall be applicable.

1.0.13 If the price adjustment amount works out to be positive, the same is payable to the Contractor by the "IA" and if it works out to be negative, the same is to be recovered by the "IA" from the Contractor without any ceiling.

1.0.14 The Contractor shall promptly submit the price adjustment invoices for the supplies made and works executed at site, positively within three (3) months from the date of shipment/work done whether it is positive or negative.

1.0.15 Bids shall conform to the price adjustment provisions detailed above. Bids specifying prices for items on variable basis run the risk of rejection. A bid submitted on a fixed price basis will not be rejected but the price adjustment will be treated as zero.

1.0.16 In case of extension of the project beyond the scheduled date of completion, the price adjustment shall remain in effect till the time of scheduled completion, however for the period beyond the scheduled date of completion for which the Contractor is liable to pay liquidated damages to the "IA", the price adjustment shall not be applicable.

DEFINITIONS

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

- (i) "Owner/ Client" means Disaster Management Unit (DMU) (Relief and Rehabilitation) Department having its office at First Floor , Main Building Mantralaya Madam Cama Road , Hutatma Rajguru Chowk Mumbai - 400032 (hereinafter called the, DMU) which expression shall include its successors and assigns and shall act as Owner.
- (ii) "Implanting Agency (IA) /Purchaser" means Telecommunications Consultants India Ltd (A Govt of India Enterprise) registered under the company's act 1956, having its office at TCIL Bhawan, Greater Kailash-I New Delhi-110048 (hereinafter called the,TCIL) which expression shall include its legal successors & assigns.
- (iii) Project Director /Nodal Officer means Official nominated by the IA for the purpose of this contract
- (iv) PMA" means, Project Monitoring Agency appointed by TCIL.
- (v) "GOI" means the Government of India and "GOM" means Government of Maharashtra
- (vi) Good Industry Practice" means such practices, methods, techniques, standards, skills, diligence and prudence which are generally and reasonably expected of and accepted from a reasonably skilled and experienced contractor or operator engaged in the same type of undertaking as envisaged under this Agreement and would mean good engineering practices in design, engineering, construction and project management which would be expected to result in the performance of its obligations by the contractor and maintenance of the project in accordance with this agreement , applicable laws, applicable permits, reliability, safety, environment protection, economy and efficiency
- (vii) "MSEDCL" means Maharashtra State Electricity Distribution Company Limited; a company incorporated under the Company's Act 1956 after the restructuring of the erstwhile Maharashtra State Electricity Board having its registered office at Plot No. G-9, Prakashgad, Bandra (East), Mumbai 400 051
- (viii) TPQAA means Third Party quality Assurance Agency appointed by the TCIL.
- (ix) "Contractor/ Supplier" means the person whose tender has been accepted by the IA and the legal successors in title to such person, but not (except with the consent of the IA) any assignee of such person "
- (x) "IA Representative" IA Representative means a person duly notified by IA for the purposes of this Contract.
- (xi) "Engineer" means a person appointed from time to time by the IA to carry out the duty at site.
- (xii) "Contract" means these Conditions, the Specifications, the Drawings, the Bill of Quantities, the Tender and its amendments/corrigendums, the Letter of Acceptance/Letter of Intent, the Contract Agreement and such further documents as may be expressly incorporated in the Letter of Acceptance or Contract Agreement

- (xiii) "Specifications" means the specification of the Works of the Contract and any modification thereof or addition thereto made under and submitted by the Contractor and approved by the Engineer
- (xiv) "Drawings" means all drawings, calculations and technical information of a like nature provided by the IA to the Contractor under the Contract and all drawings, calculations, samples, patterns, models, operation and maintenance manuals and other technical information of a like nature submitted by the Contractor and approved by the Engineer
- (xv) "Bill of Quantities" means the priced and completed bill of quantities forming part of the Tender/NIT and Agreement.
- (xvi) "Tender" means the Contractor's priced offer to the IA for the execution and completion of the Works and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of Acceptance. The word "Tender" is synonymous with the word "Bid" and the words "Schedule to Tender" with "Schedule to Bid" and the words "Tender documents" with "Bid documents" or "Bidding document
- (xvii) "Letter of Acceptance(LOA)/ LOI Letter of Intent " means the formal acceptance by the IA of the Tender.
- (xviii) "HOA" means Handing Over Authority engaged by Owner.
- (xiv) "Sundries" means such following items are considered as part of Sundries irrespective of their quantities used in project (on lumpsum basis as mention in BoQ) i.e ,Al lugs, Al Binding Tap, Al Binding wire, Jumper, Nuts, Bolts & Washer, Cable Caps, Electrical Tapes, Cable Glands, Cable Supports (Angles), Cable Ties, Earthing Materials - GI Strip of suitable size, GI Wire, MS Rod, Cable Insulation Materials, Concrete Encasement, Cable Pulling Lubricant, Cable Identification Tags, Cable Tray Covers, Heat Shrink End Caps, Cable Route Markers, Cable Cleaning Materials, LT Cable Jointing Kits, Cable Seals and Plugs, Duct Seal Compound, Cable Pulling Grips, Cable Route Marking Tape, Thermal Insulation Materials, joint chamber Welding, Main Hole , Trail Holes, Joint chamber ,Warning tape etc and other items also.

ANNEXURE- I

KALYAN EAST

DPR NO. 9 (THN/ KALYAN EAST/ 9)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”****Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable****Name of District: Thane****Name of Circle- Kalyan I****Name of Division - Kalyan East**

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub - Division	Section / Sub-Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location n)	Length (Ckt KM)	Class of Road (NMMC/ PWD/ NHAI)	Size of 22 KVHT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	Sub Division 1	Lock Dhara	Lock Dhara	Ext 200 KVA Near Ganesh Mandir	19.13881,73.07860	Lokdhara S/S	19.13558,73.07764	0.70	KMC	3x300	1.4
2	Sub Division 1	Chitpada	Chitpada	Royal Building	19.13558,73.07762	200KVA DTC	19.13773,73.07764	2.30	KMC	3 x 300	4.6
3	Sub Division 1	Lock Dhara	Lock Dhara	Near Lockdhara	19.13560,73.07747	Silfata Road	19.13641,73.07414	0.95	KMC	3x300	1.90
TOTAL								3.95			7.90

DETAILED PROJECT REPORT

“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)” :

Detail of Proposed Ring Main Unit (RMU) (2I+2B) SF-6 for HT

Name of District: Thane

Name of Circle- Kalyan I

Name of Division - Kalyan East

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub- Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Kalyan East	Sub Division 1	22KV Lock Dhara	Ext 200 KVA Near Ganesh Mandir	19.13881,73.07860	1
2	Kalyan East	Sub Division 1	22KV Chitpada	Royal Building	19.13558,73.07762	2
TOTAL						3

DPR NO. 9 (THN/ KALYAN EAST/ 9)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 22 kV Feeder Pillar for HT

Name of District: Thane**Name of Circle- Kalyan I****Name of Division - Kalyan East**

S N o	Distribution Utility Detail			Proposed 22 KV Feeder Pillar		
	Sub- Divisi on	Section / Sub- Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Kalyan East	Sub Division 1	22KV Lock Dhara	Ext 200 KVA Near Ganesh Mandir	19.13881,73.07860	1
2	Kalyan East	Sub Division 1	22KV Chitpada	Royal Building	19.13558,73.07762	2
3	Kalyan East	Sub Division 1	22KV Lock Dhara	Near Lockdhara	19.13560,73.07747	1
					TOTAL	4

ANNEXURE- J

KALYAN WEST

DPR NO. 10 (THN/ KALYAN WEST/ 10)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”****Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable****Name of District: Thane****Name of Circle- Kalyan-I****Name of Division - Kalyan West**

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub - Division	Section / Sub-Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Length (Ckt KM)	Class of Road (KDMC/ PWD/ NHAI)	Size of 22 KV HT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	Kalyan west	Sub-Division 1	Hospital Feeder	tejshree Switching	19.14.472,73 .08.464	Rukmanibai Hospital	19.14.275,73 .08.073	1.60	KDMC	3 x 95	3.20
2	Kalyan west	Sub-Division 1	Hospital Feeder	Rukmanibai Hospital	19.237559,73 .134926	Tehsil Office	19.237575,7 3.133204	0.31	KDMC	3 x 95	0.61
3	Kalyan west	Sub-Division 1	Hospital Feeder	Rukmanibai Hospital	19.237559,73 .134926	Kalyan Court	19.237972,7 3.131884	0.39	KDMC	3 x 95	0.78
4	Kalyan west	Sub-Division 1	Mohane	Mohane	19.261190,73 .170003	KDMC Water Supply	19.25655,73. 165470	2.39	KDMC	3 x 95	4.78
							TOTAL	4.69			9.37

DPR NO. 10 (THN/ KALYAN WEST/ 10)
DETAILED PROJECT REPORT

“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”

Detail of Proposed Ring Main Unit (RMU) (2I+ 2B) SF-6 for HT

Name of District: Thane
Name of Circle- Kalyan-I
Name of Division - Kalyan West

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Sub-Division 1	Sub-Division 1	Feeder No 03	Rukmani Bai Hospital Feeder No 03	19.26119,73.17000	1
2	Sub-Division 1	Sub-Division 1	Feeder No 03	Sainathwadi	19.25655,73.16547	1
TOTAL						2

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”****Detail of River Crossing on MonoPole**

Name of District: Thane

Name of Circle- Kalyan-I

Name of Division - Kalyan West

S No	Distribution Utility Detail		Detail of River Crossing					
	Sub - Divis ion	Section / Sub- Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of locatio n(To)	Lat. / Long. (To Location)	No of Crossi ngs
1	Kalyan west	Sub- Divisio n 1	Murbad Road Feeder	Birla Vanya	19.243887,73. 152483	Yogi Dham Road	19.242979, 73.15271	2
2	Kalyan west	Sub- Divisio n 1	Murbad Road Feeder	City Park	19.251973,73. 156252	Yadav Floor Mill	19.251771, 73.156829	2
							TOTAL	4

ANNEXURE- K

DOMBIVALI

DPR NO. 11 (THN/ DOMBIVALI/ 11)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”****Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable**

Name of District: Thane

Name of Circle- Kalyan

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub - Division	Section / Sub-Station	Name of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Length (Ckt KM)	Class of Road (KDMC/ PWD/ NHAI)	Size of 22 KVHT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	SD 1	Nehru Maidan	Thakurli East	Nehru Maidan	19.131400, 73.05665	Sawarkar Road	19.13038,73.05754	0.25	KDMC	3CX300	0.25
2	SD 2	SD 2	0	0	0	0	0	0.00	KDMC	3CX300	0.00
3	SD 3	Navapada	Kopper	Global safety	19.22112, 73.08988	kdmc water plant	19.2224, 73.09094	0.30	KDMC	3CX300	0.30
4	SD 4	SD 4	0	0	0	0	0	0.00	KDMC	3CX300	0.00
							TOTAL	0.55			0.55

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring Main Unit (RMU) 22 K SF-6 for HT (4I+ 0B)

Name of District: Thane

Name of Circle- Kalyan

Name of Division - Dombivali

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long.(Location)	No of RMU
1	SD- 1	Nehru Maidan	Thakurli East	Nehru Maidan	19.131400,73.05665	1
1	SD- 2	Swami samarthnath Mandir	P & T	Swami samarthnath Mandir	19.20338,73.0888	1
1	SD- 3	KDMC Water Supply	feeder 1 - Subhash Road feeder 2 - Navapada	KDMC Water Supply	19.22238,73.09095	1
1	SD-4	KDMC Water Supply	feeder 1 - koparfeeder 2 - Gupte	KDMC Water Supply	19.21791,73.08564	1
TOTAL						4

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring Main Unit (RMU) 22 K SF-6 for HT (3I+ 2B)

Name of District: Thane

Name of Circle- Kalyan

Name of Division - Dombivali

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	SD- 1	Nehru Maidan	Thakurli East	Nehru Maidan	19.131400,73.05665	1
TOTAL						1

ANNEXURE- L

BADLAPUR EAST

DPR NO. 12 (THN/ BADLAPUR EAST/ 12)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT) ”**

Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable

Name of District: Thane

Name of Circle- Kalyan II

Name of Division -
Badlapur East

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub- Division	Section / Sub- Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Leng th (Ckt KM)	Class of Road (NMMC/ PWD/ NHAI)	Size of 22 KVHT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	Badla pur East	KBMC Office	Kulgan/Kat ap	KBMC Oxygen Plant	19.09911, 73.14126	Amrapali Building	19.09724, 73.14217	0.40	KBMC	3Cx300	0.40
2	Badla pur East	Covid Center	Kripa Feeder	Nand Raj Nagar (janhvi lawns)	19.10591, 73.13530	Bank Of Baroda	19.10098, 73.13799	1.60	KBMC	3Cx300	1.60
TOTAL								2.00			2.00

DETAILED PROJECT REPORT

“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”

Detail of Proposed Ring Main Unit (RMU) (3I+2B) SF-6 for HT

Name of District: Thane

Name of Circle- Kalyan II

Name of Division - Badlapur East

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Badlapur East	KBMC Office	Kulgan/Katap	KBMC Oxygen Plant	N19 09.911 E73 14.126	1
4	Badlapur East	Covid Center	Kripa Feeder	Bank Of Baroda	N19 10.098 E73 13.799	1
TOTAL						2

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Existing DTC of section covered under the Project

Name of District: Thane

Name of Circle- Kalyan II

Name of Division - Badlapur East

S No	Distribution Utility Detail		Existing Distribution Transformer				Proposed Distribution Transformer			
	Sub-Division	Section / Sub-Station	Name of location (DT Name)	Lat. / Long. (Location)	Capacity of DTC	No of Incoming HT atDTC	Aug/ New	Capacity of Proposed DTC(KVA)	Mounting Arrangement(Pole / Plinth)	Qty
1	Badlapur East	Covid Center	Bank Of Baroda	19.10098, 73.13799	NA	1	New	100	Pole	1
			TOTAL							1

ANNEXURE- M

KALYAN (MURBAD)

DPR NO. 13 (THN/ KALYAN (MURBAD)/ 13)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT) ”**

Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable

Name of District: Thane

Name of Circle- Kalyan II

Name of Division - Kalyan
(Murbad)

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub-Division	Section / Sub-Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Length (Ckt KM)	Class of Road (NMMC/ PWD/ NHAI)	Size of 22 KVHT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	Murbad	Murbad	22KV Murbad	Near Govt Hospital	19.15259, 73.23449	Murbad 100KV DTC	19.15539, 73.23382	1.40	KDMC	3C x 300	2.8
TOTAL								1.40			2.80

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Existing DTC of section covered under the Project

Name of District: Thane

Name of Division - Kalyan

(Murbad)Name of Division -

Kalyan Rural

S No	Distribution Utility Detail		Existing Distribution Transformer				Proposed Distribution Transformer			
	Sub-Division	Section / Sub-Station	Name of location (DTName)	Lat. / Long. (Location)	Capacity of DTC	No of Incoming HT atDTC	Aug/ New	Capacity of Proposed DTC(KVA)	Mountin g Arrangement (Pole / Plinth)	Qty
1	Murbad	Murbad Town	Near Trauma Cente	19.15535, 73.23367	N A	1	New	100	Pole	1
			TOTAL							1

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring Main Unit (RMU) (3I+2B) SF-6 for HT

Name of District: Thane

Name of Circle- Kalyan II

Name of Division - Kalyan (Murbad)

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub- Division	Section / Sub-Station	Name of 22 KVFeeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Murbad	murbad	Murbad	GOT Hospital GATP	19 15.303 73 23.623	1
2	Murbad	murbad	Murbad	GOT Hospital	19 15.252 73 23.498	1
TOTAL						2

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring 22 KV Main Unit (RMU) (2I+ 2B) SF-6 for HT

Name of District: Thane

Name of Circle- Vashi

Name of Division - Vashi

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub- Division	Section / Sub- Station	Name of 22 KVFeeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Murbad	Murbad Town	Murbad Town Feeder	Rural Hospital	19.254378 73.391628	1
TOTAL						1

DETAILED PROJECT REPORT
“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”

Detail of Proposed LT Mini Pillar

Name of District: Thane
Name of Circle- Kalyan II
Name of Division - Kalyan Ruraln -
Kalyan (Murbad)

S No	Distribution Utility Detail			Proposed LT Mini Pillar		
	Sub- Division	Section / Sub- Station	DT Name	Name of Location	Lat. / Long. (Location)	Mini Feeder Pillar
1	Murbad	Murbad Town	100 KV Near EHV S/S	Rural Hospital Meter room	19.253914, 73.39046	1
				TOTAL		1

ANNEXURE- N

KALYAN (TITWALA)

DPR NO. 14 (THN/ KALYAN (TITWALA)/ 14)

DPR NO. 14 (THN/ KALYAN(TITWALA)/14)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”****Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable****Name of District: Thane****Name of Circle- Kalyan-II****Name of Division -
Kalyan (Titwala)**

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub - Divisi on	Section / Sub- Station	Name of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of locatio n(To)	Lat. / Long. (To Location)	Lengt h (Ckt KM)	Class of Road (KDMC/ PWD/ NHAI)	Size of 22 KV HT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	CSD	Titwala	Gawali Feeder	Rukamani Bain plaza	19.13713, 73.09906	Titwala	19.15903, 73.14330	14.80	KM DC	3C x 300	29.6
							TOTAL	14.80			29.6

DPR NO. 14 (THN/ KALYAN(TITWALA)/14)

DETAILED PROJECT REPORT

“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”

Detail of Proposed Ring Main Unit (RMU) 22 K SF-6 for HT (3I+ 2B)

Name of District:

Name of Circle- Kalyan 2

Name of Division - Kalyan (Titwala)

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	CSD	Titwala	Gawali Feeder	Goawali	N19 15.903 E73 14.330	1
2	CSD	Titwala	Gawali Feeder	Mahanagar Gas Pump	N19 16.228 E73 14.076	1
3	CSD	Titwala	Gawali Feeder	Hindusthan pump	N19 16.555 E73 14.085	1
4	CSD	Titwala	Gawali Feeder	Gutshahi Pata	N19 17.278 E73 13.839	1
5	CSD	Titwala	Gawali Feeder	Jagat Nahgar Titwala	N19 17.917 E73 13.440	1
6	CSD	Titwala	Gawali Feeder	Ganpati Mandir KDM	N19 17.977 E73 13.114	1
7	CSD	Titwala	Gawali Feeder	Mahaganpati Hospital	N19 17.850 E73 13.179	1
8	CSD	Titwala	Gawali Feeder	Rukamani Hospital	N19 13.713 E73 09.906	1
TOTAL						8

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 22 KV Feeder Pillar

Name of District:

Name of Circle- Kalyan 2

Name of Division - Kalyan (Titwala)

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of R M U
1	CSD	Titwala	Gawali Feeder	MH SH 76, Bhoiwada	19.232939, 73.119417	1
2	CSD	Titwala	Gawali Feeder	Kalyan Station Rd,	19.238273, 73.129303	1
3	CSD	Titwala	Gawali Feeder	Kalyan Station Rd,	19.237236, 73.135894	1
4	CSD	Titwala	Gawali Feeder	Dr godboles	19.239310, 73.142720	1
5	CSD	Titwala	Gawali Feeder	Sankar Mandir Station	19.242496, 73.156843	1
6	CSD	Titwala	Gawali Feeder	203 Rama apartment	19.247903, 73.159903	1
7	CSD	Titwala	Gawali Feeder	Near River Bank	19.256052, 73.163748	1
8	CSD	Titwala	Gawali Feeder	Near River Bank	19.260496, 73.167436	1
9	CSD	Titwala	Gawali Feeder	Near Sbi ATM	19.267607, 73.171594	1
10	CSD	Titwala	Gawali Feeder	Ambivli Rd, Atali,	19.271162, 73.176380	1
11	CSD	Titwala	Gawali Feeder	Baneli	19.275754, 73.185953	1
12	CSD	Titwala	Gawali Feeder	Titwala Road	19.281679, 73.191366	1
13	CSD	Titwala	Gawali Feeder	Near Charm city	19.289307, 73.200860	1
14	CSD	Titwala	Gawali Feeder	quba Resturant	19.292269, 73.201880	1
15	CSD	Titwala	Gawali Feeder	Near HDFC Life	19.238940, 73.128126	1
16	CSD	Titwala	Gawali Feeder	Opposite Metro Junction Mal	19.228420, 73.122712	1
17	CSD	Titwala	Gawali Feeder	Near vaishno devi temple	19.285221, 73.195870	1
TOTAL						17

ANNEXURE- O

ULHASNAGAR

DPR NO. 15 (THN/ ULHASNAGAR/ 15)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable

Name of District: Thane

Name of Circle- Kalyan II

Name of Division
Ulhasnagar

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub - Division	Section / Sub-Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Length (Ckt KM)	Class of Road (NMM C/ PWD/ NHAI)	Size of 22 KV HT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	Ulhasnagar 2	Sai Baba	22kv KAM 2 Feeder	Indian Red Cross Society Hospital	19.13713,73.09900	Near Town Hall	N19 13.723 E73 09.916	0.03	KDMC	3 x 300	0.060
2	Ulhasnagar 2	Tata Power	Tata Power	Mahanagar Hospital	19.14789 ,73.10330	Akash Works	N19 14.792 E73 10.355	0.03	KDMC	3 x 300	0.061
							Sub-Total				0.121
3	Ulhasnagar 4	Lalchakki	Hospital Feeder	Women Hospital	19.12955, 73.09500	Ulhasnagar 4	N19 12.992 E73 09.547	0.18	KDMC	3 x 300	0.368
							Sub-Total				0.368
TOTAL								0.25			0.61

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Existing DTC of section covered under the Project

Name of District: Thane

Name of Circle- Kalyan II

Name of Division - Ulhasnagar

S No	Distribution Utility Detail		Existing Distribution Transformer				Proposed Distribution Transformer			
	Sub-Division	Section / Sub-Station	Name of location(DT Name)	Lat. / Long. (Location)	Capacity ofDTC	No of Incoming HT at DTC	Aug/ New	Capacity of Proposed DTC(KVA)	Mounting Arrangement(Pole / Plinth)	Qty
1	Ulhasnagar 2	Sai Baba	Near Town Hall	N19 13.723 E73 09.916	NA	1	New	200	Pole	1
2	Ulhasnagar 4	Lalchakki	Women Hospital	N19 12.955 E73 09.508	NA	1	New	100	Pole	1
			TOTAL							2

DETAILED PROJECT REPORT
“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”

Detail of Proposed Ring Main Unit (RMU) (3I+1B) SF-6 for HT

Name of District: Thane
Name of Circle- Kalyan II Name
of Division - Ulhasnagar

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub- Division	Section / Sub- Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Ulhasnagar 2	Sai Baba	Hospital Feeder	Near Town Hall	N19 13.723 E73 09.916	1
2	Ulhasnagar 2	Tata Power	Tata Power	Akash Works	N19 14.792 E73 10.355	1
					Sub-Total	2
3	Ulhasnagar 4	Lalchakki	KAM 2	Women Hospital	N19 12.955 E73 09.508	1
4	Ulhasnagar 4	Lalchakki	KAM 2	630 KVA DT	N19 12.992 E73 09.547	1
					Sub-Total	2
TOTAL						4

ANNEXURE- P

THANE-II

DPR NO. 16 (THN/ THANE-II/ 16)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT) ”**

Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable

Name of District: Thane

Name of Circle- Thane

Name of Division -
Thane II

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub-Division	Section / Sub-Station	Nam of 11 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Leng th (Ckt KM)	Class of Road (NMM C/ PWD/ NHAI)	Size of 22 KVHT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	Power House	Manisha Builder	Manisha Builder	DNS Tower	19°11.845 72°58.701	Tembi Naka (TMC School 7)	19°11.819 72°58.657	0.15	TMC	3C x 300	0.15
2	Power House	Civil Hospital	Old Civil FeederV Jail Feeder	Civil Hospital	19°12.697 72°58.442	Post Office	19°11.924 72°58.779	1.70	TMC	3C x 300	1.70
							Sub-Total	1.85			1.85
3	Vikash	Saket Road	Hospital Feeder	Basant Lodge	19 12.697 72 58.442	SAT developers	19 12.664 72 58.360	0.55	TMC	3C x 300	0.55
							Sub-Total	0.55			0.55
TOTAL								2.40			2.40

DETAILED PROJECT REPORT

“

Detail of Proposed Ring 11 KV Main Unit (RMU) SF-6 for HT (4I+1B)

Name of District: Thane

Name of Circle- Thane

Name of Division - Thane II

S N o	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6 for HT		
	Sub- Divisio n	Section / Sub- Station	Name of 11kV Feeder	Name of Location	Lat. / Long. (Location)	NO of RMU
1	Power House	Manisha Builder	Manisha Builder	DNS Tower	19'11.845,72'58.701	1
2	Power House	Manisha Builder	Manisha Builder	Tembi Naka (TMC School 7)	19'11.819,72'58.657	1
3	Power House	Civil Hospital	Old Civil Feeder Jail Feeder	Post Office	19'11.924,72'58.779	1
					TOTAL	3

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 11kV Ring Main Unit (RMU) SF-6 for HT (4I+0B)

Name of District: Thane

Name of Circle- Thane

Name of Division - Thane II

S N o	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6 for HT		
	Sub-Division	Section / Sub-Station	Name of 11 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
	Power House	Civil Hospital	Old Civil Feeder Jail Feeder	Civil Hospital	19'12.697,72'58.442	1
					TOTAL	1

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 11KV Ring Main Unit (RMU) SF-6 for HT (3I+1B)

Name of District: Thane

Name of Circle- Thane

Name of Division - Thane II

S N o	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6 for HT		
	Sub- Divisio n	Section / Sub- Station	Name of 11kV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Vikas	Saket Road	Near Global Covid Hospital	Near Global Covid Hospital	19.12369 72.58257	1
					TOTAL	1

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 11KV Ring Main Unit (RMU) SF-6 for HT (3I+0B)

Name of District: Thane

Name of Circle- Thane

Name of Division - Thane II

S N o	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6 for HT		
	Sub- Divisio n	Section / Sub- Station	Name of 11 kVFeeder	Name of Location	Lat. / Long. (Location)	No. of RMU
1	Vikas	Saket Road	Hospital	Avalon Parking	19.12369 72.58257	2
2	Vikas	Saket Road	Hospital	Near Global Covid Hospital	19.12369 72.58257	1
					TOTAL	3

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring Main Unit (RMU) SF-6 for HT

Name of District: Thane

Name of Circle- Thane

Name of Division - Thane II

S N o	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6 for HT		
	Sub- Divisio n	Section / Sub- Station	Name of 11 KVFeeder	Name of Location	Lat. / Long. (Location)	RMU (2i+1B)
1	Vikas	Saket Road	Near Global Covid Hospital	Near Global Covid Hospital	19.12369 72.58257	1
					TOTAL	1

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 8 Way LT Pillar with ACB

Name of District: Thane

Name of Circle- Vashi

Name of Division - Vashi

S No	Distribution Utility Detail		Proposed 8-Way LT Pillar with ACB		
	Sub-Division	Section / Sub-Station	Name of Location	Lat. / Long. (Location)	No of LT Pillar
1	Power House	DTBhave DTC 8 way	Bhave DTC 8 way	19°19.435,72°97.320	1
2	Power House	DTBhave DTC 8 way	Bhave DTC 8 way	19°13.436,72°97.318	1
3	Power House	DTGadakari Rangayatan 8 way	Gadakari Rangayatan 8 way	19°19.438,72°97.337	1
4	Power House	DTNeelkanth 8 way	Neelkanth 8 way	19°10.191,72°37.260	1
5	Power House	DTKrishnaKutir 8 way/dhighe saheb	KrishnaKutir 8 way/dhighe saheb samadhi	19°19.525,72°09.043	1
6	Power House	DTJain DTC 8 way	Jain DTC 8 way	19°19.423,72°97.618	1
TOTAL					6

ANNEXURE- Q

VASHI

DPR NO. 17 (THN/ VASHI/ 17)

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT) ”**

Name of District: Thane Name
of Circle- Vashi Name of
Division – Vashi

Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub-Division	Section / Sub-Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long.(To Location)	Length (Ckt KM)	Class of Road (NMMC/ PWD/ NHAI)	Size of 22 KV HT XLPE UG Cable (Sq mm)	Length of Cable (Km)
1	Airoli	Airoli	Kalwa 1	Datta Mandir	19.169234,72.996860	SLDC , Kalwa	19.168188,72.998054	0.420	NMMC	3C x 300	0.700
2	Airoli	Airoli	Kalwa 1	Vishunagr Naka	19.175375,73.005636	Eltanapada	19.171855,73.007547	0.885	NMMC	3C x 300	1.690
3	Airoli	Airoli	Kalwa 1	Visnunagar	19.175375,73.005636	Vijay nagar	19.176189,73.005284	0.540	NMMC	3C x 300	0.900
4	Airoli	Airoli	Cidco 4	400 KV Yard	19.168188,72.998054	Sainathwadi	19.167181,72.997597	0.410	NMMC	3C x 300	0.700
5	Airoli	Ghansoli	GhansoliFeeder	From Shetkari School RMU	19.135470,73.001401	Hanuman Mandir DTC , Ghansoli	19.124912,72.995031	0.850	NMMC	3C x 300	1.500
6	Airoli	Ghansoli	GhansoliFeeder	From Talavli Naka RMU	19.135470,73.001401	Bhoir Bangla DTC , Ghansoli .	19.126471,72.994401	1.440	NMMC	3C x 300	2.500
7	Airoli	Ghansoli	GhansoliFeeder	From Sent Xevers School 4 Pole Str .	19.135470,73.001401	Khadan RMU	19.138101,73.001621	2.000	NMMC	3C x 300	3.500
8	Airoli	Ghansoli	GhansoliFeeder	From Khadan RMU	19.135470,73.001401	Kumkum Park CTC .	19.143420,73.000450	0.570	NMMC	3C x 300	1.000
9	Airoli	Ghansoli	For interlinking proposedRMU and existing DTCs					0.850	NMMC	3C x 300	1.500
10	Airoli	Rabale	Techanoprocess	R-260	19.143323,73.006315	E bus DTC	19.145658,73.006727	0.360	NMMC	3C x 300	0.600
11	Airoli	Rabale	Techanoprocess	R-241	19.143323,73.006316	R - 214	19.145658,73.006728	0.140	NMMC	3C x 300	0.250
12	Airoli	Rabale	Roshan hotel	back Side Bhushan Hotel	19.143323,73.006317	W - 92	19.145658,73.006729	0.120	NMMC	3C x 300	0.200
13	Airoli	Rabale	Roshan hotel	Bhushan Hotel	19.143323,73.006318	Aniket lodge	19.145658,73.006730	0.140	NMMC	3C x 300	0.250
14	Airoli	Rabale	Roshan hotel	Roshan Hotel DTC	19.143323,73.006319	R 310	19.145658,73.006731	0.080	NMMC	3C x 300	0.150
15	Airoli	Rabale	Roshan hotel	R-320	19.143323,73.006320	R 341	19.145658,73.006732	0.100	NMMC	3C x 300	0.180
16	Airoli	Rabale	Phillips	Mohit Hotel RMU	19.136609,73.009194	R - 22 DTC	19.145658,73.006733	0.120	NMMC	3C x 300	0.210
17	Airoli	Rabale	Phillips	Indico God to	19.136609,73.009195	R - 101 RMU	19.136605,73.012141	0.110	NMMC	3C x 300	0.200
18	Airoli	Rabale	Phillips	R-373	19.136609,73.009196	R - 413 RMU	19.136605,73.012142	0.100	NMMC	3C x 300	0.180
19	Airoli	Rabale	Phillips	R-207 RMU	19.136609,73.009197	R - 68 tap	19.136605,73.012143	0.110	NMMC	3C x 300	0.200
20	Airoli	Rabale	Phillips	R-68	19.136609,73.009198	R- 400 DTC	19.136605,73.012144	0.140	NMMC	3C x 300	0.250
21	Airoli	Rabale	Phillips	R-207 RMU	19.136609,73.009199	Shankar Hote	19.136605,73.012145	0.110	NMMC	3C x 300	0.200
22	Airoli	Rabale	Techno process	R-201	19.143323,73.006320	R- 223	19.145658,73.006732	0.140	NMMC	3C x 300	0.250
23	Airoli	Rabale	Techno process	R-223	19.143323,73.006316	R- 220 tap	19.145658,73.006728	0.140	NMMC	3C x 300	0.250
24	Airoli	Rabale	Techno process	R-217	19.143323,73.006316	214	19.145658,73.006728	0.140	NMMC	3C x 300	0.250

S No	Distribution Utility Detail		Existing Line (HT)							Proposed HT XLPE UG Cable	
	Sub-Division	Section / Sub-Station	Nam of 22 KV Feeder	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Length (Ckt KM)	Class of Road (NMMC/ PWD/ NHAI)	Size of 22 KV HT XLPE UG Cable (Sq mm)	Length of Cable (Km)
25	Airoli	Rabale	Ultra Tech	R-456	19.148365,73.009327	W 345 DTC	19.149364,73.010536	0.110	NMMC	3C x 300	0.200
26	Airoli	Rabale	Ultra Tech	R 608 cutpoint	19.148365,73.009325	Ultratech	9.149364,73.010538	0.180	NMMC	3C x 300	0.320
27	Airoli	Rabale	Ultra Tech	R-456	19.149364,73.010536	jain Hardware	19.149364,73.010536	0.200	NMMC	3C x 300	0.350
28	Airoli	Rabale	Ultra Tech	W-321	19.148399,73.005325	W-335	19.136605,73.012142	0.280	NMMC	3C x 300	0.500
29	Airoli	Rabale	Ultra Tech	W-278	19.130395,73.010543	W-289	19.136728,73.009295	0.250	NMMC	3C x 300	0.450
30	Airoli	Rabale	Ultra Tech	W-340	19.136795,73.012742	W-351	19.136795,73.012742	0.200	NMMC	3C x 300	0.350
31	Airoli	Rabale	Ultra Tech	W-251	19.136609,73.009196	W 266 .	19.130364,73.010553	0.140	NMMC	3C x 300	0.250
32	Airoli	Rabale	Ultra Tech	W-290	19.136609,73.009197	R 891	19.136605,73.012143	0.170	NMMC	3C x 300	0.300
33	Airoli	Rabale	Ultra Tech	R-496	19.136609,73.009198	R 877	19.136605,73.012144	0.150	NMMC	3C x 300	0.260
34	Airoli	Rabale	Ultra Tech	V tech	19.136609,73.009199	R 626	19.136605,73.012145	0.130	NMMC	3C x 300	0.240
35	Airoli	Rabale	Golden Garadge	R 541	19.143323,73.006320	Golden agardge DTC	19.145658,73.006732	0.050	NMMC	3C x 300	0.100
36	Airoli	Rabale	Golden Garadge	R 541	19.143323,73.006316	Sambhaji Nagar	19.145658,73.006728	0.330	NMMC	3C x 300	0.500
37	Airoli	Rabale	Golden Garadge	R 548	19.143323,73.006316	R - 566	19.145658,73.006728	0.090	NMMC	3C x 300	0.170
38	Airoli	Rabale	Golden Garadge	R 577 RMU	19.143323,73.006320	R 588 DTC	19.145658,73.006732	0.130	NMMC	3C x 300	0.240
39	Airoli	Rabale	Hamara Mahanagar	W 407 RMU	19.148365,73.009325	R 658 TAP	19.149364,73.010536	0.130	NMMC	3C x 300	0.230
40	Airoli	Rabale	Hamara Mahanagar	W 407 RMU	19.136609,73.009196	R 651	19.136605,73.012142	0.170	NMMC	3C x 300	0.300

41	Airoli	Rabale	Hamara Mahanagar	W 363	19.136609,73.009197	Sify DTC	19.136605,73.012143	0.170	NMMC	3C x 300	0.300
42	Airoli	Rabale	Narayan dairy	Narayan Dairy	19.136609,73.009198	R 689	19.136605,73.012144	0.280	NMMC	3C x 300	0.500
43	Airoli	Rabale	Narayan dairy	Alfa level	19.136609,73.009199	R 701	19.136605,73.012145	0.210	NMMC	3C x 300	0.380
44	Airoli	Rabale	Narayan dairy	W 417 tap	19.143323,73.006320	W 440 DTC	19.145658,73.006732	0.170	NMMC	3C x 300	0.300
45	Airoli	Rabale	Narayan dairy	R-520	19.143323,73.006316	R 506	19.145658,73.006728	0.290	NMMC	3C x 300	0.500
46	Airoli	Rabale	Chinchpada	Back side Police stn	19.143323,73.006316	katkaripada	19.145658,73.006728	0.110	NMMC	3C x 300	0.200
47	Airoli	Rabale	Chinchpada	Katkaripada	19.143323,73.006320	Rabale Talao Rmu	19.145658,73.006732	0.110	NMMC	3C x 300	0.200
48	Airoli	CIDCO	CIDCO	220 / 22KV EHV Kalwa	19.166040,73.003945	Airoli Sec - 15	19.165536,73.003936	1.830	NMMC	3C x 300	3.200
49	Airoli	CIDCO	Diwa	Sec - 15 , Airoli	19.165536,73.003936	Diwa Gaon , Airoli	19.166782,73.003523	0.500	NMMC	3C x 300	0.880
						Sub Total		16.395			28.830
50	Kopar khairan	Pawane	MIDC - 1	Old bus depo mahape	19.119194,3.0229437	RMC plant	19.113862,73.021595	1.130	NMMC	3C x 300	2.150
51	Kopar khairan	Pawane	MIDC - 1	Sarovar hotel corner	19.118472,3.0169117	Coromandal tap	19.114750,73.017395	1.050	NMMC	3C x 300	2.050
52	Kopar khairan	Pawane	Expanded	Expanded	19.084143,73.026503	Shalina	19.085516,73.023333	1.250	NMMC	3C x 300	2.200
53	Kopar khairan	Pawane	Ekvira	SSD Gas	19.120859,3.0307275	Utility forms	19.118060,3.0290318	0.980	NMMC	3C x 300	1.750
54	Kopar khairan	Pawane	MIDC - 1	Mhatre DTC	19.116737,3.0233929	Mahape Talav	19.116914,73.022569	0.460	NMMC	3C x 300	0.950
55	Kopar khairan	Pawane	Arihant gen	candoor foods	19.096849,73.017802	Mangalsing brothers	19.098830,73.017055	0.890	NMMC	3C x 300	1.560
56	Kopar khairan	Pawane	Arihant gen	brown ball food	19.096201,73.019270	Mangalsing brothers	19.098830,73.017055	0.340	NMMC	3C x 300	0.650
57	Kopar khairan	Pawane	petrol pump	Engineering	19.100454,73.019363	Tiranga tap	19.100288,73.019362	0.250	NMMC	3C x 300	0.500
58	Kopar khairan	Pawane	petrol pump	Tiranga tap	19.100288,73.019362	Bidve compony	19.104428,73.018454	0.700	NMMC	3C x 300	1.340

59	Kopar khairan	Pawane	Bhavkhaleshwar	Laxmi architech	19.092018,73.023869	Refine automobile	19.093087,73.025257	1.130	NMMC	3C x 300	2.000
60	Kopar khairan	Pawane	Bhavkhaleshwar	Plot no. A6	19.091127,73.024615	Darshan chemicals	19.091782,3.0239411	0.450	NMMC	3C x 300	0.900
61	Kopar khairan	MBP	Shil Feeder	22 / 22KV L & T SwtStn, Pawane	19.118472,3.0169117	Stock Holding , Shil Road	19.114750,73.017395	1.070	NMMC	3C x 300	1.900
						Sub Total		9.700			17.950
62	Vashi	MAFCO	Turbhe Naka	100 / 22 / 11KV VashiS / Stn	19.030029,73.019469	Ganesh Nagar GOD	19.072813,73.019223	0.620	NMMC	3C x 300	0.650
63	Vashi	MAFCO	Turbhe Naka	Janta Market Pole	19.072778,73.015545	Manav Bar GOD	19.069738,73.015223	0.400	NMMC	3C x 300	0.400
64	Vashi	MAFCO	Turbhe Naka	Punit Industries	19.080028,73.019469	Sarmai Devi RMU	19.072813,73.019223	0.850	NMMC	3C x 300	0.850
65	Vashi	MAFCO	Turbhe Naka	Chirag RMU	19.069603,73.004975	Zamzam DTC	19.068442,73.004841	0.600	NMMC	3C x 300	0.600
						Sub Total		2.470			2.500
TOTAL								54.660			49.280

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT) ”**

Detail of Existing Section of HT Feeder/ Line covered under the Project and Proposed HT Cable Proposed

Name of District- Thane

Name of Circle- Vashi

Name of Division – Vashi

Sr. No	Distribution Utility Detail		Existing Line (LT)							Proposed LT XLPE UG	
	Sub-Division	Section / Sub-Station	LT Feeder detail	Name of location (From)	Lat. / Long. (From Location)	Name of location (To)	Lat. / Long. (To Location)	Length (Ckt KM)	Class of Road (NMMC/PWD/NHAI)	Size of LT XLPE Cable (Sq mm)	Length of LT XLPE Cable (Km)
1	Airoli	Airoli	LT Feeder	Yadavnagar DTC	19.167871,73.005331	Krishna Chawl	19.166075,73.007250	0.48	NMMC	3.5C x 300	0.5
2	Airoli	Airoli	LT Feeder	Yadavnagar DTC 2	19.167892,73.005581	Sant Kabir Nagar	19.168087,73.005398	0.24	NMMC	3.5C x 300	0.25
3	Airoli	Airoli	LT Feeder	Sant Kabir Nagar	19.168206,73.006645	Jay Bhavani Nagar	19.168206,73.006645	0.33	NMMC	3.5C x 300	0.35
4	Airoli	Airoli	LT Feeder	Yadavnagar DTC 2	19.167905,73.004749	Chakki	19.168543,73.006110	0.14	NMMC	3.5C x 300	0.15
5	Airoli	Airoli	LT Feeder	Chakki	19.168088,73.005045	Devidhamnagar	19.168088,73.005045	0.48	NMMC	3.5C x 300	0.5
6	Airoli	Airoli	LT Feeder	Devidhamnagar	19.166075,73.007250	Tabela	19.167908,73.006833	0.48	NMMC	3.5C x 300	0.5
7	Airoli	Airoli	LT Feeder	Gavatewad : DTC	19.168269,73.002545	Thane Belapur Road	19.169859,72.999217	0.43	NMMC	3.5C x 300	0.45
8	Airoli	Airoli	LT Feeder	Gavatewadi DTC	19.168269,73.002545	Girish Garage	19.170457,73.003122	0.43	NMMC	3.5C x 300	0.45
9	Airoli	Airoli	LT Feeder	Pandharinagar 4 Way	19.172764,73.004693	Sarate House	19.171848,73.006865	0.24	NMMC	3.5C x 300	0.25
10	Airoli	Airoli	LT Feeder	Pandharinagar 4 Way	19.172764,73.004693	Subhash Nagar	19.173643,73.006400	0.29	NMMC	3.5C x 300	0.3
11	Airoli	Airoli	LT Feeder	Juna Chinchpada	19.165728,73.003386	MIDC Road	19.166130,73.004238	0.24	NMMC	3.5C x 300	0.25
12	Airoli	Airoli	LT Feeder	Juna Chinchpada	19.165728,73.003386	Pacharane House	19.165184,73.002770	0.29	NMMC	3.5C x 300	0.3
13	Airoli	Airoli	LT Feeder	Juna Chinchpada	19.165728,73.003386	Munna Hotel	19.167628,73.004531	0.14	NMMC	3.5C x 300	0.15
14	Airoli	Airoli	LT Feeder	Water Tank DTC	19.167244,73.003104	NMMC School	19.167337,73.003224	0.14	NMMC	3.5C x 300	0.15
15	Airoli	Airoli	LT Feeder	NMMC School	19.167337,73.003224	BJP office	19.166040,73.003945	0.14	NMMC	3.5C x 300	0.15
16	Airoli	Airoli	LT Feeder	BJP Office	19.166040,73.003945	Ambedkar Statue	19.165536,73.003936	0.1	NMMC	3.5C x 300	0.1
17	Airoli	Airoli	LT Feeder	Ambedkar Statue	19.165536,73.003936	Adiwasi Pada	19.166782,73.003523	0.19	NMMC	3.5C x 300	0.2
18	Airoli	Airoli	LT Feeder	BJP Office	19.166040,73.003945	Bawadi	19.166069,73.003545	0.1	NMMC	3.5C x 300	0.1
19	Airoli	Airoli	LT Feeder	Chaugule School	19.165683,73.003305	Bawadi	19.166069,73.003545	0.33	NMMC	3.5C x 300	0.35
20	Airoli	Airoli	LT Feeder	Sagar Saloon	19.166019,73.002805	Dattamandir	19.165786,73.001775	0.1	NMMC	3.5C x 300	0.1
21	Airoli	Airoli	LT Feeder	Shankar Mandir	19.168358,73.003109	mamit Chawl	19.168185,73.002899	0.14	NMMC	3.5C x 300	0.15
22	Airoli	Airoli	LT Feeder	Shankar Mandir	19.168353,73.003109	Gujarathi Chawl	19.167680,73.002921	0.19	NMMC	3.5C x 300	0.2
23	Airoli	Airoli	LT Feeder	Hanuman Mandir DTC	19.165269,73.003537	JayVijay Chawl	19.164475,73.003323	0.14	NMMC	3.5C x 300	0.15
24	Airoli	Airoli	LT Feeder	Ram DTC	19.180716,72.998288	Hanuman Mandir	19.181124,72.998063	0.14	NMMC	3.5C x 300	0.15
25	Airoli	Airoli	LT Feeder	Hanuman Mandir	19.181124,72.998063	NMMC toilet	19.180450,72.998624	0.29	NMMC	3.5C x 300	0.3
26	Airoli	Airoli	LT Feeder	Ramnagar DTC	19.180716,72.998288	Datta Mandir	19.182063,72.998422	0.38	NMMC	3.5C x 300	0.4
27	Airoli	Airoli	LT Feeder	Datta Mandir	19.182063,72.998422	Shankar Mandir	19.181443,72.999002	0.24	NMMC	3.5C x 300	0.25
28	Airoli	Airoli	LT Feeder	Fish Market	19.180450,72.998624	Milind Patil House	19.180389,72.999002	0.19	NMMC	3.5C x 300	0.2
29	Airoli	Ghansoli	LT Feeder	Arjun wadi	19.129226,73.001308	Kumar patil house	19.129133,73.001798	0.24	NMMC	3.5C x 300	0.25

30	Airoli	Ghansoli	LT Feeder	Arjun wadi	19.129226,73.001308	Datta nagar	19.129747,73.000283	0.26	NMMC	3.5C x 300	0.27
31	Airoli	Ghansoli	LT Feeder	Samshan Bhumi dtc	19.137182,73.000121	promod pati bldg	19.137282,72.999628	0.26	NMMC	3.5C x 300	0.27
32	Airoli	Ghansoli	LT Feeder	Talvpali dtc	19.130071,72.996291	Anusaya apt	19.129785,72.996036	0.27	NMMC	3.5C x 300	0.28
33	Airoli	Ghansoli	LT Feeder	Anant nagar	19.123194,72.994992	Pragti Nagar	19.122057,72.995799	0.21	NMMC	3.5C x 300	0.22
34	Airoli	Ghansoli	LT Feeder	Rajdeep bekry	19.125580,72.998778	Sanjay house	19.125980,72.998209	0.24	NMMC	3.5C x 300	0.25
35	Airoli	Ghansoli	LT Feeder	Rajdeep bekry	19.125580,72.998778	Samrth nagar	19.125737,73.000685	0.26	NMMC	3.5C x 300	0.27
36	Airoli	Ghansoli	LT Feeder	Balaramwadi DTC	19.126497,72.994354	Ghansham Madvi	19.126084,72.994464	0.19	NMMC	3.5C x 300	0.2
37	Airoli	Ghansoli	LT Feeder	Talvali marathi school	19.131697,72.994764	ram mandir	19.130341,72.994380	0.21	NMMC	3.5C x 300	0.22
38	Airoli	Ghansoli	LT Feeder	Rabale naka	19.268001,73.001500	Raj Residency	19.142076,73.001018	0.2	NMMC	3.5C x 300	0.21
39	Airoli	Ghansoli	LT Feeder	Shankar Mandir DTC	19.417820,73.000547	Devki apt	19.141769,73.001075	0.19	NMMC	3.5C x 300	0.2
40	Airoli	Ghansoli	LT Feeder	Patel Park DTC	19.138488,72.996081	Ankur apt	19.138812,72.997232	0.24	NMMC	3.5C x 300	0.25
41	Airoli	Ghansoli	LT Feeder	DK telor Shelar	19.141054,72.996846	Shelar Mandir Ghotival	19.140120,72.996877	0.24	NMMC	3.5C x 300	0.25
42	Airoli	Ghansoli	LT Feeder	Ketan patil house	19.137952,72.996818	Siddivinayak chwal Tahvali naka	19.138488,72.996081	0.31	NMMC	3.5C x 300	0.33
43	Airoli	Ghansoli	LT Feeder	New DTC	19.131942,72.999901	Arjunwadi 2	19.131780,73.000386	0.23	NMMC	3.5C x 300	0.24
44	Airoli	Ghansoli	LT Feeder	New DTC	19.126420,73.001241	Arjunwadi 3	19.126067,73.001186	0.27	NMMC	3.5C x 300	0.28
45	Airoli	Ghansoli	LT Feeder	New DTC Datta	19.127147,73.001429	Datta nagar - 2	19.127588,73.001471	0.25	NMMC	3.5C x 300	0.26
46	Airoli	Ghansoli	LT Feeder	New DTC Goldan	19.131780,73.000341	Goldan Nagar - 2	19.128566,73.000276	0.26	NMMC	3.5C x 300	0.27
47	Airoli	Ghansoli	LT Feeder	New DTC Sathe	19.134207,73.001361	Sathe Nagar - 2	19.132012,73.002182	0.22	NMMC	3.5C x 300	0.23
48	Airoli	Ghansoli	LT Feeder	New DTC Secr - 23	19.135355,72.997687	ghansoli - 2	19.134112,73.001814	0.26	NMMC	3.5C x 300	0.27
49	Airoli	Ghansoli	LT Feeder	New DTC Secr - 23	19.135621,72.999256	ghansoli - 3	19.135907,72.997683	0.21	NMMC	3.5C x 300	0.22
50	Airoli	Ghansoli	LT Feeder	New DTC Secr - 25	19.131931,73.000600	ghansoli - 2	19.135731,72.998673 19.131851,73.001083	0.23	NMMC	3.5C x 300	0.24
51	Airoli	Ghansoli	LT Feeder	New DTC shankar	19.137868,72.996060	shankar mandir - 2	19.137950,72.996632	0.24	NMMC	3.5C x 300	0.25
52	Airoli	Ghansoli	LT Feeder	New DTC	19.136971,72.999615	Vit bhatti - 2	19.136715,72.998934	0.26	NMMC	3.5C x 300	0.27
53	Airoli	Ghansoli	LT Feeder	New DTC	19.137533,73.000825	rabale samshanbhumi	19.138154,73.000630	0.24	NMMC	3.5C x 300	0.25
54	Airoli	Ghansoli	LT Feeder	New DTC	19.140344,73.000348	Salvinagar - Gothivali	19.139990,73.000986	0.27	NMMC	3.5C x 300	0.28
55	Airoli	Ghansoli	LT Feeder	Golden Nagar DTC	19.126420,73.001241	First 4 way	19.126067,73.001186	0.2	NMMC	3.5C x 300	0.21
56	Airoli	Ghansoli	LT Feeder	First 4 Macchi	19.127147,73.001429	Macchi Market 4way	19.127588,73.001471	0.21	NMMC	3.5C x 300	0.22
57	Airoli	Ghansoli	LT Feeder	Macchi Market 4 way	19.128302,73.000341	Tanaji Patil House	19.128566,73.000276	0.26	NMMC	3.5C x 300	0.27
58	Airoli	Ghansoli	LT Feeder	Macchi Maket 4 way	19.131780,73.002012	chetan Bar New 4 way	19.132012,73.002182	0.29	NMMC	3.5C x 300	0.31
59	Airoli	Ghansoli	LT Feeder	Patel Timber DTC	19.139807,72.999156	First 6way	19.139336,72.999006	0.23	NMMC	3.5C x 300	0.24
60	Airoli	Ghansoli	LT Feeder	First 6 way Second	19.141782,73.000547	Second 6 way	19.141769,73.001075	0.21	NMMC	3.5C x 300	0.22
61	Airoli	Ghansoli	LT Feeder	Second 6 way	19.138488,72.996081	Rama Park	19.138812,72.997232	0.23	NMMC	3.5C x 300	0.24
62	Airoli	Ghansoli	LT Feeder	Gaondevi DTC	19.139807,72.999156	Abhinav Mitra Mandal	19.139336,72.999006	0.14	NMMC	3.5C x 300	0.15
63	Airoli	Ghansoli	LT Feeder	Gaondevi DTC	19.141782,73.000547	Shrikant Gym	19.141769,73.001075	0.14	NMMC	3.5C x 300	0.15
64	Airoli	Ghansoli	LT Feeder	Shrikant Gym	19.138488,72.996081	Mhatre Ali	19.138812,72.997232	0.24	NMMC	3.5C x 300	0.25
65	Airoli	Ghansoli	LT Feeder	Jain Mandir DTC	19.123194,72.994992	First 6 way	19.122057,72.995799	0.11	NMMC	3.5C x 300	0.12
66	Airoli	Ghansoli	LT Feeder	First 6 way	19.125580,72.998778	Second 6 way	19.125980,72.998209	0.23	NMMC	3.5C x 300	0.24
67	Airoli	Ghansoli	LT Feeder	Kaulali DTC	19.131942,72.999901	First 4 way	19.131780,73.000386	0.2	NMMC	3.5C x 300	0.21
68	Airoli	Ghansoli	LT Feeder	First 4	19.126420,73.001241	First 4 6 way	19.126067,73.001186	0.23	NMMC	3.5C x 300	0.24
69	Airoli	Ghansoli	LT Feeder	996 way	19.127147,73.001429	Vithal Mandir 4 way	19.127588,73.001471	0.33	NMMC	3.5C x 300	0.35
70	Airoli	Ghansoli	LT Feeder	Church DTC	19.141054,72.996846	first 6 way	19.140120,72.996877	0.11	NMMC	3.5C x 300	0.12
71	Airoli	Ghansoli	LT Feeder	First 6 way	19.137952,72.996818	6 way	19.138488,72.996081	0.2	NMMC	3.5C x 300	0.21
72	Airoli	Ghansoli	LT Feeder	Second 6 way	19.131942,72.999901	Tarai Nagar first 4 way	19.131780,73.000386	0.23	NMMC	3.5C x 300	0.24
73	Airoli	Ghansoli	LT Feeder	First 6 way	19.137182,73.000121	Manjita patil mini pillar	19.137282,72.999628	0.21	NMMC	3.5C x 300	0.22
74	Airoli	Ghansoli	LT Feeder	Balaji Park 6 way	19.129133,73.001798	Balaji Park 4 way	19.129226,73.001308	0.23	NMMC	3.5C x 300	0.24
75	Airoli	Ghansoli	LT Feeder	Ruby DTC	19.129747,73.000283	Sakharam Plaza	19.129226,73.001308	0.23	NMMC	3.5C x 300	0.24

76	Airoli	Ghansoli	LT Feeder	Sakharam Plaza	19.137282,72.999628	Gym	19.137182,73.000121	0.17	NMMC	3.5C x 300	0.18
77	Airoli	Ghansoli	LT Feeder	Gym	19.139807,72.999156	Balaji Park 4 way	19.139336,72.999006	0.11	NMMC	3.5C x 300	0.12
78	Airoli	Ghansoli	LT Feeder	Veet Bhatti DTC	19.141769,73.001075	First 4 way	19.141782,73.000547	0.21	NMMC	3.5C x 300	0.22
79	Airoli	Ghansoli	LT Feeder	First 4 way	19.138812,72.997232	next pillar	19.138488,72.996081	0.21	NMMC	3.5C x 300	0.22
80	Airoli	Ghansoli	LT Feeder	Next Pillar	19.122057,72.995799	Mari Aaai Pillar Gothivali	19.123194,72.994992	0.23	NMMC	3.5C x 300	0.24
81	Airoli	Ghansoli	LT Feeder	Pillar Gothivali	19.123194,72.994992	Diva naka	19.148259,73.003756	0.38	NMMC	3.5C x 300	0.4
82	Airoli	Rabale	LT Feeder	Diva naka	19.148259,73.003756	Hanuman Mandir	19.148259,73.004467	0.49	NMMC	3.5C x 300	0.51
83	Airoli	Rabale	LT Feeder	Diva naka	19.148259,73.003756	Jari mari	19.148259,73.003756	0.48	NMMC	3.5C x 300	0.5
84	Airoli	Rabale	LT Feeder	Diva naka	19.148259,73.003756	Diva Naka DTC (4128012)	19.148259,73.003757	0.43	NMMC	3.5C x 300	0.45
85	Airoli	Rabale	LT Feeder	Diva naka	19.148259,73.003756	Diva naka Barwadi	19.148576,73.003757	0.33	NMMC	3.5C x 300	0.35
86	Airoli	Rabale	LT Feeder	Diva naka Shiv	19.148259,73.003758	Shiv sena shakaha	19.148259,73.003755	0.45	NMMC	3.5C x 300	0.48
87	Airoli	Rabale	LT Feeder	Shiv sena shakaha	19.148259,73.003755	Ganesh galli	19.148259,73.003755	0.33	NMMC	3.5C x 300	0.35
88	Airoli	Rabale	LT Feeder	Ganesh Galli	19.148259,73.003756	Diva Naka DTC (4128012)	19.148259,73.003757	0.18	NMMC	3.5C x 300	0.19
89	Airoli	Rabale	LT Feeder	Jari mari	19.148259,73.003757	Bansode House	19.148259,73.003755	0.21	NMMC	3.5C x 300	0.23
90	Airoli	Rabale	LT Feeder	Hanuman mandir	19.148259,73.003758	Banjarwadi School	19.148259,73.003756	0.2	NMMC	3.5C x 300	0.21
91	Airoli	Rabale	LT Feeder	Banjarwadi School	19.148259,73.003755	water tank	19.148259,73.003757	0.37	NMMC	3.5C x 300	0.39
92	Airoli	Rabale	LT Feeder	Shivsena Shakha	19.148259,73.003756	Katkaripada DTC	19.148259,73.003755	0.3	NMMC	3.5C x 300	0.31
93	Airoli	Rabale	LT Feeder	Katkaripada	19.148259,73.003757	Karnti Chauk	19.148259,73.003756	1.07	NMMC	3.5C x 300	1.13
94	Airoli	Rabale	LT Feeder	Karnti Chauk	19.148259,73.003755	NMMC hospital	19.148259,73.003757	0.45	NMMC	3.5C x 300	0.48
95	Airoli	Rabale	LT Feeder	Katkaripada	19.147307,73.003422	Samj Mandir	19.147307,73.003422	0.3	NMMC	3.5C x 300	0.31
96	Airoli	Rabale	LT Feeder	Katkaripada	19.147307,73.003423	Ganpati Mandir	19.147307,73.003423	0.3	NMMC	3.5C x 300	0.31
97	Airoli	Rabale	LT Feeder	Parolekarwadi	19.147307,73.003424	Ganpati Mandir	19.147307,73.003424	0.18	NMMC	3.5C x 300	0.19
98	Airoli	Rabale	LT Feeder	Coropack DTC	19.147307,73.003425	Ekata widyalay 6w	19.147307,73.003425	0.25	NMMC	3.5C x 300	0.26
99	Airoli	Rabale	LT Feeder	Ekata vidyalaya	19.147307,73.003426	Parolekarwadi	19.147307,73.003426	0.32	NMMC	3.5C x 300	0.34
100	Airoli	Rabale	LT Feeder	Ekata vidyalaya	19.147307,73.003422	Kole House	19.147307,73.003427	0.38	NMMC	3.5C x 300	0.4
101	Airoli	Rabale	LT Feeder	Ekata vidyalaya	19.147307,73.003423	Putala no 2	19.147307,73.003428	0.38	NMMC	3.5C x 300	0.4
102	Airoli	Rabale	LT Feeder	Kole House	19.147307,73.003424	Durga mata mandir	19.148259,73.003756	0.21	NMMC	3.5C x 300	0.23
103	Airoli	Rabale	LT Feeder	Duraga Mata Mandir	19.147307,73.003425	Niban Tekadi DTC	19.148259,73.003756	0.43	NMMC	3.5C x 300	0.45
104	Airoli	Rabale	LT Feeder	Putala no 2	19.147307,73.003426	Niban Tekadi DTC	19.148259,73.003756	0.48	NMMC	3.5C x 300	0.5
105	Airoli	Rabale	LT Feeder	Oil Field DTC	19.147307,73.003427	Putala no 2 (gautam nagar DTC)	19.148259,73.003756	0.48	NMMC	3.5C x 300	0.5
106	Airoli	Rabale	LT Feeder	Niban Tekadi DTC	19.149263,73.006266	Gautam nagar DTc	19.150023,73.008197	0.24	NMMC	3.5C x 300	0.25
107	Airoli	Rabale	LT Feeder	Gautam nagar	19.149263,73.006267	masjid	19.150023,73.008198	0.24	NMMC	3.5C x 300	0.25
108	Airoli	Rabale	LT Feeder	Nmmc Hospital	19.149263,73.006268	water tank	19.150023,73.008199	0.18	NMMC	3.5C x 300	0.19
109	Airoli	Rabale	LT Feeder	Golcha DTC	19.146313,73.017359	Varlipada	19.146435,73.016748	0.24	NMMC	3.5C x 300	0.25
110	Airoli	Rabale	LT Feeder	Varlipada	19.146435,73.016748	4w Varlipada	19.146313,73.017359	0.12	NMMC	3.5C x 300	0.13
111	Airoli	Rabale	LT Feeder	Sainaga DTC	19.149263,73.006266	NMMC ilet	19.149263,73.006267	0.48	NMMC	3.5C x 300	0.5
112	Airoli	Rabale	LT Feeder	Nmmc toilet	19.150023,73.008197	Mishra House sai Nagar Dtc	19.149263,73.006268	0.3	NMMC	3.5C x 300	0.31
113	Airoli	Rabale	LT Feeder	Nmmc toilet	19.150023,73.008198	Ganesh Galli Sainagar DTC	19.149263,73.006269	0.24	NMMC	3.5C x 300	0.25
114	Airoli	Rabale	LT Feeder	Sainagar	19.150023,73.008199	Ganesh Galli Sainagar DTC	19.149263,73.006270	0.36	NMMC	3.5C x 300	0.38
115	Airoli	Rabale	LT Feeder	Back side MIDC	19.150023,73.008200	Sainagar	19.149263,73.006271	0.36	NMMC	3.5C x 300	0.38
116	Airoli	Rabale	LT Feeder	Sambhaji nag	19.150023,73.008201	Sambhaji Nagar DTC	19.149263,73.006272	0.51	NMMC	3.5C x 300	0.54
117	Airoli	Rabale	LT Feeder	ASHVIN qury DTC	19.150023,73.008202	ASHVIN qury	19.149263,73.006273	0.36	NMMC	3.5C x 300	0.38
118	Airoli	Rabale	LT Feeder	RABALE mide area	19.150023,73.008203	RABALE mide	19.149263,73.006274	1.62	NMMC	3.5C x 300	1.7
119	Airoli	CIDCO	LT Feeder	Dhyandeep school	19.167337,73.003224	Megha Engineering College	19.166040,73.003945	0.64	NMMC	3.5C x 300	0.67
120	Airoli	CIDCO	LT Feeder	Janta market sec 2	19.166040,73.003945	Dhyandeep School	19.165536,73.003936	0.6	NMMC	3.5C x 300	0.63

121	Airoli	CIDCO	LT Feeder	Hotel Parichiti	19.165536,73.003936	sec- 2 , Airoli	19.166782,73.003523	0.48	NMMC	3.5C x 300	0.5
122	Airoli	CIDCO	LT Feeder	Janta Market	19.166040,73.003945	Patil Corppor Home	19.166069,73.003545	0.52	NMMC	3.5C x 300	0.55
123	Airoli	CIDCO	LT Feeder	1st pole of ShramikNagar	19.09341,73.0669737	end pole of shramiknagar	19.09376,73.0669537	1.43	NMMC	3.5C x 300	1.5
									NMMC	Sub-Total	38.74
124	Kopar khairane	Boakode	LT Feeder	R No 471 , Sec - 4	19.107449,73.006772	R No - 737 , Sec - 4	19.106952,73.005722	0.15	NMMC	3.5C x 300	0.16
125	Kopar khairane	Boakode	LT Feeder	Shani Mandir	19.109643,73.003570	Mandir Naka	19.109745,73.002870	0.64	NMMC	3.5C x 300	0.67
126	Kopar khairane	Boakode	LT Feeder	R No - 756 , Sec - 3	19.106461,73.005680	R No - 756 , Sec - 4	19.107048,73.005824	0.02	NMMC	3.5C x 300	0.02
127	Kopar khairane	Boakode	LT Feeder	Garden - 3 / 4 S / Stn	19.107547,73.005215	R No - 737 , Sec - 3	19.1071313,73.00563	0.27	NMMC	3.5C x 300	0.28
128	Kopar khairane	Boakode	LT Feeder	Dtc - 4753055	19.098776,73.013540	Buddhavihar , Khairne	19.097732,73.013442	0.09	NMMC	3.5C x 300	0.1
129	Kopar khairane	Boakode	LT Feeder	Plot - 8 , Sec - 12D	19.099128,73.011897	Plot - 12 / 13 , Sec - 12D	19.098804,73.012237	0.12	NMMC	3.5C x 300	0.13
130	Kopar khairane	Boakode	LT Feeder	Plot - 14, Sec - 12D	19.098605,73.012123	Plot - 22/23, Sec - 12D	19.098589,73.012185	0.41	NMMC	3.5C x 300	0.43
131	Kopar khairane	Boakode	LT Feeder	Dtc - 4753055	19.098776,73.013540	Khairne Naka 6Way	19.098182,73.013747	0.12	NMMC	3.5C x 300	0.13
132	Kopar khairane	Boakode	LT Feeder	H No - 388 , Khairne	19.095276,73.013589	Munawar Patel Bldg , Khairne	19.094912,73.012911	0.09	NMMC	3.5C x 300	0.1
133	Kopar khairane	Boakode	LT Feeder	Urdu School , Khairne	19.096104,73.013726	H No - 132 , Khairne	19.095581,73.013901	0.1	NMMC	3.5C x 300	0.1
134	Kopar khairane	Boakode	LT Feeder	H No - 132 ; Khairne	19.095581,73.013901	Nr . Dargah , Khairne Village	19.095850,73.013632	0.1	NMMC	3.5C x 300	0.11
135	Kopar khairane	Boakode	LT Feeder	R No - 737 , Sec - 3	19.107131,73.005636	R No - 756 , Sec - 3	19.106461,73.005680	0.1	NMMC	3.5C x 300	0.11
136	Kopar khairane	Boakode	LT Feeder	Garden - 5 / 8 Stn	19.102512,73.007281	Ganpati Mandir , Sec - 8	19.1025141,73.00636	0.16	NMMC	3.5C x 300	0.17
137	Kopar khairane	Boakode	LT Feeder	Nmmc Hospital, Sec - 12B	19.098556,73.009716	H No - 952 , Bonkode	19.097977,73.009754	0.1	NMMC	3.5C x 300	0.1
138	Kopar khairane	Boakode	LT Feeder	Swagat Bar , Bonkode	19.097113,73.012125	H No - 340 , Bonkode	19.096245,73.012258	0.1	NMMC	3.5C x 300	0.1
139	Kopar khairane	Boakode	LT Feeder	Dtc - 4753055	19.098776,73.013540	Plot - 46 To 48 , Sec - 12D	19.098563,73.012336	0.16	NMMC	3.5C x 300	0.17
140	Kopar khairane	Boakode	LT Feeder	P - 1 S / Stn	19.109784,73.007320	R No - 380 , Sec - 1	19.109461,73.006655	0.2	NMMC	3.5C x 300	0.22
141	Kopar khairane	Boakode	LT Feeder	R No - 10 , Sec - 2	19.108215,73.005174	R No - 470 , Sec - 2	19.108225,73.003876	0.19	NMMC	3.5C x 300	0.2
142	Kopar khairane	Boakode	LT Feeder	Plot - 7A , Seec - 6	19.103750,73.005950	Plot - 6B , Sec - 6	19.103660,73.005660	0.12	NMMC	3.5C x 300	0.13
143	Kopar khairane	Boakode	LT Feeder	R No - 737 , Sec - 6	19.103740,73.006550	R No - 245 , Sec - 6	19.103071,73.005548	0.14	NMMC	3.5C x 300	0.15
144	Kopar khairane	Boakode	LT Feeder	R No - 400 , Sec - 6	19.103603,73.004892	Plot - 36 , Se - 6	19.103720,73.004780	0.1	NMMC	3.5C x 300	0.11
145	Kopar khairane	MBP	LT Feeder	Deepak S / S Sect 1	19.112751,73.006486	Plot 408 Sect 01	19.113156,73.005944	0.11	NMMC	3.5C x 300	0.12

146	Kopar khairane	MBP	LT Feeder	Deepak S / S Sect 1	19.112751,73.006486	Plot 415/416 Sect 01	19.113139,73.006271	0.1	NMMC	3.5C x 300	0.11
147	Kopar khairane	MBP	LT Feeder	Plot No 84/85 Sec-1	19.112071,73.002048	Plot 105 Sect 1	19.112618,73.001864	0.1	NMMC	3.5C x 300	0.11
148	Kopar khairane	MBP	LT Feeder	Plot 81 Sect 1	19.11784,73.0021240	Nala Sector 1	19.11267,73.0022420	0.11	NMMC	3.5C x 300	0.12
149	Kopar khairane	MBP	LT Feeder	Plot No 272 Sect 1	19.112079,73.005170	Plot 253 Sect 1	19.112824,73.004844	0.12	NMMC	3.5C x 300	0.13
150	Kopar khairane	MBP	LT Feeder	Plot 84 Sect 01	19.112071,73.002048	Plot 81 Sect 1	19.11784,73.0021241	0.1	NMMC	3.5C x 300	0.11
151	Kopar khairane	MBP	LT Feeder	Mahape Dtc	19.111703,73.017470	Hanuman Nagar 4 Way	19.112204,73.014752	0.24	NMMC	3.5C x 300	0.25
152	Kopar khairane	MBP	LT Feeder	Hanuman Nagar 4 Way	19.112204,73.014752	Baghrao Office	19.112540,73.013960	0.11	NMMC	3.5C x 300	0.12
153	Kopar khairane	MBP	LT Feeder	Baghrao Hanuman Nagar	19.112540,73.013960	Magar Chakki Hanuman Nagar	19.112835,73.013933	0.15	NMMC	3.5C x 300	0.16
154	Kopar khairane	MBP	LT Feeder	Magar Chakki Handman Nagar	19.112835,73.013933	Shankar Mandir Hanuman Nagar	19.113122,73.013996	0.11	NMMC	3.5C x 300	0.12
155	Kopar khairane	MBP	LT Feeder	Shankar Mandir Hanuman Mandir	19.113122,73.013996	Vijay Shinde Kirana Hanuman Nagar	19.113366,73.014129	0.15	NMMC	3.5C x 300	0.16
156	Kopar khairane	MBP	LT Feeder	Marathi Shal Hanuman Mandir	19.112405,73.014425	Sunita Kirana Dukan	19.113060,73.014510	0.14	NMMC	3.5C x 300	0.15
157	Kopar khairane	MBP	LT Feeder	Sunita Kirana Hanuman Nagar	19.113060,73.014510	Shankar Mandir Hanuman Nagar	19.113122,73.013996	0.16	NMMC	3.5C x 300	0.17
158	Kopar khairane	MBP	LT Feeder	Manoshi S / S Sector 3	19.115515,73.005452	Plot 8 Sector 3	19.114816,73.005789	0.1	NMMC	3.5C x 300	0.1
159	Kopar khairane	MBP	LT Feeder	Manisha S / S Sect 5	19.11869,73.0004252	Plot 160 Sector S	19.119104,73.004189	0.14	NMMC	3.5C x 300	0.15
160	Kopar khairane	MBP	LT Feeder	Manisha S / S Sect 5	19.11869,73.0004252	Pmookambika Mandir	19.119044,73.004940	0.13	NMMC	3.5C x 300	0.14
161	Kopar khairane	MBP	LT Feeder	Plot 31 Sector 6	19.121692,73.003602	Plot 8/9/10 Sector 6	19.21413,73.003874	0.12	NMMC	3.5C x 300	0.13
									NMMC	Sub-Total	6
162	Vashi	MAFCO	LT Feeder	Janta Market 4127098	19.071324,73.016443	To Police Chouky	19.0712314,73.01739	1.14	NMMC	3.5C x 300	1.2
163	Vashi	MAFCO	LT Feeder	Front Ganesh Nagar Dtc	19.070680,73.023363	Ganesh Nagar	19.0706270,73.02336	2.28	NMMC	3.5C x 300	2.4
164	Vashi	MAFCO	LT Feeder	Hanuman Nagar Dtc	19.0701188,73.02085	Amrut Medhkar House	19.0726054,73.02103	1	NMMC	3.5C x 300	1.05
165	Vashi	MAFCO	LT Feeder	Kkr Road Dtc	19.076131,73.018573	Kamlesh Verma House	19.0767912,73.02077	1.46	NMMC	3.5C x 300	1.54
166	Vashi	MAFCO	LT Feeder	Police Chauki Dtc	19.077987,73.020603	Ambedkar Putla	19.0772272,73.01857	1.24	NMMC	3.5C x 300	1.3
167	Vashi	MAFCO	LT Feeder	Sarmain New	19.079610,73.019658	Dindayal Hotel	19.0799040,73.02151	1.05	NMMC	3.5C x 300	1.1
168	Vashi	MAFCO	LT Feeder	Gavry Cory	19.079935,73.018639	Dindayal Hotel	19.0795492,73.01963	0.9	NMMC	3.5C x 300	0.95
169	Vashi	MAFCO	LT Feeder	Sarmai Devi Dtc	19.079234,73.017813	Sarmai Devi Mandir	19.0798635,73.01877	1.57	NMMC	3.5C x 300	1.65
										Sub-Total	11.19
							TOTAL	53.28			55.93

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 22 KV HT Feeder Pillar

Name of District- Thane

Name of Circle- Vashi

Name of Division - Vashi

S No	Distribution Utility Detail			Proposed 22 KV HT Feeder Pillar		
	Sub- Division	Section / Sub- Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of Feeder Pillar
1	Kopar Kahlarane	Pawane	Bhavkhaleshwar	Near Shendge Quarry	19.093696,73.032173	4
2	Kopar Kahiarane	Pawane	Bhavkhaleshwar	Near Mayuri Print	19.088780,73.028355	2
3	Kopar Kahiarane	Pawane	Bhavkhaleshwar	Near Darshan Chemicals	19.091782,73.023941	2
4	Kopar Kahlarane	Pawane	Bhavkhaleshwar	Near Laxmi Architech	19.093087,73.025257	2
5	Kopar Kahlarane	Pawane	petrol pump	Near Bidve Compony	19.104428,73.018454	2
6	Kopar Kahlarane	Pawane	petrol pump	Near Printograph	19.106412,73.021460	2
7	Kopar Kahiarane	Pawane	Arihant general	Near Desal Foods	19.098990,73.017920	2
8	Kopar Kahlarane	Pawane	Arihant ral	Candoor Foods	19.098830,73.017055	2
9	Kopar Kahiarane	Pawane	MIDC - 1	Mhatre DTC	19.116914,73.022569	2
10	Kopar Kahlarane	Pawane	Ekvira feeder	Near SSD Gas	19.118060,73.029081	2
11	Kopar Kahiarane	Pawane	Ekvira feeder	Near Utility Forms	19.120859,73.030727	2
12	Kopar Kahlarane	Pawane	Expanded	Near Expanded Compony	19.085516,73.023333	2
13	Kopar Kahiarane	Pawane	Expanded	At Corner Of Expanded Compony	19.085516,73.023333	2
14	Kopar Kahlarane	Pawane	Expanded	Near Shalina Compony	19.084143,73.026503	2
15	Kopar Kahlarane	Pawane	MIDC - 1	Near Old Bus Depo Mahape	19.113862,73.021595	2
16	Kopar Kahiarane	Pawane	MIDC - 1	Near Plot No A400	19.113862,73.021595	2
17	Kopar Kahlarane	Pawane	MIDC - 1	Near RMC Plant Mahape	19.119194,73.022943	1
18	Vashi	MAFCO / Tubhe				80

19	Alroli	CIDCO / Airoli / Rabale /Ghansoli	41
TOTAL			156

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring Main Unit (RMU) (3I+2B) SF-6 for HT

Name of District- Thane

Name of Circle- Vashi

Name of Division - Vashi

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KV Feeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Airoli	Airoli	Kalwa 1	Vishunagr	19.174423,73.002464	2
2	Airoli	Airoli	Kalwa 1	Sharpline	19.175375,73.005636	1
3	Airoli	Airoli	CIDCO 4	Airoli Sector 1	19.165985,72.996422	1
4	Airoli	Airoli	CIDCO 4	Shivcolony	19.164199,72.996297	1
5	Airoli	Airoli	Airoli Naka	NMMC Toilet AiroliNaka	19.166680,72.997625	1
6	Airoli	Airoli	Kalwa 1	Hanuman Mandir Chinchpada	19.165941,73.001032	1
7	Airoli	Airoli	Kalwa 1	Navkos	19.175564,73.005602	1
8	Airoli	Airoli	Kalwa 1	Datta Mandir	19.168188,72.998054	1
9	Airoli	Airoli	Kalwa 1	SLDC Kalwa	19.169234,72.996860	1
10	Airoli	Ghansoli	Sai Baba	Rabale height	19.141622,73.000594	1
11	Airoli	Ghansoli	Sai Baba	Rabale gaon DTC	19.141522,73.000234	1
12	Airoli	Ghansoli	Sai Baba	MSEB Office	19.140994,72.999471	1
13	Airoli	Ghansoli	Sai Baba	Sec - 29 C	19.141919,72.998724	1
14	Airoli	Ghansoli	Sai Baba	Vijay deep	19.141795,72.999571	1
15	Airoli	Ghansoli	Sai Baba	Virundavan dtc	19.141671,72.998372	1
16	Airoli	Ghansoli	Sai Baba	Urvashi	19.141359,72.998090	1
17	Airoli	Ghansoli	Sai Baba	Nardiwala	19.141238,72.997630	1
18	Airoli	Ghansoli	Sai Baba	Sec - 30 D Patelpark	19.141039,72.996832	1
19	Airoli	Ghansoli	Sai Baba	Rubi	19,140673,72.996509	1

20	Airoli	Ghansoli	Sai Baba	Shankar mandit	19.13857172.996389	1
21	Airoli	Ghansoli	Sai Baba	vitt bhatti	19.136815,72.998661	1
22	Airoli	Ghansoli	Ghansoli	Machi Market	19.139258,72.999012	1
23	Airoli	Ghansoli	Ghansoli	Patel park	19.136815,72.998661	1
24	Airoli	Ghansoli	Ghansoli	Sec - 23 mauliheight	19.134623,72.998908	1
25	Airoli	Ghansoli	Ghansoli	kumkum park	19.134728,72.997830	1
26	Airoli	Ghansoli	Ghansoli	Rabale Naka	19.142613,73.001617	1
27	Airoli	Ghansoli	Ghansoli	Kamala Arked,Sec-30C	19.139239,73.001665	1
28	Airoli	Ghansoli	Ghansoli	Sathenagar	19.134207,73.001361	1
29	Airoli	Ghansoli	Ghansoli	Golden Nagar	19.131780,73.002012	1
30	Airoli	Ghansoli	Ghansoli	Kapribaba DTC	19.124876,73.000953	1
31	Airoli	Ghansoli	Ghansoli	Sec - 25 Dattanagar	19.129813,73.000286	1
32	Airoli	Ghansoli	Ghansoli	Ganesh Tower PltNo.98,Sec- 21	19.130803,72.997559	1
33	Airoli	Ghansoli	Ghansoli	hanuman mandir	19.124850,72.995033	1
34	Airoli	Ghansoli	Ghansoli	NMMC office	19.126656,72.998908	1
35	Airoli	Ghansoli	Ghansoli	Patel Timber	19.138571,72.996389	2
36	Airoli	Ghansoli	Ghansoli	Gunali Talav	19.136815,72.998661	1
37	Airoli	Ghansoli	Ghansoli	Church DTC	19.139258,72.999012	2
38	Airoli	Rabale	PHILLIPS	R - 83	19.136367,73.011503	1
39	Airoli	Rabale	Chinchpada	Back side Policestation	19.142807,73.003990	1
40	Airoli	Rabale	Chinchpada	Katkaripada	19.137251,73.018521	1
41	Airoli	Rabale	Rabale	Noban Tekadl	19.148305,73.005827	1
42	Airoli	Rabale	Rabale	Sainagar	19.148305,73.005827	1
43	Airoli	Rabale	Narayan Dairy	R 520	19.138368,73.016063	1
44	Airoli	Rabale	Narayan Dairy	R - 689	19.137251,73.018521	1
45	Airoli	CIDCO	Diwa Feeder	220 / 22KV EHV Kalwa	19.168188,72.998054	2

46	Airoli	CIDCO	Diwa Feeder	Airoli Sec - 15	19.169234,72.996860	1
47	Airoli	CIDCO	Diwa Feeder	Diwa Gaon , Airoli	19.141622,73.000594	2
TOTAL						52

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring Main Unit (RMU) (2I+ 2B) SF-6 for HTName

Name of District: Thane

Name of Circle- Vashi

Name of Division - Vashi

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section / Sub-Station	Name of 22 KVFeeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Airoli	Airoli	Kalwa 1	Eltanpada	19.171855,73.007547	1
2	Airoli	Airoli	CIDCO 4	Sainathwadi	19.163167,72.991852	1
3	Airoli	Airoli	Kalwa 1	Ramaji Ambedkar Nagar	19.179943,72.995789	1
4	Airoli	Airoli	Kalwa 1	Vishunagr2	19.175375,73.005636	1
5	Airoli	Airoli	Kalwa 1	Chaugule School	19.165683,73.003305	1
6	Airoli	Ghansoli	Ghansoli Gaonthan	Gaondevi DTC	19.141622,73.000594	1
7	Airoli	Ghansoli	Ghansoli Gaonthan	Pragati Nagar DTC	19.141522,73.000234	1
8	Airoli	Ghansoli	Ghansoli Gaonthan	Jain Mandir DTC	19.140994,72.999471	1
9	Airoli	Ghansoli	Ghansoli Gaonthan	Talavpali DTC	19.141919,72.998724	1
10	Airoli	Ghansoli	Ghansoli Gaonthan	Arjunwadi DTC	19.141795,72.999571	1
11	Airoli	Ghansoli	Ghansoli Gaonthan	Hanuman mandir DTC	19.141671,72.998372	1
12	Airoli	Ghansoli	Ghansoli	Bhoir Bangla DTC	19.141359,72.998090	1
13	Airoli	Ghansoli	Ghansoli	Balaramwadi DTC	19.141238,72.997630	1
14	Airoli	Ghansoli	Ghansoli	Samshan Bhumi DTC	19.141039,72.996832	1
15	Airoli	Ghansoli	Ghansoli	Sector 21 plot No.98	19.140673,72.996509	1
16	Airoli	Ghansoli	Ghansoli	Manu Sagar DTC	19.138571,72.996389	1
17	Airoli	Ghansoli	Ghansoli	Sector 21 Plot No100 DTC	19.136815,72.998661.	1

18	Airoli	Ghansoli	Ghansoli	Marathi School DTCTalavli	19.139258,72.999012	1
19	Airoli	Rabale	PHILLIPS	South coust GOD	19.135557,73.004373	1
20	Airoli	Rabale	PHILLIPS	R 413	19.137234,73.014717	1
21	Airoli	Rabale	PHILLIPS	R 400	19.137234,73.014717	1
22	Airoli	Rabale	Techno process	269 DTC	19.145849,73.006652	1
23	Airoli	Rabale	Techno process	241 DTC	19.145849,73.006652	1
24	Airoli	Rabale	Techno process	251	19.145849,73.006652	1
25	Airoli	Rabale	RMU - 201	223 GOD	19.145849,73.006652	1
26	Airoli	Rabale	RMU - 201	217 Tap 22	19.145849,73.006652	1
27	Airoli	Rabale	RMU - 201	263 Tap 22	19.145849,73.006652	1
28	Airoli	Rabale	Roshan hotel	311 tap 22	19.142807,73.003990	1
29	Airoli	Rabale	Roshan hotel	303 22	19.142807,73.003990	1
30	Airoli	Rabale	Roshan hotel	Back Side BhushanHotel 22	19.142807,73.003990	1
31	Airoli	Rabale	Ultratech	322 DTC 22	19.149709,73.011874	1
32	Airoli	Rabale	Ultratech	Near DTR Ultratech	19.149709,73.011874	1
33	Airoli	Rabale	R - 496	W 266	19.144745,73.012498	1
34	Airoli	Rabale	Hamara Mahanagr	W 407	19.143284,73.015948	1
35	Airoli	Rabale	Hamara Mahanagr	Rotex Tap	19.143284,73.015948	1
36	Airoli	Rabale	Hamara Mahanagr	W 365	19.143284,73.015948	1
37	Airoli	Rabale	Goladen Garadge	R 588	19.142094,73.013375	1
38	Airoli	Rabale	Narayan Dairy	R 513	19.138368,73.016063	1
39	Airoli	Rabale	Narayan Dairy	R 417 tap	19.137251,73.018521	1
40	Airoli	Rabale	Narayan Dairy	R 681	19.137251,73.018521	1
41	Airoli	Rabale	Narayan Dairy	W 440	19.137251,73.018521	1
42	Airoli	Rabale	Narayan Dairy	R 702	19.138368,73.016063	1
43	Airoli	Rabale	Narayan Dairy	R 724	19.138368,73.016063	1
44	Airoli	CIDCO	Kalwa	220 / 22KV EHV Kalwa	19.179943,72.995789	2
45	Airoli	CIDCO	Kalwa	Airoli Sec 15	19.175375,73.005636	1
46	Airoli	CIDCO	Kalwa	Diwa Gaon , Airoli	19.165683,73.003305	1
TOTAL						47

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed Ring Main Unit (RMU) SF-6 (2I+1B) for HT

Name of District: Thane

Name of Circle- Vashi

Name of Division - Vashi

S No	Distribution Utility Detail			Proposed Ring Main Unit (RMU) SF-6		
	Sub-Division	Section /Sub-Station	Name of 22 KVFeeder	Name of Location	Lat. / Long. (Location)	No of RMU
1	Airoli	Airoli	Kalwa 1	Vijaynagar	19.176189,73.005284	1
2	Airoli	Ghansoli	Chinchpada	Chinchpaga DTC	19.165689,73.000852	1
3	Airoli	Ghansoli	Ghansoli	Sector 25 DTC	19.141622,73.000594	1
4	Airoli	Rabale	Phillips	Indico God	19.136444,73.009507	1
5	Airoli	Rabale	Phillips	R - 36	19.136348,73.010525	1
6	Airoli	Rabale	Phillips	R - 30	19.136367,73.011502	1
7	Airoli	Rabale	Phillips	R.P Ind	19.142437,73.011647	1
8	Airoli	Rabale	Phillips	Shankar Hotel	19.142437,73.011649	1
9	Airoli	Rabale	Techno Process	R - 270	19.145849,73.006652	1
10	Airoli	Rabale	RMU - 201	R - 913 DTC	19.145849,73.006652	1
11	Airoli	Rabale	Roshan hotel	R - 331	19.142807,73.003990	1
12	Airoli	Rabale	Roshan hotel	W - 92	19.142807,73.003990	1
13	Airoli	Rabale	Chinchpada	Diva naka	19.146141,73.002195	1
14	Airoli	Rabale	Rabale	R 974	19.148305,73.005827	1
15	Airoli	Rabale	Ultratech	W - 270	19.148578,73.009604	1
16	Airoli	Rabale	Ultratech	Shalimar volve	19.149709,73.011874	1
17	Airoli	Rabale	Ultratech	R 615	19.149709,73.011874	1
18	Airoli	Rabale	Ultratech	Ultratech	19.149709,73.011874	1
19	Airoli	Rabale	R - 496	R 877	19.144745,73.012498	1
20	Airoli	Rabale	R - 496	W - 290 Tap	19.144745,73.012498	1
21	Airoli	Rabale	R - 496	R 492	19.144745,73.012498	1
22	Airoli	Rabale	Hamara Mahanagar	Durga Hotel	19.143284,73.015948	1
23	Airoli	Rabale	Goladen Garadge	R - 548	19.142094,73.013374	1
24	Airoli	Rabale	Goladen Garadge	R - 566	19.142094,73.013375	1
25	Airoli	Rabale	Goladen Garadge	R - 584	19.142094,73.013376	1
26	Airoli	Rabale	Goladen Garadge	Sambhaji Nagar	19.138368,73.016062	1
27	Airoli	Rabale	Narayan Dairy	W - 450	19.138368,73.016063	1
28	Airoli	Rabale	Narayan Dairy	692	19.137251,73.018521	1
TOTAL						28

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 8 Way LT Pillar with ACBName

Name of District: Thane

Name of Circle- Vashi Name

Name of Division - Vashi

S No	Distribution Utility Detail		Proposed 8-Way LT Pillar with ACB		
	Sub-Division	Section / Sub-Station	Name of Location	Lat. / Long. (Location)	No of LT Pillar
1	Airoli	Airoli	vishnu nagar midc	19.174423,73.002464	1
2	Airoli	Airoli	vishnu nagar	19.175375,73.005636	2
3	Airoli	Airoli	yadav nagar	19.168677,73.006440	2
4	Airoli	Airoli	airoli village	19.162879,72.992456	1
5	Airoli	Airoli	gavtewadi	19.171386,73.002779	1
6	Airoli	Airoli	chinchpada	19.165326,73.001605	2
7	Airoli	Airoli	ramnagar	19.181302,72.998633	1
8	Airoli	Ghansoli	Ghotivali Goan	19.129226,73.001308	1
9	Airoli	Ghansoli	Nr Mseb Office	19.137182,73.000121	1
10	Airoli	Ghansoli	Rabale naka	19.130071,72.996291	1
11	Airoli	Ghansoli	Machi market	19.123194,72.994992	1
12	Airoli	Ghansoli	Vit Bhatti	19.125580,72.998778	1
13	Airoli	Ghansoli	Shankar Mandir	19.125580,72.998778	1
14	Airoli	Ghansoli	Rabale Gaon	19.126497,72.994354	1
15	Airoli	Ghansoli	NR . PATEL TIMBER	19.131697,72.994764	1
16	Airoli	Ghansoli	GANESH NAGAR	19.142680,73.001504	1
17	Airoli	Ghansoli	285 PRAGATI Nagar	19.139807,72.999156	1
18	Airoli	Ghansoli	GAWDEVIWADI	19.141782,73.000547	1
19	Airoli	Ghansoli	NR . CHURCH ,	19.138488,72.996081	1
20	Airoli	Ghansoli	NR WARD OFFICE	19.141054,72.996846	1
21	Airoli	Ghansoli	SHANKAR MANDIR	19.137952,72.996818	1
22	Airoli	Ghansoli	NR.GUNALI TALAV	19.131942,72.999901	1
23	Airoli	Ghansoli	Talavpali	19.126420,73.001241	1
24	Airoli	Ghansoli	Hanuman Mandir	19.127147,73.001429	1
25	Airoli	Ghansoli	Arjun Wadi	19.128302,73.000341	1
26	Airoli	Ghansoli	GOLDEN NAGER	19.131780,73.002012	1
27	Airoli	Ghansoli	NOCIL NAKA	19.134207,73.001361	1
28	Airoli	Ghansoli	TAKAVALINAKA	19.130803,72.997559	1
29	Airoli	Ghansoli	Datta Nagar	19.130341,72.999436	1
30	Airoli	Ghansoli	Talavpali	19.131780,73.000386	1

31	Airoli	Ghansoli	Talavpali - 2	19.129226,73.001308	1
32	Airoli	Ghansoli	Mathre Ali	19.129226,73.001308	1
33	Airoli	Ghansoli	Hanuman Mandir	19.137182,73.000121	1
34	Airoli	Ghansoli	Hanuman Mandir - 2	19.130071,72.996291	1
35	Airoli	Ghansoli	Arjun Wadi	19.123194,72.994992	1
36	Airoli	Ghansoli	Arjun Wadi - 2	19.125580,72.998778	1
37	Airoli	Ghansoli	GOLDEN NAGER	19.125580,72.998778	1
38	Airoli	Ghansoli	Talvali Gaon	19.126497,72.994354	1
39	Airoli	Ghansoli	Talvali Gaon - 2	19.131697,72.994764	1
40	Airoli	Ghansoli	GOLDEN NAGER - 2	19.142680,73.001504	1
41	Airoli	Ghansoli	NOCIL NAKA	19.139807,72.999156	1
42	Airoli	Ghansoli	KUNDLIK WADI ,	19.141782,73.000547	1
43	Airoli	Rabale	Sianagr DTC	19.145658,73.006728	1
44	Airoli	Rabale	Katkaripada DTC	19.145658,73.006729	1
45	Airoli	Rabale	Diva naka DTC	19.145658,73.006730	2
46	Airoli	Rabale	Gautam Nagar DTC	19.145658,73.006731	2
47	Airoli	Rabale	Kranti Chauk DTC	19.145658,73.006732	1
48	Airoli	Rabale	Ekata vidtalay	19.145658,73.006733	2
49	Airoli	Rabale	Putala no2	19.136605,73.012141	1
50	Airoli	Rabale	Golden Garadge	19.136605,73.012142	1
51	Airoli	Rabale	hamara mahnagar DTC	19.136605,73.012143	1
52	Airoli	Rabale	Near Goadevi hotel	19.136605,73.012144	1
53	Airoli	Rabale	Near R 560	19.136605,73.012145	1
54	Airoli	Rabale	Naer R 585	19.145658,73.006732	1
55	Airoli	Rabale	Sambhaji nagra	19.145658,73.006728	2
56	Airoli	Rabale	Narayan dairy	19.145658,73.006728	1
57	Airoli	Rabale	Karishma hotel	19.145658,73.006732	1
58	Airoli	Rabale	Uktra tecg	19.149364,73.010536	1
59	Airoli	Rabale	R 891	19.149364,73.010536	1
60	Airoli	Rabale	near Mini hotel	19.149364,73.010537	1
61	Airoli	Rabale	Near Vista inn	19.149364,73.010538	1
62	Airoli	Rabale	Nera R 24	19.149364,73.010536	1
63	Airoli	Rabale	naryan dairy	19.145658,73.006732	1
64	Airoli	Rabale	Gaodevi	19.145658,73.006733	2
65	Airoli	Rabale	Indico	19.136605,73.012141	1
66	Airoli	Rabale	Vista innDTC	19.136605,73.012142	1
67	Airoli	Rabale	Roshan hotel	19.136605,73.012143	1
68	Airoli	Rabale	Cng Galli	19.145658,73.006732	1
69	Airoli	CIDCO	Dhyandeep School	19.175375,73.005636	2
70	Airoli	CIDCO	Janta Market , Sec -	19.168677,73.006440	2

DPR NO.17 (THN/ VASHI/ 17)

71	Airoli	CIDCO	Hotel Prachiti	19.162879,72.992456	1
72	Airoli	CIDCO	Datta MeghaEngineeri	19.171386,73.002779	2
73	Airoli	CIDCO	Gawte wadi	19.129226,73.001308	1
74	Airoli	CIDCO	NMMC school	19.137182,73.000121	2
TOTAL					85

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detial of Proposed 6 Way LT Pillar

Name of District: Thane

Name of Circle- Vashi Name

Name of Division - Vashi

S No	Distribution Utility		Proposed 6 Way LT Pillar		
	Sub-Division	Section / Sub-Station	Name of Location	Lat. / Long. (Location)	No of Lt Pillar
1	Airoli	Airoli	Vishnu Nagar Midc	19.174423,73.002464	2
2	Airoli	Airoli	Vishnu Nagar	19.175375,73.005636	3
3	Airoli	Airoli	Yadav Nagar	19.168677,73.006440	3
4	Airoli	Airoli	Airoli Village	19.162879,72.992456	2
5	Airoli	Airoli	Gavtewadi	19.171386,73.002779	2
6	Airoli	Airoli	Chinchpada	19.165326,73.001605	3
7	Airoli	Airoli	Ramnagar	19.181302,72.998633	3
8	Airoli	Ghansoli	Ghotivali Goan	19.129133,73.001798	1
9	Airoli	Ghansoli	Nr Mseb Office	19.129747,73.000283	1
10	Airoli	Ghansoli	Rabale Naka	19.137282,72.999628	1
11	Airoli	Ghansoli	Machi Market	19.129785,72.996036	1
12	Airoli	Ghansoli	Vit Bhatti	19.122057,72.995799	1
13	Airoli	Ghansoli	Shidart Nagar	19.125980,72.998209	1
14	Airoli	Ghansoli	Mesh Shankar Mandir	19.125737,73.000685	1
15	Airoli	Ghansoli	Rabale Gaon	19.126084,72.994464	1
16	Airoli	Ghansoli	Gavli Hospital	19.130341,72.994380	1
17	Airoli	Ghansoli	Nr Rabale RailwaySt	19.142076,73.001081	1
18	Airoli	Ghansoli	26 Nr . Patel Timber	19.139336,72.999006	1
19	Airoli	Ghansoli	Nr Rabale Height	19.141769,73.001075	1
20	Airoli	Ghansoli	Ghansoli Gaon	19.138812,72.997232	1
21	Airoli	Ghansoli	Samarth Nagar	19.140120,72.996877	1
22	Airoli	Ghansoli	Ganesh Nagar	19.138488,72.996081	1
23	Airoli	Ghansoli	Pragati Nagar	19.131780,73.000386	1
24	Airoli	Ghansoli	Chinchali	19.126067,73.001186	1
25	Airoli	Ghansoli	Gawdeviwadi	19.127588,73.001471	1
26	Airoli	Ghansoli	Gaondevi Wadi	19.128566,73.000276	1
27	Airoli	Ghansoli	Nr . Church ,	19.132012,73.002182	1
28	Airoli	Ghansoli	Nmmc Hospital	19.134112,73.001814	1
29	Airoli	Ghansoli	Ward Office	19.131217,72.997945	1

30	Airoli	Ghansoli	Shankar Mandir	19.130442,72.998960	1
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31	Airoli	Ghansoli	Post Office	19.135907,72.997683	1
32	Airoli	Ghansoli	Nr.Abhinav Mitra Man	19.135731,72.998673	1
33	Airoli	Ghansoli	Nr.Gunali Talav	19.131851,73.001083	1
34	Airoli	Ghansoli	Rankar Ali	19.137950,72.996632	1
35	Airoli	Ghansoli	Tarai Nagar	19.136715,72.998934	1
36	Airoli	Ghansoli	Mahesheswar Nagar	19.138154,73.000630	1
37	Airoli	Ghansoli	Talavpali	19.139990,73.000986	1
38	Airoli	Ghansoli	Mathre All	19.126420,73.001241	1
39	Airoli	Ghansoli	Hanuman Mandir	19.127147,73.001429	1
40	Airoli	Ghansoli	Arjun Wadi	19.128302,73.000341	1
41	Airoli	Ghansoli	Golden Nager	19.131780,73.002012	1
42	Airoli	Ghansoli	Nocil Naka	19.134207,73.001361	1
43	Airoli	Ghansoli	Kundlik Wadi ,	19.130803,72.997559	1
44	Airoli	Ghansoli	Takavalinaka	19.130341,72.999436	1
45	Airoli	Ghansoli	Shate Nagar	19.135355,72.997687	1
46	Airoli	Ghansoli	Datta Nagar	19.135621,72.999256	1
47	Airoli	Ghansoli	Nr . Ram Mandir	19.131931,73.000600	1
48	Airoli	Ghansoli	Datta Nagar - 2	19.137868,72.996060	1
49	Airoli	Ghansoli	Sai Sadananad Nagar	19.136971,72.999615	1
50	Airoli	Ghansoli	Shankarbuwa Wadi	19.137533,73.000825	1
51	Airoli	Ghansoli	Rabale Height	19.139807,72.999156	1
52	Airoli	Ghansoli	Rabale Gaon Dtc	19.141782,73.000547	1
53	Airoli	Ghansoli	Mseb Office Va	19:138488-72.996081	1
54	Airoli	Ghansoli	Sec - 29 C	19.139807,72.999156	1
55	Airoli	Ghansoli	Vijay Deep	19.141782,73.000547	1
56	Airoli	Ghansoli	Virundavan Dtc	19.138488,72.996081	1
57	Airoli	Ghansoli	Urvashi	19.123194,72.994992	1
58	Airoli	Ghansoli	Nardiwala	19.125580,72.998778	1
59	Airoli	Ghansoli	Sec - 30 D Patel Park	19.131942,72.999901	1
60	Airoli	Ghansoli	Rubi	19.126420,73.001241	1
61	Airoli	Ghansoli	Shankar Mandir	19.127147,73.001429	1
62	Airoli	Ghansoli	Vitt Bhatti	19.141054,72.996846	1
63	Airoli	Ghansoli	Machi Market	19.137952,72.996818	1
64	Airoli	Ghansoli	Patel Park	19.131942,72.999901	1
65	Airoli	Ghansoli	Sec - 23 Mauli Height	19.137182,73.000121	1
66	Airoli	Ghansoli	Kumkum Park	19.129133,73.001798	1
67	Airoli	Ghansoli	Rabale Naka	19.129747,73.000283	1
68	Airoli	Ghansoli	Kamala Arked , Sec - 30C	19.137282,72.999628	1
69	Airoli	Ghansoli	Sathenagar	19.139807,72:999156	1

DPR NO.17 (THN/ VASHI/ 17)

70	Airoli	Ghansoli	Golden Nagar	19.141769,73.001075	1
71	Airoli	Ghansoli	Kapribaba Dtc	19.138812,72.997232	1
72	Airoli	Ghansoli	Sec - 25 Datta Nagar	19.122057,72.995799	1
73	Airoli	Ghansoli	Ganesh Tower PltNo.98,9	19.125980,72.998209	1
74	Airoli	Ghansoli	Hanuman Mandir	19.141782,73.000547	1
75	Airoli	Ghansoli	Nmmc Office	19.138488,72.996081	1
76	Airoli	Ghansoli	Ghotivali Goan	19.126497,72.994354	1
77	Airoli	Ghansoli	Nr Mseb Office	19.131697,72.994764	1
78	Airoli	Ghansoli	Rabale Naka	19.142680,73.001504	1
79	Airoli	Ghansoli	Machi Market	19.139807,72.999156	1
80	Airoli	Ghansoli	Vit Bhatti	19.141782,73.000547	1
81	Airoli	Ghansoli	Shankar Mandir	19.138488,72.996081	1
82	Airoli	Ghansoli	Rabale Gaon	19.141054,72.996846	1
83	Airoli	Ghansoli	Nr . Patel Timber	19.137952,72.996818	1
84	Airoli	Ghansoli	Ganesh Nagar	19.131942,72.999901	1
85	Airoli	Ghansoli	Pragati Nagar	19.129133,73.001798	1
86	Airoli	Ghansoli	Gawdeviwadi	19.129747,73.000283	1
87	Airoli	Ghansoli	Nr . Church ,	19.137282,72.999628	1
88	Airoli	Ghansoli	Nr Ward Office	19.129785,72.996036	1
89	Airoli	Ghansoli	Shankar Mandir	19.122057,72.995799	1
90	Airoli	Ghansoli	Nr.Gunali Talav	19.140344,73.000348	1
91	Airoli	Ghansoli	Talavpali	19.129785,72.996036	1
92	Airoli	Ghansoli	Hanuman Mandir	19.122057,72.995799	1
93	Airoli	Rabale	Ekata Vidyalay	19.143323,73.006320	1
94	Airoli	Rabale .	Bansode House	19.143323,73.006316	1
95	Airoli	Rabale	Diva Naka	19.143323,73.006316	1
96	Airoli	Rabale	Katkaripada	19.143323,73.006320	2
97	Airoli	Rabale	Sainagar	19.148365,73.009325	2
98	Airoli	Rabale	Gautam Nagar	19.148365,73.009326	1
99	Airoli	Rabale	Bhim Nagar	19.148365,73.009327	1
100	Airoli	Rabale	Parolekarwadi	19.148365,73.009325	2
101	Airoli	Rabale	Bhim Nagar	19.149364,73.010536	1
102	Airoli	Rabale	Putala No 2	19.136609,73.009196	2
103	Airoli	Rabale	Sambhaji Nagar	19.136609,73.009197	2
104	Airoli	Rabale	Near Bhusan Hotel	19.136609,73.009198	1
105	Airoli	Rabale	Aniket Hotel	19.136609,73.009199	2
106	Airoli	Rabale	Rabale Midc Area	19.143323,73.006320	12
107	Airoli	Rabale	Golden Garadge	19.143323,73.006316	2
108	Airoli	Rabale	Narayan Dairy	19.143323,73.006320	2
109	Airoli	Rabale	Sambhaji Nage	19.148365,73.009325	2
110	Airoli	Rabale	Mahnagar	19.148365,73.009326	2
111	Airoli	Rabale	Masala	19.148365,73.009327	2
112	Airoli	Rabale	Hotel	19.148365,73.009325	2

DPR NO.17 (THN/ VASHI/ 17)

113	Airoli	Rabale	W 266	19.136609,73.009196	2
114	Airoli	Rabale	W 275	19.136609,73.009197	2
115	Airoli	Rabale	R 942 Lane	19.136609,73.009198	2
116	Airoli	Rabale	Karishma Hotel	19.136609,73.009199	2
117	Airoli	CIDCO	Sec - 03	19.141054,72.996846	4
118	Airoli	CIDCO	Sec - 04	19.137952,72.996818	2
119	Airoli	CIDCO	Dhyandeep School	19.131942,72.999901	2
120	Airoli	CIDCO	Janta Market , Sec -2	19.137182,73.000121	2
121	Airoli	CIDCO	Sec - 05	19.129133,73.001798	4
122	Airoli	CIDCO	Gawte Wadi	19.129747,73.000283	2
123	Airoli	CIDCO	Sec - 06	19.137282,72.999628	4
124	Airoli	CIDCO	Sec - 09	19.139807,72.999156	4
125	Airoli	CIDCO	Sec - 10	19.141769,73.001075	4
126	Airoli	CIDCO	Nmmc School	19.131942,72.999901	1
TOTAL					183

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed 4 Way LT Pillar

Name of District: Thane

Name of Circle- Vashi Name

Name of Division - Vashi

S No	Distribution Utility		Proposed 4 Way LT Pillar		
	Sub-Division	Section / Sub-Station	Name of Location	Lat. / Long. (Location)	4 way pillar
1	Airoli	Airoli	Vishnu Nagar MIDC	19.174923,73.002764	5
2	Airoli	Airoli	Vishnu nagar	19.175175,73.005436	4
3	Airoli	Airoli	Yadav nagar	19.168377,73.006140	2
4	Airoli	Airoli	airoli village	19.162579,72.992756	5
5	Airoli	Airoli	gavtewadi	19.171086,73.002479	7
6	Airoli	Airoli	chinchpada	19.165626,73.001905	8
7	Airoli	Airoli	ramnagar	19.181002,72.998233	8
8	Airoli	Ghansoli	Ghotivali Goan	19.126067,73.001186	1
9	Airoli	Ghansoli	Nr Mseb Office	19.127588,73.001471	1
10	Airoli	Ghansoli	Sec - 29 c	19.128566,73.000276	1
11	Airoli	Ghansoli	Rabale naka	19.132012,73.002182	1
12	Airoli	Ghansoli	Rabale naka - 2	19.134112,73.001814	1
13	Airoli	Ghansoli	Machi market	19.131217,72.997945	1
14	Airoli	Ghansoli	SEE Machi market 2	19.130442,72.998960	2
15	Airoli	Ghansoli	Vit Bhatti	19.135907,72.997683	1
16	Airoli	Ghansoli	Shidart Nagar	19.135731,72.998673	1
17	Airoli	Ghansoli	Shankar Mandir	19.131851,73.001083	1
18	Airoli	Ghansoli	Shankar Mandir 2	19.137950,72.996632	1
19	Airoli	Ghansoli	Rabale Gaon	19.136715,72.998934	1
20	Airoli	Ghansoli	Rabale Gaon 2	19.138154,73.000630	1
21	Airoli	Ghansoli	Gavli Hospital	19.139990,73.000986	1
22	Airoli	Ghansoli	Nr Rabale RailwaySt	19.126420,73.001241	1
23	Airoli	Ghansoli	Sec - 30	19.127147,73.001429	1
24	Airoli	Ghansoli	NR . PATEL TIMBER	19.128302,73.000341	1
25	Airoli	Ghansoli	NR . PATEL TIMBER 2	19.131780,73.002012	1
26	Airoli	Ghansoli	Nr RABALE HEIGHT	19.134207,73.001361	1
27	Airoli	Ghansoli	Ghansoli Gaon	19.130803,72.997559	1
28	Airoli	Ghansoli	SAMARTH NAGAR	19.130341,72.999436	1
29	Airoli	Ghansoli	GANESH NAGAR	19.135355,72.997687	1

30	Airoli	Ghansoli	PRAGATI Nagar	19.135621,72.999256	1
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31	Airoli	Ghansoli	CHINCHALI	19.131931,73.000600	1
32	Airoli	Ghansoli	GAWDEVIWADI	19.137868,72.996060	1
33	Airoli	Ghansoli	GAONDEVI WADI	19.136971,72.999615	1
34	Airoli	Ghansoli	NR . CHURCH	19.137533,73.000825	1
35	Airoli	Ghansoli	NR . CHURCH-2	19.140344,73.000348	1
36	Airoli	Ghansoli	NR . NMMC HOSPITAL	19.129785,72.996036	1
37	Airoli	Ghansoli	NR WARD OFFICE	19.122057,72.995799	1
38	Airoli	Ghansoli	SHANKAR MANDIR	19.125980,72.998209	1
39	Airoli	Ghansoli	NR POST OFFICE	19.125737,73.000685	1
40	Airoli	Ghansoli	NR.ABHINAV MITRAMANDAL	19.126084,72.994464	1
41	Airoli	Ghansoli	NR.ABHINAV MITRAMANDAL - 2	19.130341,72.994380	1
42	Airoli	Ghansoli	SECTOR NO - 21 ,	19.142076,73.001081	1
43	Airoli	Ghansoli	SECTOR NO - 21,2	19.139336,72.999006	1
44	Airoli	Ghansoli	NR.GUNALI TALAV	19.141769,73.001075	1
45	Airoli	Ghansoli	RANKAR ALI	19.138812,72.997232	1
46	Airoli	Ghansoli	TARAI NAGAR	19.140120,72.996877	1
47	Airoli	Ghansoli	MAHESHESWAR NAGAR	19.138488,72.996081	1
48	Airoli	Ghansoli	Talavpali	19.131780,73.000386	1
49	Airoli	Ghansoli .	Talavpali - 2	19.129226,73.001308	1
50	Airoli	Ghansoli	Mathre	19.129445,73.001308	1
51	Airoli	Ghansoli	Hanuman Mandir	19.137182,73.000120	1
52	Airoli	Ghansoli	man Mandir	19.130071,72.996291	1
53	Airoli	Ghansoli	Arjun Wadi .	19.123194,72.994992	1
54	Airoli	Ghansoli	Arjun Wadi 2	19.125580,72.998778	1
55	Airoli	Ghansoli	GOLDEN NAGER	19.125580,72.998778	1
56	Airoli	Ghansoli	Talvali Gaon	19.126497,72.994354	1
57	Airoli	Ghansoli	Talvali Gaon - 2	19.131697,72.994764	1
58	Airoli	Ghansoli	GOLDEN NAGER - 2	19.142680,73.001504	1
59	Airoli	Ghansoli	NOCIL NAKA	19.139807,72.999156	1
60	Airoli	Ghansoli	KUNDLIK WADI ,	19.141782,73.000547	1
61	Airoli	Ghansoli	TAKAVALINAKA	19.138488,72.996081	1
62	Airoli	Ghansoli	Shate Nagar	19.141054,72.996846	1
63	Airoli	Ghansoli	Sector - 23	19.137952,72.996818	1
64	Airoli	Ghansoli	Datta Nagar	19.131942,72.999901	1
65	Airoli	Ghansoli	SECTOR - 25 ,	19.129133,73.001798	1
66	Airoli	Ghansoli	NR . RAM MANDIR	19.129747,73.000283	1
67	Airoli	Ghansoli	Datta Nagar - 2	19.137282,72.999628	1
68	Airoli	Ghansoli	SAI SADANANAD NAGAR	19.129785,72.996036	1
69	Airoli	Ghansoli	SHANKARBUWA WADI	19.122057,72.995799	1

70	Airoli	Rabale	banjarwadi	19.143323,73.006315	2
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DPR NO.17 (THN/ VASHI/ 17)

71	Airoli	Rabale	Hanuman Mandir	19.143323,73.006316	1
72	Airoli	Rabale	Shivsena shakaha	19.143323,73.006317	1
73	Airoli	Rabale	jar mari chauk	19.143323,73.006318	1
74	Airoli	Rabale	Ganesh galli	19.143323,73.006319	1
75	Airoli	Rabale	Katkaripada	19.143323,73.006320	2
76	Airoli	Rabale	Diva naka	19.136609,73.009194	3
77	Airoli	Rabale	Kole house	19.136609,73.009195	1
78	Airoli	Rabale	Samaj mandir	19.136609,73.009196	1
79	Airoli	Rabale	Parolekarwadi	19.136609,73.009197	2
80	Airoli	Rabale	Ganpati madir	19.136609,73.009198	1
81	Airoli	Rabale	Putala no 2	19.136609,73.009199	1
82	Airoli	Rabale	Kranti chauk	19.143323,73.006320	1
83	Airoli	Rabale	Durga mata Mandir	19.143323,73.006316	1
84	Airoli	Rabale	Water tank	19.145658,73.006728	1
85	Airoli	Rabale	Masjid	19.145658,73.006732	2
86	Airoli	Rabale	Gautam Nagar	19.149364,73.010536	2
87	Airoli	Rabale	Bansode House	19.149364,73.010536	1
88	Airoli	Rabale	Sai Nagar	19.149364,73.010537	2
89	Airoli	Rabale	Sambhaji nagar	19.149364,73.010538	2
90	Airoli	Rabale	RABALE MIDC	19.149364,73.010536	1
TOTAL					132

DETAILED PROJECT REPORT**“Shifting of Overhead Power lines to Underground Power Cables (HT/LT)”**

Detail of Proposed LT Mini Pillar

Name of District: Thane

Name of Circle- Vashi

Name of Division - Vashi

S No	Distribution Utility Detail			Proposed LT Mini Pillar		
	Sub-Division	Section / Sub-Station	DT Name	Name of Location	Lat. / Long. (Location)	Mini Feeder Pillar
1	Airoli	Airoli	Yadavnagar DTC	Yadavnagar DTC	19.168087,73.005398	1
2	Airoli	Airoli	Yadavnagar DTC	Yadavnagar DTC 2	19.168206,73.006645	1
3	Airoli	Airoli	Sant Kabir	Sant Kabir Nagar	19.168543,73.006110	1
4	Airoli	Airoli	Yadavnagar DTC 2	Yadavnagar DTC 2	19.168088,73.005045	1
5	Airoli	Airoli	Near Chakki	Chakki	19.166075,73.007250	1
6	Airoli	Airoli	Devidhamnagar	Devidhamnagar	19.167908,73.006833	1
7	Airoli	Airoli	Gavatewadi DTC	Gavatewadi DTC Thane	19.169859,72.999217	1
8	Airoli	Airoli	Gavatewadi DTC	Gavatewadi DTC	19.170457,73.003122	1
9	Airoli	Airoli	Pandharinagar 4	Pandharinagar 4 Way	19.171848,73.006865	1
10	Airoli	Airoli	Pandharinagar 4	Pandharinagar 4 Way	19.173643,73.006400	1
11	Airoli	Airoli	Juna Chinchpada	Juna Chinchpada	19.166130,73.004238	1
12	Airoli	Airoli	Juna Chinchpada	Juna Chinchpada	19.165184,73.002770	1
13	Airoli	Airoli	Juna Chinchpada	Juna Chinchpada	19.167628,73.004531	1
14	Airoli	Airoli	Water Tank	Water Tank DTC	19.167337,73.003224	1
15	Airoli	Airoli	NMMC School	NMMC School	19.166040,73.003945	1
16	Airoli	Airoli	BJP Office	BJP Office	19.165536,73.003936	1
17	Airoli	Airoli	Ambedkar Statue	Ambedkar Statue	19.166782,73.003523	1
18	Airoli	Airoli	BJP Office	BJP Office	19.166069,73.003545	1
19	Airoli	Airoli	Chaugule School	Chaugule School	19.166069,73.003545	1
20	Airoli	Airoli	Sagar Saloon	Sagar Saloon	19.165786,73.001775	1
21	Airoli	Airoli	Shankar Mandir	Shankar Mandir	19.168185,73.002899	1
22	Airoli	Airoli	Shankar Mandir	Shankar Mandir	19.167680,73.002921	1
23	Airoli	Airoli	Hanuman Mandir	Hanuman Mandir DTC	19.164475,73.003323	1
24	Airoli	Airoli	Ramnagar DTC	Ramnagar DTC	19.181124,72.998063	1
25	Airoli	Airoli	Hanuman Mandir	Hanuman Mandir	19.180450,72.998624	1
26	Airoli	Airoli	Ramnagar DTC	Ramnagar DTC	19.182063,72.998422	1
27	Airoli	Airoli	Datta Mandir	Datta Mandir	19.181443,72.999002	1
28	Airoli	Airoli	Fish Market	Fish Market Milind	19.180389,72.999002	1
29	Airoli	Ghansoli		Talavpali	19.131780,73.000386	1
30	Airoli	Ghansoli	Talavpali -	Talavpali	19.129226,73.001308	1
31	Airoli	Ghansoli	Mathre Ali	Mathre Ali	19.129226,73.001308	1
32	Airoli	Ghansoli	Hanuman Mandir	Hanuman Mandir	19.137182,73.000121	1

DPR NO.17 (THN/ VASHI/ 17)

33	Airoli	Ghansoli	Hanuman Mandir	Hanuman Mandir	19.130071,72.996291	1
34	Airoli	Ghansoli	Arjun Wadi	Arjun Wadi	19.123194,72.994992	1
35	Airoli	Ghansoli	Arjun Wadi	Arjun Wadi	19.125580,72.998778	1
36	Airoli	Ghansoli	GOLDEN NAGER	GOLDEN NAGER	19.125580,72.998778.	1
37	Airoli	Ghansoli	Talvali Gaon	Talvali Gaon	19.126497,72.994354	1
38	Airoli	Ghansoli	Talvali Gaon	Talvali Gaon	19.131697,72.994764	1
39	Airoli	Ghansoli	GOLDEN NAGER	GOLDEN NAGER	19.142680,73.001504	1
40	Airoli	Ghansoli	NOCIL NAKA	NOCIL NAKA	19.139807,72.999156	1
41	Airoli	Ghansoli	KUNDLIK WADI	KUNDLIK	19.141782,73.000547	1
42	Airoli	Ghansoli		TAKAVALINAKA	19.138488,72.996081	1
43	Airoli	Ghansoli	Shate Nagar	Shate Nagar	19.141054,72.996846	1
44	Airoli	Ghansoli	Sector - 23	Secr - 23	19.137952,72.996818	1
45	Airoli	Ghansoli	Datta Nagar	Datta Nagar	19.131942,72.999901	1
46	Airoli	Ghansoli	SECTOR -	SECR -	19.129133,73.001798	1
47	Airoli	Ghansoli	NR .	NR .	19.129747,73.000283	1
48	Airoli	Ghansoli	Datta Nagar	Datta Nagar	19.137282,72.999628	1
49	Airoli	Ghansoli	SAI SADANANAD	SAI	19.129785,72.996036	1
50	Airoli	Ghansoli	SHANKARBUWA WADI	SHANKARBUWA WADI	19.122057,72.995799	1
51	Airoli	Ghansoli	Ghotivali Goan DTC	Ghotivali Goan	19.129133,73.001798	1
52	Airoli	Ghansoli	Nr Mseb Office DTC	Nr Mseb Office	19.129747,73.000283	1
53	Airoli	Ghansoli	Rabale naka DTC	Rabale naka	19.137282,72.999628	1
54	Airoli	Rabale	Machi market DTC	Machi market	19.129785,72.996036	2
55	Airoli	Rabale	Vit Bhatti DTC	Vit Bhatti	19.122057,72.995799	2
56	Airoli	Rabale	Diva naka to banjarwadi DTC	Diva naka	19.143323,73.006315	7
57	Airoli	Rabale	Diva naka to HanumanMandir DTC	Diva naka	19.143323,73.006316	7
58	Airoli	Rabale	Diva naka to Jarl mari DTC	Diva naka	19.143323,73.006317	7
59	Airoli	Rabale	Diva naka to Shiv sena shakaha DTC	Diva naka Shiv	19.143323,73.006318	6
60	Airoli	Rabale	Shiv sena shakaha toGanesh galli DTC	Shiv sena shakaha	19.143323,73.006319	5
61	Airoli	Rabale	Ganesh Galli to 6 way DTC	Ganesh Galli	19.143323,73.006320	3
62	Airoli	Rabale	Jari mari to BansodeHouse DTC	Jari mari	19.136609,73.009194	3
63	Airoli	Rabale	Hanuman Bandir to Banjarwadi SchoolDTC	Hanuman Bandir	19.136609,73.009195	3
64	Airoli	Rabale	Banjarwadi School toWater tank DTC	Banjarwadi School	19.136609,73.009196	5
65	Airoli	Rabale	Shivsena Shakha toKatkaripada DTC	Shivsena Shakha	19.136609,73.009197	4

66	Airoli	Rabale	Katkaripada to kranti Chauk DTC	Katkaripada	19.136609,73.009198	15
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67	Airoli	Rabale	Karnti Chauk to NMMChospital DTC	Karnti Chauk	19.136609,73.009199	6
68	Airoli	Rabale	Katkaripada to SamjMandir DTC	Katkaripada	19.143323,73.006320	4
69	Airoli	Rabale	Katkaripada to Ganpati Mandir DTC	Katkaripada	19.143323,73.006316	4
70	Airoli	Rabale	Parolekarwadi to Ganpati Mandir DTC	Parolekarwadi	19.143323,73.006316	2
71	Airoli	Rabale	Coropack DTC to Ekata widyalay 6wDTC	Coropack DTC Ekata	19.143323,73.006320	3
72	Airoli	Rabale	Ekata vidyalaya to Parolekarwadi DTC	Ekata vidyalaya	19.148365,73.009325	4
73	Airoli	Rabale	Ekata vidyalaya to Kole House DTC	Ekata vidyalaya	19.148365,73.009326	5
74	Airoli	Rabale	Ekata vidyalaya to Putala no.2 DTC	Ekata vidyalaya	19.148365,73.009327	5
75	Airoli	Rabale	Kole House to Durgamata Mandir DTC	Kole House Durga	19.148365,73.009325	3
76	Airoli	Rabale	Duraga Mata Mandir to Nibar 200 DTC DTC	Duraga Mata Mandir	19.136609,73.009198	6
77	Airoli	Rabale	200 Putala no 2 to Niban te DTC	200 Putala no 2	19.136609,73.009196	7
78	Airoli	Rabale	Oil Field DTG to P to Puta DTC	Oil Field DTG P	19.136609,73.009197	7
79	Airoli	Rabale	Niban Tekadi DTC to Gautam nagar DTC	Niban Tekadi DTC	19.136609,73.009198	3
80	Airoli	Rabale	Gautam nagar to Masjid DTC	Gautam nagar	19.136609,73.009199	3
81	Airoli	Rabale	Nmmc Hospital to Water tank DTC	Nmmc Hospital	19.143323,73.006320	3
82	Airoli	Rabale	Golcha DTC to Varlipada DTC	Golcha DTC	19.143323,73.006316	3
83	Airoli	Rabale	Varlipada to 4w DTC	Varlipada	19.143323,73.006320	2
84	Airoli	Rabale	Sainaga DTC to Nmmc Toilet DTC	Sainaga DTC	19.143323,73.006320	3
85	Airoli	Rabale	Nmmc Toilet to Mishra house DTC	Nmmc ilet	19.148365,73.009325	4
86	Airoli	Rabale	Nmmc Toilet to Ganesh galli DTC	Nmmc ilet	19.136609,73.009196	3
87	Airoli	Rabale	Sainagar DTC	Sainagar	19.136609,73.009197	5

DPR NO.17 (THN/ VASHI/ 17)

88	Airoli	Rabale	Sainaga DTC	Back side MIDC	19.136609,73.009193	5
89	Airoli	Rabale	Sambhaji nagar DTC	Sambhaji nagar	19.136609,73.009199	7
90	Airoli	Rabale	Ashvin Qury DTC	Ashvin Qury	19.143323,73.006320	6
91	Airoli	CIDCO	Sec - 02 DTC	Sec - 02	19.142680,73.001504	3
92	Airoli	CIDCO	Sec - 04 DTC	Sec - 04	19.139807,72.999156	1
93	Airoli	CIDCO	Dhyandeep School DTC	Dhyandeep School	19.141782,73.000547	2
94	Airoli	CIDCO	Janta Market , Sec - 2 DTC	Janta Market , Sec -	19.138488,72.996081	2
95	Airoli	CIDCO	Sec - 05 DTC	Sec - 05	19.141054,72.995846	2
96	Airoli	CIDCO	Sec - 10 DTC	Sec - 10	19.137952,72.996818	2
97	Airoli	CIDCO	Sec - 06 DTC	Sec - 06	19.131942,72.999901	3
98	Airoli	CIDCO	Sec - 09 DTC	Sec - 09	19.143323,73.006320	1
					Sub-Total	241
99	Kopar hairan	Pawane	EL102 DTC	EL102	19.103804,73.007989	2
100	Kopar hairan	Pawane	pawanegaon DTC	pawanegaon	19.103339,73.005259	2
101	Kopar hairan	Pawane	A65 / 1 DTC	A65 / 1	19.102534,73.005067	1
102	Kopar hairan	Pawane	C345 DTC	C345	19.100650,73.005130	1
103	Kopar hairan	Pawane	C255 DTC	C255	19.094986,73.007965	1
104	Kopar hairan	Pawane	A422 DTC	A422	19.095030,73.007957	1
105	Kopar hairan	Pawane	A74 DTC	A74	19.103339,73.005259	1
106	Kopar hairan	Pawane	near tiranga componyDTC	near tiranga compony	19.102534,73.005067	2
107	Kopar hairan	Bonkode	NA	Garden - 1 / 2 , Sector - 1	19.108196,73.005379	1
108	Kopar hairan	Bonkode	NA	Nr . R No - 965, Sector - 4	19.107874,73.007319	1
109	Kopar hairan	Bonkode	NA	Nr . R No - 328 , Sector - 5	19.103804,73.007989	1
110	Kopar hairan	Bonkode	NA	Nr . R No - 354 , Sector - 6	19.103339,73.005259	1
111	Kopar hairan	Bonkode	NA	Nr . R No - 986 , Sector - 6	19.102534,73.005067	1
112	Kopar hairan	Bonkode	NA	Nr . Plot no - 52 , Sector - 7	19.100650,73.005130	1
113	Kopar hairan	Bonkode	NA	Nr . Bldg no - 21 , Fam CHS , Sector -11	19.094986,73.007965	1
114	Kopar hairan	Bonkode	NA	Nr . Bldg no - 37 , Fam CHS , Sector -11	19.095030,73.007957	1

115	Kopar hairan	Bonkode	NA	Nr . Plot no - 51 /52 , Sector - 12D	19.098407,73.012659	1
					Sub-Total	20
116	Vashi	MAFCO	NA	Turbhe Store Nr Kulkarni Office	19.078761,73.018085	1
117	Vashi	MAFCO	NA	Turbhe Store Nr JainHouse	19.078738,73.018281	1
118	Vashi	MAFCO	NA	Turbhe Store NrItkar House	19.079442,73.018249	1
119	Vashi	MAFCO	NA	Turbhe Store Nr Sarmai Mandir	19.079757,73.018388	1
120	Vashi	MAFCO	NA	Turbhe Store Opp Dtc - 4127625	19.079782,73.018764	1
121	Vashi	MAFCO	NA	Turbhe Store Nr Islamiya Backry	19.079990,73.019595	1
122	Vashi	MAFCO	NA	Turbhe Store Nr ShivShena Office	19.079016,73.019493	1
123	Vashi	MAFCO	NA	Turbhe Store Ne Bholanath SarojHouse	19.078648,73.019992	1
124	Vashi	MAFCO	NA	Turbhe Store Nr JayBhavani Hotel	19.078011,73.018651	1
125	Vashi	MAFCO	NA	Turbhe Store Nr Shankar Mandir	19.078061,73.019648	1
126	Vashi	MAFCO	NA	Turbhe Store Nr Ambedkar Putla	19:078066,73.020630	1
127	Vashi	MAFCO	NA	Turbhe Store Nr PalStore	19.078315,73.020743	1
128	Vashi	MAFCO	NA	Turbhe Store Nr Bawdi Durga Mandir	19.078786,73.020713	1
129	Vashi	MAFCO	NA	Turbhe KKR Road NrAnwer House	19.076667,73.019127	1
130	Vashi	MAFCO	NA	Kkr Road Nr DurgaMandir	19.076724,73.020019	1
131	Vashi	MAFCO	NA	Kkr Road Nr GushaMasjid	19.076660,73.020419	1
132	Vashi	MAFCO	NA	Kkr Road Nr KamleshVarma	19.076767,3.0208270	1
133	Vashi	MAFCO	NA	Kkr Road Nr WaterTank	19.077231,73.020955	1
134	Vashi	MAFCO	NA	Kkr Road Nr KatimaniOffice	19.077266,73.021393	1
135	Vashi	MAFCO	NA	Kkr Road ekdi Chudhary Store	19.076815,73.021318	1
136	Vashi	MAFCO	NA	Kkr Road Tekdi Nr.Ragi House	19.076942,73.021817	1

137	Vashi	MAFCO	NA	Turbhe Naka Nr Rashan Dukan	19.071919,73.021139	1
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138	Vashi	MAFCO	NA	Turbhe Naka Nr Balwadi	19.072562,73.021018	1
139	Vashi	MAFCO	NA	Turbhe Naka Nr Medkar House	19.072654,73.021508	1
140	Vashi	MAFCO	NA	Turbhe Naka GaneshNagar	19.070372,73.022366	1
141	Vashi	MAFCO	NA	Turbhe Naka Nr Chamunda Hardwer	19.069675,73.022366	1
142	Vashi	MAFCO	NA	Turbhe Store Back toGetta Ganral Store	19.078512,73.018102	1
143	Vashi	MAFCO	NA	Turbhe Store Bijanath Gupta Ganral Store	19.078434,73.020290	1
144	Vashi	MAFCO	NA	Turbhe Store Nr Santosh Kirana	19.077685,73.020779	2
145	Vashi	MAFCO	NA	Turbhe Store Nr Samta Hindi School	19.078755,73.021319	1
146	Vashi	MAFCO	NA	TURBHE Store Nr JayBhavani Hotel Galli	19.078325,73.018473	3
147	Vashi	MAFCO	NA	Tubhe Store Nr Airtel Booking Point	19.078696,73.018552	1
148	Vashi	MAFCO	NA	Turbhe Store Nr Santosh Hotle	19.078799,73.019082	1
149	Vashi	MAFCO	NA	Turbhe Store Nr Billal Masjid	19.079686,73.020032	1
150	Vashi	MAFCO	NA	Tubhe Store Tekdi	19.076762,73.021984	4
151	Vashi	MAFCO	NA	Trrbhe Store Tekdi	19.076453,73.022424	1
152	Vashi	MAFCO	NA	Tubhe Store Tekdi	19.076509,73.021818	1
153	Vashi	MAFCO	NA	Turbhe Store Nr Navjivan School	19.076448,73.021056	1
154	Vashi	MAFCO	NA	Turbhe Store Nr Liboni Budh Vihar	19.077328,73.019189	2
155	Vashi	MAFCO	NA	Turbhe Store Nr Water Tank	19.077209,73.020665	1
156	Vashi	MAFCO	NA	Turbhe Naka Nr FishMarket	19.069931,73.020300	1
157	Vashi	MAFCO	NA	Turbhe Naka Opp Femas Telar	19.069988,73.019931	1
158	Vashi	MAFCO	NA	Turbhe Naka Nr RajHotle	19.069897,73.020286	1

159	Vashi	MAFCO	NA	Turbhe Naka Nr Ganesh Ti Center Ganesh Nagar	19.070030,73.022381	2
					Sub-Total	52
					TOTAL	313

CONSTRUCTIONS GUIDELINES

Annexure-U

CONSTRUCTIONS GUIDELINES

Table of Contents

Annexure-11	217
Annexure-11 :CONSTRUCTIONS GUIDELINES	218
1. Overview of the Scope of Works	219
2. Survey	220
3. Project Management System	221
4. Quality Assurance and Evaluation Mechanism	222
Annexure-A	236
5. Type and Acceptance test	247
6. Type Testing, Inspection, Testing & Inspection Certificate	247
7. Pre-Commissioning Tests	249
8. Commissioning Tests	249
9. GIS mapping & asset tagging	249
10. Documentation	250
11. Return of replaced old materials to the area stores of MSEDCL	252
12. Miscellaneous activities	253
13. Individual work components	254
13.1. New 33 KV Lines	254
13.2. 66/11KV new Substation	261
13.3. New 33/11 kV Power Substation	264
13.4. New 11 KV Lines	282
13.5. Distribution Transformer Substations	287
13.6. New LT Line	294
13.7. Augmentation and Renovation	299
13.8. High voltage distribution system (HVDS)	310
13.9. Civil Works And Soil Investigation	317
13.10. LT AB Cable Reconductoring Work	342
13.11. Construction of New 11 kV Feeders and Associated Works for Separation of Agricultural Consumers	350
13.12. Underground Cabling	353
13.13. Specification for erection of 66 kV M/C, D/C tower / H-frame line :	357
13.14. Plinth Mounted Distribution Substations	363
13.15. Installation, Testing & Commissioning of 3-phase outdoor Switched Capacitor Bank	382

1. Overview of the Scope of Works

The work is to be executed on turnkey basis, the scope of which includes survey, network design, supply, manufacturer's quality assurance, testing (where specified/ required), transportation, storage, erection, including all civil/ structural works, site testing, commissioning of all items & materials including all associated activities though not exclusively specified herein and are required for the completion and satisfactory performance of the entire works as intended.

The scope of works also include General Technical Instructions enclosed at Annexure-B.

This specification intends to cover but not limited to the following activities, services and works:

- Providing engineering data, and drawing for review, approval and records.
- Supply, testing, packing, transportation and insurance from the manufacturer's work to the site.
- Receipt, storage, insurance, preservation and conservation of equipments at the site.
- Fabrication, pre-assembly (if any), erection, testing and putting into satisfactory operation of all the equipments/ materials including successful commissioning.
- In addition to the requirements indicated in this section, all the requirements as stated in Technical specifications shall also be considered as a part of this specification as if completely bound herewith.
- Providing all materials, equipments and services specified or otherwise, including survey, which are required to fulfill the intent of ensuring operability, maintainability and the reliability of the complete works covered under this specification.
- During warranty period the bidder is required to provide all the services and activities mentioned in the contract.
- Preparation of project completion report/ closure proposal along with a report clearly indicating completion of any outstanding/ remedial work that needs to be carried out.
- Handing over the works to the MSEDCL for taking into commercial services.

It is not the intent to specify all aspects of design and construction of equipments mentioned herein. The systems, subsystems and equipments shall conform in all respect to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. Accordingly, scope of works under this contract is as under:

- 1.1 Execution of all other works as per tender document. All Steel structure except STPs shall be hot dip galvanized as per relevant Indian Standard.
- 1.2 All the raw materials such as steel, zinc for galvanizing, reinforcement steel and cement for foundation, coke for earthing, bolts, nuts & washers, danger plates, phase plate, number plate etc. required for substations & its structures shall be included in the scope of supply. Bidders shall clearly indicate in their offer, the sources from where they propose to procure the key raw materials and the components.
- 1.3 All the Distribution Transformers procured under 'Konkan Disaster Mitigation Project' are procured with Standard ratings, meeting at least Energy Efficiency Level-1 as specified in IS 1180 (Part-1):2014 and its Amendment 1, 2, 3 & 4, should be manufactured by an authorised licensee and bear BIS certification standard mark.
- 1.4 A set of drawings are enclosed with this bid document. These are tender drawings and are to be approved by the IA. These drawings are indicative in nature and therefore, must be referred while preparing drawings for approval.
- 1.5 All the new assets created under 'KONKAN DISASTER MITIGATION PROJECT' to be properly GIS tagged with the help of mobile App provided by the IA/MSEDCL.

- 1.6 The engraving of word “Developed under ‘KONKAN DISASTER MITIGATION PROJECT’” in materials viz., Poles, Transformers (All types), Cables, Energy Meter etc is mandatory requirement. The TKC shall ensure strict compliance of this requirement. Also, while processing payments to the Contractor, suitable documentary evidence / photographs must be asked by the IA in support of the compliance.
- 1.7 Major infrastructures like new primary substation, new Distribution Transformer, new lines etc developed under ‘KONKAN DISASTER MITIGATION PROJECT’ needs to be clearly denoted by a signboard that should represent
- 1.7.1. About the Work
 - 1.7.2. Date of Commissioning
 - 1.7.3. Estimated cost
 - 1.7.4. Scheme
 - 1.7.5. IA/End user’s details
 - 1.7.6. For Transformers, rating in kVA

The signboard shall comply to the technical specifications attached and shall reflect as a separate billable item in the price schedule attached . Colour coding of the DTs is essential.

- 1.8 The Manufacturing Quality Plan (MQP) shall be finalized by the IA in consultation with the contractor/manufacturer in line with the Technical Specifications and as per MSEDCL practices

Supply of Plant and Services under this tender covers all interventions required for satisfactory operations of the facilities unless specifically excluded. Scope includes Design, Supply, survey, installation, erection testing and commissioning, on turnkey basis. The types of works envisaged in the ‘KONKAN DISASTER MITIGATION PROJECT’ scheme are:

- Under-ground Cabling in Natural Disaster Prone Areas

All items to be supplied and erected shall be strictly as per the specifications given in the Bid and should comply the relevant standards and any amendments thereof.

Any deviation taken by the bidder and not specifically / clearly brought out in the price schedule will not be considered as a valid deviation.

In addition to the works mentioned above the bidder is required to take care of the activities listed below:-

2. Survey

The Contractor shall carry out, and be responsible for, final design of the works, including any site surveys, subsoil investigations and all other things necessary for proper planning design and execution. The initial site surveys will be carried out for tentative freezing of the material requirement and the work content finalization, within one month of commencement of project, and this will be a joint survey and sample check by the IA. The same shall be reviewed progressively on quarterly basis for freezing of the material requirement and work content. Design shall be prepared by qualified designers who are engineers and experienced in design of transmission and distribution systems. IA shall provide all options proposed for loss reductions to the contractor. Contractor, while surveying the execution of work, shall keep this requirement in view and suggest best loss reduction options in

decending order. Means, maximum loss reduction option shall be proposed on priority. Also, while executing the works, same priority of works must be followed.. The changes in design should be approved by Engineer-in-charge of IA.

- Based on the finalized network design, the Bidder shall carry out the field survey for deciding location of RMUs, HT/LT Feeder Pilars and distribution transformers etc. Besides, field survey will also cover the following:
 - a. Proposed route of 33 KV, 22KV, 11KV and LT Underground Cable.
 - b. Proposed location of 33/11 KV sub-stations along with number, capacity of power transformers and number of 11 KV feeders to be taken out.
 - c. Locations of new distribution transformers etc.
- Bill of Quantity (BOQ), for each proposed work will be prepared by the Bidder and submitted to the IA's for his approval before commencement of actual work.
- All architectural and civil designs such as control room, foundation for equipment, transformer, RMUs, isolators, VCB, Feeder Pillar/Minipillar shall be approved by the IA's.
- Within substation yard, all clamps and connectors used for bus-bar will be crimped. All the clamps and connectors connecting the equipments shall be of bolted type.

3. Project Management System

3.1. General

The Contractor shall assign a project manager with the authority to make commitments and decisions that are binding on the Contractor. IA will designate an officer incharge to coordinate all IA project related activities. All communications between IA and the Contractor shall be coordinated through the officer incharge of IA. TKC shall also be assisting IA in communicating project related information to other stake holders.

Bidder shall submit the manpower deployment plan along with the bids, describing the key roles of each person.

The role and responsibilities of **contractor** shall be as follows:

- a) To prepare, maintain and update project detailed Work Execution Plan for successful implementation of project like approval of GTP, approval of sub-contractor, approval of drawings, supply of materials, mobilization of men, material and equipment etc. at site for successful completion of works, Compile and up-load physical as well as financial progresses, compile the progress of works at IA level and to assist in forwarding it to all stake holders.
- b) To actively participate in resolving all issues relating to project implementation including ROW, Forest Clearances and Railway Crossings.
- c) To actively participate in monitoring, reviewing and analysing the physical, financial and quality assurances works' progress of 'KONKAN DISASTER MITIGATION PROJECT' works and also to take suitable measures on compliance of observations being raised during monitoring/review meetings with IA.

- d) To upload and up-date project wise physical progress in web portal. Physical as well as financial progresses shall be uploaded in standard Bill of Material format of the contract. Also, to submit invoices as per released 'KONKAN DISASTER MITIGATION PROJECT' guidelines to IA for release of payments/funds.
- e) To oversee the progress and compliance of the Quality Assurance Mechanism as per 'KONKAN DISASTER MITIGATION PROJECT' guidelines.

3.2. Project Schedule

As per the schedule the bidder shall submit a preliminary implementation plan along with the bid. The detailed project implementation schedule shall be submitted by the contractor after the award of contract for IA's approval, which shall include at least the following activities:

- (a) Surveying of site.
- (b) Documents submission and approval schedule
- (c) Pre-Dispatch Inspection schedule
- (d) Dispatch Schedule
- (e) Installation & commissioning schedule
- (f) Training schedule, if any.

The project schedule shall include the estimated period for completion of project and its linkage with other activities etc. It is expected that the contractor should share updated project schedule based on the actual progress done at site, priorities of the IA, availability of material etc once per quarter along with the Progress report.

3.3. Progress Report

A progress report shall be prepared by the Contractor each month against the activities listed in the project schedule. The report shall be made available to IA on a monthly basis, e.g., the 10th of each month. The progress report shall include all the completed, ongoing and scheduled activities.

3.4. Transmittals

Every document, letter, progress report, change order, and any other written transmissions exchanged between the Contractor and IA shall be assigned a unique transmittal number. The Contractor shall maintain a correspondence index and assign transmittal numbers consecutively for all Contractor documents. TKC will maintain a similar correspondence numbering scheme identifying documents and correspondence that IA initiates.

4. Quality Assurance and Evaluation Mechanism

The Quality Assurance (QA) will be carried out by IA. The IA may engage an Authorised representative of IA responsible & accountable for assuring quality in 'KONKAN DISASTER MITIGATION PROJECT' works. Key activities would include:

- Formulation of a detailed comprehensive Quality Assurance Mechanism (QAM) plan/Guaranteed Technical Particulars as the case may be in the State for the works to be carried out under 'KONKAN DISASTER MITIGATION PROJECT' scheme with an objective to create quality infrastructure works. The QAM and Inspection Plan shall be integral part of the contract agreement with turnkey contractor or equipment supplier and erection agency as the case may be in case of turnkey/ or departmental execution of works.
- Ensuring that the quality of materials/equipment supplied at site and execution of works carried out at field under 'KONKAN DISASTER MITIGATION PROJECT' scheme is in accordance to Manufacturing Quality Plan

(MQP)/Guaranteed Technical Particulars (GTP) and Field Quality Plan (FQP)/Approved Drawings/Data Sheets respectively.

4.1. Quality checks to be ensured by Turnkey Contractor:

Turnkey Contractor shall strictly ensure QAM checks during the day to day course of project execution, which are as follows:

- a. Pre-dispatch inspections of all materials viz. as per MQP/GTP, Approved Drawings, Technical Specifications, Datasheet, GTP, applicable national & international standards as applicable.
- b. 100% verification of all 33kV,22kV,11kV Cables & RMUs etc for quality of material as per MQP/GTP, Approved Drawings, Technical Specifications , Datasheet and erection works in the field as per FQP/approved drawings.
- c. 100% verification of materials utilised under the scheme.
- d. 100% verification of works done under the scheme.

4.1.1. Vendor approval: All the materials procured for 'KONKAN DISASTER MITIGATION PROJECT' works shall be purchased from the authorised vendors approved by the Quality Assurance Department of IA. Approved vendors list is uploaded periodically on the MSEDCL website.

New vendors/suppliers may be approved by IA, provided capability of manufacturer(s) is assessed suitably by visiting the factory premises and checking the testing facility available before accepting it as an approved vendor. If required, State Electricity Board/Power Department/ Distribution Companies may adopt vendors already approved by CPSEs.

4.1.2. FQP for Civil works: IA shall prepare a separate FQP/field execution drawings which shall be approved by their competent authority which shall be uploaded at web portal. The turnkey shall adhere to this FQP/drawings while carrying out physical works.

4.1.3. FQP for testing & commissioning: IA shall prepare a comprehensive Pre-commissioning test Check-list for testing & commissioning of 33KV/22KV/11kV Under ground cables, 33KV/22KV/11KV RMU, LT Feeder Pillars and LT Cables etc. The electrical system shall be energized only after performing all tests as described in the pre-commissioning test checklist. and inspection from the electrical inspector of the state (or as the practice may be). Proper records in this regard, including tests on earth resistance, insulation resistance of 11 kV line & Distribution Transformer etc. shall be maintained, jointly signed by IA and turnkey representatives.

4.1.4. Quality Assurance Mechanism (QAM) to be followed by the Contractor is as below:

- a. The Contractor shall be responsible and accountable for assuring quality in the scheme works. Accordingly, the Contractor shall formulate a comprehensive Quality Assurance mechanism (QAM) and Inspection Plan with an objective to build quality infrastructure under the project, which should be approved by the IA. Alternately, the IA may also provide its QAM which needs to be complied by the Contractor. The QAM and Inspection Plan shall be an integral Part of the contract agreement with turnkey Contractor or equipment supplier/vendor and erection agency as the case may be in case of partial turnkey and departmental execution of works. Documentation with regard to Quality Assurance and Inspection Plan shall be maintained by the Contractor and kept in proper order for scrutiny during the course of project execution and for future reference. The Contractor has to ensure that the quality of materials/equipment's supplied at site and execution of works carried out at field is in accordance to the Manufacturing Quality Plan (MQP)/Guaranteed Technical Particulars (GTP) and Field Quality Plan (FQP)/Approved Drawings/Data Sheets respectively.

- b. Some key indicative measures for effective implementation of the QAM by the Contractor are given below. However, these are for reference and need to be followed as per relevant provisions of the contract.
- Supply:
 - Verification of qualifications of the subcontractor / manufacturer for supply of plant / equipment and materials. Factory inspections may be conducted if required.
 - Verification of material data, specifications, drawings and samples submitted by the subcontractor / manufacturer including GTPs.
 - Verification of type test reports including qualifications of the test laboratory, completeness and acceptance of the type test reports.
 - Witnessing acceptance tests carried out by the subcontractor/ manufacturer.
 - Carrying out pre-dispatch inspections as per relevant guidelines of this tender/ contract.
 - Inspection of storage facilities of the subcontractor/ manufacturer.
 - Works:
 - Carry out field inspections on sample basis during implementation to verify works are carried out in compliance to technical specifications and acceptable quality of workmanship.
 - Issue Site Observation Reports (SOR) and follow-up with the subcontractor/ manufacturer for implementation of any remedial actions.
 - Upon completion, carry out joint inspections together with the IA's staff/IA representatives/TPQMA and for final measurements and quality inspections.
 - Follow-up any on technical issues for corrective action during defects liability period with the subcontractor/ manufacturer.
- c. It should be noted that no functional guarantees are applicable for equipment installed as a part of this contract hence Guarantee Tests are not applicable.
- d. The IA may identify any third party agency including TPQMA etc. who would be responsible to monitor the QAM measures including verifications and inspections mentioned in tender. The IA may also engage third party inspectors for this purpose in addition if required.
- e. The IA or its appointed third party shall design systems and procedures to implement QAM system including formats for submittals by the Contractor in line with the above requirements and provisions of the Contract.
- f. The Contractor shall cooperate with and follow these QAM systems and procedures to ensure proper implementation of an effective quality assurance and evaluation mechanism.

4.1.5. Pre-commissioning test record: All pre-commissioning test check list shall be documented properly and signed by the quality engineer of the turnkey Contractor & countersigned by IA's representative and shall be kept for future reference. These documents shall be maintained by IAs in proper order and shall be made available at site for verification by Quality Monitors during inspection and finally be handed over to user department (O&M department) at the time of handing over of energized assets.

4.1.6. Roles and responsibility of Contractor in ensuring Quality of Plant and Facilities:

- 1) Turnkey contractor shall be primarily be responsible for supply of quality materials. Hence, turnkey contractor shall take all necessary actions including following:

- a. To assess the capabilities and capacity of manufacturer to whom they intend to appoint as sub-vendor,
 - b. To keep strict control over manufacturing of materials by controlling procurements of right raw materials, periodical stage inspections, to ensure process control and to get the materials invariably inspected in manufacturing stage as well as after manufacturing but before dispatch at the works of manufacturer to ensure quality of materials/equipment.
 - c. To ensure stage inspection and final dispatch inspection, turnkey contractor should deploy his/her quality assurance team to inspect the materials with IA/third party inspector as well as independently as per requirements.
- 2) Receipt inspection: On receipt of materials at site, it would be the prime responsibility of turnkey contractor to verify materials physically in accordance to agreed technical specifications. Physical parameters like dimensions (length, width, height, area of conductor), weight per unit, Insulation Value, length of cable/conductor in sample drum(s), clear embossing on cables through sequential marking depicting name of manufacturer, size of cable and length in meter. Once the Contractor is satisfied, materials must be offered for joint inspection to IA.
 - 3) Earlier, on receipt of materials at site, dispatch documents shall be verified jointly by IA, IA's appointed Third Party, Turnkey Contractor and materials supplier (if representative is full time available at site. During inspection, quantities of items, sealing on the materials, serial numbers of the items, sequential embossing (proper visible/legible without any additional efforts) and name plates on the materials shall be checked. Dispatch challans shall be verified for details of consigner and consignee, materials descriptions, quantities transported, pre-dispatch clearance certificate/waiver of inspection. In case of high value equipment, capacity of equipment in terms of current carrying capacity, operating voltage and KVA ratings should be recorded.
 - 4) Clearance for installation: Once, materials on receipt are accepted by turnkey contractor as well as IA representative, they will be eligible for erection, testing and commissioning.
 - 5) Sampling from field: Any material, including materials listed below, may be picked from site for testing at test laboratory chosen by inspecting official. 1. Distribution Transformer, 2. Overhead Conductor, 3. Energy Meter, 4. Pole, 5. Insulators, 6. Cables, 7. Circuit Breaker.
 - a. Inspecting official will have right to pick any of the supplied equipment whether it is lying in site stores, is under erection, is under local transportation from site stores to erection location or is already commissioned. The equipment shall be sealed jointly in presence of representatives of IA, IA's appointed Third Party, Contractor, and Supplier/manufacturer (if his representative is available at site). IA at its discretion may invite manufacturer's representative to participate in sealing of materials.
 - b. Sealed equipment, on cost of turnkey contractor shall be sent to test laboratory for verification of routine/type test results. At the time of sealing, details of equipment available at site shall be recorded like cable/conductor drum number, power/distribution transformer unique number, status of sequential legible embossing on cables, name of manufacturer etc.
 - c. For testing of equipment, IA/Nodal agency shall empanel test laboratories located in or nearer to the state wherefrom sample is picked up.
 - d. Such picked up materials at a random shall be tested for all routine, acceptance and type tests feasible to conduct in the empaneled laboratory. The laboratory expenses including all other expenditures that shall incurred towards packing, transport, inspection, testing charges etc. are to be borne by the TKC. At least one sample from a lot may be subjected to inspection.

- e. In cases, where pre-dispatch and factory test results/NABL accredited lab test report are found mismatched with tests results on the sample picked from field; actions shall be taken against willful defaulted manufacturer and turnkey contractor both.
 - f. Willful defaulter shall be those manufacturers and turnkey contractor whose material is found to be manufactured using inferior quality raw materials, second hand core materials, under-size/under-weight of cable/conductor in various parts of cable/conductor drum, not conforming to transformer load losses as defined in agreed technical specifications/contract conditions, improper or no sequential legible embossing on cable etc.
 - g. This mismatch shall generally be, but not limited to the deviations in results from guaranteed technical specifications of materials in terms of capacity (KVA capacity, current carrying capacity, heating capacity, tensile strength, mechanical strength etc., operational efficiencies (errors in measurements of power, power/load losses, power consumption etc., weights of key component materials (aluminum, copper, insulation materials, steel components etc.), sub-standard specifications of key component (measured specifications are in deviation from guaranteed specifications as per technical specifications of the project and inferior/illegible embossing/sequential marking on cables are found, following two actions shall be taken:
 - i. Sub-vendors/vendor registration of the manufacturer shall be discontinued in all the power utilities of the country for a period of 5 years including in power utility concerned where this act is found,
 - ii. Entire lot of materials/equipment supplied by the defaulting manufacturer shall be rejected whether supplied materials/equipment is lying in site-stores, in transit, under erection, testing & commissioning or has already been commissioned. All costs related to removal of such rejected materials and reinstating fresh lot of materials shall be borne by turnkey contractor without any cost implication to power utility.
 - iii. Turnkey contractor shall be responsible for repetitive failures of materials in field testing in a turnkey-contract. In such situations, registration of turnkey contractor firm shall be discontinued in all the power utilities of the country for a period of 5 years including in power utility concerned where this act is found,
 - h. In cases, where field testing results are slightly mismatched with factory test results / pre-dispatch test reports/NABL accredited lab test report but are in permissible limits as per GTP/Data Sheet/Technical Specifications, no action shall be taken against the turnkey contractor/manufacturer.
 - i. In cases where turnkey contract is reluctant/not willing to support the IA in selecting sample for testing by way of non-association in sampling, sampling and testing related activities of equipment, all actions related to sample selection, sealing and testing including dismantling, loading, unloading, transportation etc, will be taken by IA on risk & cost of the turnkey contractor. The non-cooperative act on part of turnkey contractor shall be circulated amongst all power utilities in the country. In such situations, registration of turnkey contractor firm shall be discontinued in all the power utilities of the country for a period of 5 years including in power utility concerned where this act is found.
- 6) <Optional clause – to be deleted>
~~The Contractor should set up at least one testing laboratory under this contract for testing the materials received at site from its subcontractors/ vendors/ manufacturers etc. The testing laboratory thus setup, should have the facility for carrying out basic tests to ascertain the quality of the following equipments/ materials:~~
- ~~a. Cables/ Conductors~~
 - ~~b. Distribution Transformers~~
 - ~~c. Insulators~~
- ~~[100%] quantity of each lot shall be tested by the Contractor at its field test laboratory. Post completion of testing of the above items at its laboratory, the Contractor shall submit a report to the IA, certifying the satisfactory testing results.~~
- 7) The Contractor should develop the quality assurance programme which shall generally cover the following:
- a. Organization structure for the management and implementation of the proposed quality assurance programme :
 - b. Documentation control system;

- c. Qualification data for bidder's key personnel;
- d. Procedure for purchases of materials, parts, components and selection of sub-Contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- e. System for shop manufacturing and site erection controls including process controls and fabrication and assembly control;
- f. Control of non-conforming items and system for corrective actions;
- g. Inspection and test procedure both for manufacture and field activities.
- h. Control of calibration and testing of measuring instruments and field activities;
- i. System for indication and appraisal of inspection status;
- j. System for quality audits;
- k. System for authorizing release of manufactured product to the IA.
- l. System for maintenance of records;
- m. System for handling storage and delivery; and
- n. A manufacturing quality plan detailing out the specific quality control measures and procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.
- o. A Field quality Plan covering field activities

- 8) **Electrical Inspector inspection:** After successful completion of the work permission from State Electrical Inspectorate is required. Necessary fee etc. shall be paid by the Contractor. However if Contractor pays such fee it shall be reimbursed on actual basis on documentary evidence. In case of defects / in-complete works notified by Electrical Inspectorate, these shall be completed by the agency at no extra cost implication to IA.

4.2. Concurrent Quality Monitoring by Nodal agencies: In addition to the in-house quality checks and processes followed by the IA, the Nodal Agency of 'KONKAN DISASTER MITIGATION PROJECT' shall also carry out concurrent inspection of works through Third Party Quality Monitoring Agency (TPQMA). The Contractor needs to comply with the requirements and cooperate for effective implementation.

4.2.1. Scope of Quality Assurance Mechanism by 'KONKAN DISASTER MITIGATION PROJECT' Nodal Agency:

The Nodal Agency shall carry out concurrent inspection of works through TPQMA. To enable the same, the IAs shall share the physical and financial progress of the works through portal of the scheme or otherwise. In addition to the above, the Nodal Agencies may also carry out concurrent quality monitoring on random sample basis as per the need through its own manpower. TPQMA shall also verify quality of works carried out in the Project, which are as follows:

- 100% New Power Substations or at least one in each district/circle.
- 5% Augmented Substations or at least five in each district/circle.
- 100% HT feeders and LT line Underground work.
- 2% of DTR Substations (11/0.4kV), including few spans of associated LT Lines
- IT/OT/SCADA/DMS infrastructure – primarily at system level for highlevel functional checks.

4.2.2. Field Works Quality Inspection:

- (i) **Substation inspection:** 100% New and 5% of Augmentation Substations are to be inspected in 2 (two) stages. Stage-I & Stage-II inspections shall cover 50% new substation & 2.5 % of Augmented substations respectively.
- **Stage-I** Inspection of TPQMA shall commence in a project when 50% New & 30% of Augmentation substation works are completed in all respect.
 - **Stage-II** inspection of TPQMA shall commence in a project when 100% New & 70 % of Augmentation substation works are completed in all respect.

(ii) **RMUs/ HT/LT Feeders:** 100 % HT/LT Feeder underground work are to be inspected in 2 (two) stages. Stage-I & Stage-II inspections shall cover 100 % HT/LT Feeder respectively.

- **Stage-I** Inspection of TPQMA shall commence in a project at the start of laying of HT/LT Feeder Under ground cable works.
- **Stage-II** Inspection of TPQMA shall commence in a project after completion of HT/LT Feeder Under ground cable laying work in all respect.

(iii) **DTR Substations:** 2% of DTR Substations (11/0.4kV), including few spans of associated LT Lines are to be inspected in 2 (two) stages. Stage-I & Stage-II inspections shall cover 1 % of DTR Substations respectively

- **Stage-I** Inspection of TPQMA shall commence in a project when 30% of DTR Substation including LT Lines works are completed in all respect.
- **Stage-II** Inspection of TPQMA shall commence in a project when 70% of DTR Substation including LT Lines works are completed in all respect.

(iv) **IT/OT/SCADA/DMS infrastructure:** IT/OT/SCADA/DMS infrastructure are to be inspected when works is completed in all the respect. For this:

- 1) TPQMA shall submit the report after inspections on 'KONKAN DISASTER MITIGATION PROJECT' portal along with all BoQ, Photographs, SLD, etc.
- 2) TPQMA also verify the Contract Management Part once for each project and upload deviations, if any observed in respect of the guidelines/ Standard Bidding Document, adherence to QAM, Contractual provisions pertaining to defects identification and rectification. (In this part TPQMA would give thrust on adherence on systems and procedures of 'KONKAN DISASTER MITIGATION PROJECT' schemes by turnkey contractors during project implementation).
- 3) As only random inspections are to be carried out by TPQMA agencies leaving around 90 to 95% materials/works unchecked therefore there should be some stringent penal clause to be made if materials /works verified by TPQMA found faulty/wage. The TKC is required to rectify the observations / defects detected within 7 days of notification. However based on severity the IA may direct the Contractor on resolution mechanism / process and timeline.

(v) **Deployment of mobile vans for quality inspection:** The IA/ Nodal Agency reserves the right to also deploy mobile vans with Testing facility to test the plants and facilities by selecting random samples from store or from site. The IA may take sample from any lot placed in store including the lot on which Pre-Dispatch Inspection was not carried out or from the installed materials which it feels are not performing as it was intended to. In such a case if the material/ facility fails, the same shall be replaced with new material, and one more random sample would be selected from the same batch for testing. If the material fails the test again, then the whole lot shall be replaced by the Contractor at its own risk and cost.

4.2.2. Cross verification of field /TPQMA works by Nodal Agency: The Nodal Agency also reserves the right to monitor the field /materials to the tune of 1% of total inspections carried out by TPQMA.

4.3. Material Inspection: For the purpose of inspection, materials have been segregated into two categories as mentioned below:

4.3.1 **Category – A (Pre-Dispatch Inspection &**

Testing at NABL accredited Labs):

- a) This category shall include high ticket
 materials ((1) Power Transformer 2) Distribution Transformers 3) Circuit Breakers 4) AB / XLPE Cables 5) Overhead / Covered Conductor (AAAC / ACSR) 6) SDT 7) Current Transformers (CT) 8) Potential Transformers (PT) 9) Insulators 10) Control Panels 11) RSJ/PSC poles 12) 11 KV AB Switch / Horn Gap Fuse 13) LTDB (Low Tension Distribution Box) 14) DT Meter 15) Jointing Kit 16) Isolator 17)HT/LT cable 18) RMU 19) HT/LT Feeder pillar/Minipillar 20) Service connection box 21) Breakdown attending van alongwith cable fault finding equipments with 5KVA DG set) which involves more and important testing procedures and hence the inspection of these materials will be carried out in the factory before the dispatch of the material.

- b) In addition, IA shall also ensure that for major materials as discussed above, samples from 1st lot and one other lot randomly selected by the IA shall be directly sent to NABL accredited test labs for third party testing. It is also to be noted that material clearance of the lots under testing shall only be given post receipt of successful test results. Contractor shall also mandatorily depute its authorized official for pre – dispatch inspection at manufacturing facility alongwith the IA officials. The inspection and testing report would be jointly signed by the IA and the Contractor. All the expenses related to testing would be beared by the Contractor.
- c) Apart from the above mentioned protocol any one power transformer shall be selected by Employeeer from the supply schedule from the vendor, which shall be jointly sealed and tested for short circuit testing on turnkey-Contractor's expenses.

4.3.2**Category – B (On-site inspection):**

Category B materials include all other materials not listed Category-A. These materials can be inspected upon arrival at the site before installation. However, if the IA has concerns about the quality of the supplied materials, the IA reserves the right to send the selected lot to an NABL accredited testing lab for third party testing. The rest of the procedures remain unchanged.

4.3.3

IA also reserves the right to send any installed equipment / materials to the NABL accredited testing lab for testing. The IA would have to reimburse the expenses related to transportation of material from site to testing lab and all testing expenses in this regard.

4.3.4

The material which has to be tested at laboratory shall be sealed in the presence of authorized official of IA and Contractor.

4.3.5

If the materials tested at Laboratory fails then the entire lot would be rejected. Contractor shall bear the responsibility of sending back such failed materials from site. Any subsequent delay in contract performance due to failure of materials in the test laboratory would be on account of Contractor and no time extension would be provided by the IA in this regard. Any LD levies in this regard would be borne by the Contractor.

4.3.6**Pre-dispatch Inspection (PDI) for****Category-A**

4.3.6.1. Pre-dispatch inspection shall be performed on the identified materials at manufacturer's work place for which Contractor shall be required to raise requisition giving at least 10-day time. Depending on requirement, inspection shall be witnessed by representatives of IA, TPQMA, Contractor and/or representative of the Nodal Agency. TPQMA shall carry out pre-dispatch inspection of major materials randomly in a single lot containing minimum 10% materials at manufacturer works. The TPQMA shall perform pre – dispatch inspection test of below materials:

(1) Power Transformer	11) Insulators
2) Distribution Transformers	12) Control Panels
3) Circuit Breakers	13) RSJ/PSC poles
4) HT/LT AB / XLPE Cables	14) 11 KV AB Switch / Horn Gap Fuse
5) Overhead / Covered Conductor (AAAC / ACSR)	15) LTDB (Low Tension Distribution Box)
6) SDT	16) DT Meter
7) Current Transformers (CT)	17) Jointing Kit
8) Potential Transformers (PT)	18) Isolator
9) Ring Main Units (RMUs)	19) HT/LT Feeder Pillar/Minipillar

10) Service Connection Metering Box	20) Breakdown fault attending van
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4.3.6.2. Tests to be conducted during the Pre-dispatch Inspection: All the tests shall be carried out in accordance with the latest relevant IS published from time to time by BIS. An indicative list of IS specification and tests for some of the materials are given below:

Power Transformers

Standards Applicable:-	
IS:2026 (Part I to IV)	Power Transformer
IS:5	Colour for ready mixed paints
IS:325	Three Phase Induction Motors
IS:335	New insulating oil for transformers, switch gears
IS:1271	Classification of insulating materials for electrical machinery and apparatus in relation to their stability in services
IS:2071	Method of high voltage testing
IS:2099	High voltage porcelain bushings
IS:2147	Degree of protection
IS:2705	Current Transformers
IS:3202	Code of practice for climate proofing of electrical equipment
IS:3347	Dimensions for porcelain Transformer Bushings
IS:3637	Gas operated relays
IS:3639	Fittings and accessories for power Transformers
IS:5561	Electric Power Connectors
IS:6600/BS:CP“ 10:0	Guide for loading of oil immersed Transformers
IS:10028	Code of practice for selection, installation and maintenance of transformers, Part I. II and III
C.B.I.P. Publication	Manual on Transformers
Proposed Tests as per IS	
1	All standard routine tests in accordance with IS: 2026 with dielectric tests corresponding to latest amendments of IS: 2026 shall be carried out.
2	All auxiliary equipment shall be tested as per the relevant IS. Test certificates shall be submitted for bought out items.
3	High voltage withstand test shall be performed on auxiliary equipment and wiring after complete assembly.
4	Following additional routine tests shall also be carried out on each transformer: a) Magnetic Circuit Test on each core shall be tested for 1 minute at 2000 Volt DC b) Oil leakage test on transformer

Distribution Transformers

Standards Applicable:-

IS 2026: (Part 1 to 10) as applicable	General Specification of Transformer
IS 1180 (Part1) (Including Amendment 1, 2, 3 & 4)	Outdoor type oil immersed Distribution transformer upto including 2500 kVA & 33 kV
IS 3347 (Part 1)	Specification upto 1.1 kV Voltage Bushing (for Porcelain)
IS 3347 (Part 3)	Specification upto 17.5 kV Voltage Bushing (for Porcelain)
Type Test	A valid Type test report within 5 years of supply 3 star rated transformer as per BEE
IS -5484	Specification for Aluminum wire rods
IS 12444	Specification for Copper wire Rods
Proposed Tests as per IS	
1	Measurement of Winding resistance at all Tap Positions
2	Ratio of Tap Position Polarity & Phase Position
3	% Impedance at 75 degree Celsius at 50Hz
4	Load losses at 50% and at 100% Loading on Energy efficiency Level -5 as per IS 1980 (Part-1) 2014 and its amendment 1.2. 3 and 4
5	No Load Loss at 50Hz and No load current at rated voltage
6	Insulation Resistance
7	Induced Overvoltage Withstand
8	Separate source voltage Withstand
9	Magnetizing Current at Rated voltage and frequency an 112.5% of rated voltage
10	Temperature rise test
11	Pressure Test
12	Oil Leakage Test

Circuit Breaker

Standards Applicable:-	
IS: 13118	Specification for HV AC Circuit Breaker
IS: 14658	HV AC Circuit Breakers - Guide for Short-circuit and Switching Test Procedures for Metal-enclosed and Dead Tank Circuit Breakers
IS: 2099	Specification for HV porcelain bushings
IS: 5621	Specification for porcelain hollow insulator.
IS: 8603	Specification for Dimension for Porcelain Transformer Bushing for use in heavily polluted area.
IS: 3347	Specification for Dimension for Porcelain Transformer Bushing for use in normal and lightly polluted area.
IS: 2633	Specification for method for testing uniformity of coating On Zinc coated articles.
IS: 5561	Specification for Electrical Power Connectors
IS: 2147	Specification for Degree of Protection

Proposed Tests as per IS

1	Single Capacitor bank breaking test
2	Short time withstand and Peak Withstand Current Test
3	Wet power frequency withstand voltage test
4	Lightening Impulse voltage withstand test
5	Temperature rise test
6	Mechanical Endurance Test(M2 Class)
7	Degree of Protection test of Control Cubicle

XLPE Cables

Standards Applicable:-	
IS : 7098 (Part-I) : 1988	Specification for Crosslinked Polyethylene Insulated PVC sheathed Cables for working Voltage upto 33KV & including 1100 Volt
IS: 8130 : 1984	Specification for Conductors for insulated electric cables and flexible cords
IS:5831 : 1984	PVC insulation & sheath of electric cables
IS: 3975 : 1970	Specification for Low Carbon Galvanized steel wires, Formed Wires and tapes for armouring of Cables
IS:10810 : 1984	Methods of test for Cables.
IS:10418 : 1982	Cable Drums for Electric Cables.
IS : 694 : 2010	PVC unsheathed and Sheathed cables / Chords with rigid and flexible conductor for rated voltages upto and including 450/ 750 V
Proposed Tests as per IS	
1	Resistance Test on conductor
2	Test for thickness of insulation and sheath
3	Tensile strength and elongation at break test for insulation & outer sheath.
4	Hot set test for insulation.
5	Insulation resistance (Volume resistivity) Test
6	High voltage test

Arial Bunched Conductor

Standards Applicable:-	
IS 14255 : 1995	Specification for Aerial Bunched Cables for working Voltage up to & including 1100 Volts.
IS : 8130 : 1984	Specification for Conductors for Insulated Electric Cables and flexible Cords.
IS : 398 (Part-IV) : 1994	Specification for Aluminum Conductors for overhead transmission purposes: Aluminum Alloy Stranded Conductors (Aluminum Magnesium –Silicon type).
IS:10418:1982	Specification for Drums for Electric Cables
Proposed Tests as per IS	
1	Breaking Load Test for messenger Conductor.
2	Elongation test for messenger conductor.
3	Conductor resistance test for both messenger and XLPE conductor

4	Test for thickness of insulation of XLPE conductor
5	Tensile Strength and Elongation at Break Test for both messenger and XLPE conductor
6	Hot Set Test for XLPE insulation.
7	Insulation resistance test for XLPE conductor
8	High Voltage Test for XLPE conductor

Overhead Conductors AAAC/ACSR

Standards Applicable:-	
IS: 398 (Part I & II) : 1996	Specification for Aluminum Conductors with Steel Re-inforced.
IS: 4826 : 1968	Coating of the galvanized steel wires shall be applied by the hot process or electrolysis process
IS: 398 (Part-IV): 1994	Specification for All Aluminum Alloy Conductor (AAAC)
IS: 1778 : 1980	Packaging of Overhead conductor in Wooden Drum
Proposed Tests as per IS	
1	Measurement of lay ratio.
2	Measurement of diameters of individual wire
3	Measurement of resistance of individual wire.
4	Breaking load test of individual wire.
5	Elongation test of individual wire.

Porcelain Insulators

Standards Applicable:-	
IS 1445 : 1977	Porcelain insulators for overhead power lines with a nominal voltage up to and including 1000 V
IS 2486 (Part 1) : 1993	Metal fittings of insulators for overhead power lines with nominal voltage greater than 1000 V: Part 1 General requirements and tests
IS 2486 (Part 2) : 1989	Insulator fittings for overhead power lines with nominal voltage greater than 1 000 V: Part 2 Dimensional requirements
IS 2486 (Part 4) : 1989	Insulator Fittings for Overhead Power Lines with a Nominal Voltage Greater than 1 000 V - Part IV : Tests for Locking Devices
Proposed Tests as per IS	
1	Resistance Test on conductor
2	Test for thickness of insulation and sheath
3	Tensile strength and elongation at break test for insulation & outer sheath.
4	Hot set test for insulation.
5	Insulation resistance (Volume resistivity) Test
6	High voltage test

The above list of tests is only indicative in nature and if the IA feels, it can add some tests based on latest IS Standards. If the IA faces any issues with respect to actual performance of a material then it can issue a notice to the Contractor for testing of that material at its sole discretion.

4.3.6.3. The Contractor shall ensure receipt of material at site within 21 days from date of receipt of dispatch instructions. In case materials are not received within 21 days from date of issue of dispatch instruction, the dispatch instruction shall stand cancelled. All expenditure incurred by IA in performance of dispatch instruction shall be recovered from turnkey Contractor. A fresh pre – dispatch inspection would be required to issue a dispatch instruction for supplying the same lot at the site.

4.3.6.4. The turnkey Contractor shall ensure that pre-dispatch inspection for materials are intimated only when the material is completely ready for inspection. On due date of inspection, if it is found that materials are not ready in required quantities or the inspection could not be carried out due to non-availability of requisite calibrated certificate of instruments with manufacturer, closing of works on scheduled date of inspection, non-availability of sufficient testing/material handling staff at manufacturer works etc, all expenditures incurred on deployment of various inspecting officials along with a fine of Rs 50,000/- shall be recovered from the bills of the agency and re-inspection shall be carried out on expense of the Contractor. 2nd such situation at same manufacturer/supplier shall result in rejection of name of manufacturer from list of approved vendors/sub-vendors. In case sub-standard materials (old component, re-cycled materials, re-used core material, re-used transformer coil material etc) offered for inspection and are noticed during the inspection, materials shall be rejected and approval of sub-vendor shall also be cancelled for all ‘KONKAN DISASTER MITIGATION PROJECT’ projects.

4.4. Implications for not meeting quality requirements by Contractor

4.4.1. In case of failures in testing:

- a) The turnkey Contractor shall ensure that pre-dispatch inspection for materials is intimated only when the material is completely ready for inspection. On due date of inspection, if it is found that materials are not ready in required quantities or the inspection could not be carried out due to non-availability of requisite calibrated certificate of instruments with manufacturer, closing of works on scheduled date of inspection, non-availability of sufficient testing/material handling staff at manufacturer works etc, all expenditures incurred on deployment of various inspecting officials along with a fine of Rs 50,000/- inclusive of GST shall be recovered from the bills of the agency and re-inspection shall be carried out on expense of Contractor.
- b) 2nd such situation at same manufacturer/supplier shall result in rejection of name of manufacturer from list of approved vendors/sub-vendors. In case sub-standard materials (old component, re-cycled materials, re-used core material, re-used transformer coil material etc) offered for inspection and are noticed during the inspection, materials shall be rejected and approval of sub-vendor shall also be cancelled for all ‘KONKAN DISASTER MITIGATION PROJECT’ projects.
- c) In case, a material fails the pre-dispatch inspection, and also fails the subsequent repeat inspection of the rectified/replaced material, the complete lot of material under inspection will be required to be replaced by the manufacturer/supplier. If in subsequent inspection of the new lot, the material again fails the inspection, then materials shall be rejected and approval of vendor/sub-vendor shall also be cancelled for all ‘KONKAN DISASTER MITIGATION PROJECT’ projects. In such scenario any subsequent delay in contract performance due to failure of materials in the test laboratory would be on account of Contractor and no time extension would be provided by the IA in this regard. Any LD levies in this regard would be borne by the Contractor.
- d) Apart from the above, in case of default by vendors/manufacturers, Contractor shall also be penalized based on the no. of materials/lots get rejected as per below table:

Sr. No.	No. of Material/lot rejected in a project/district	% Penalty imposed on contract price
1	>5	5.0%
2	>3	2.5%
3	>1	1.0%

4.4.2. In case of defects found during Field inspection: There are three categories of defects found in field inspection as defined below:

- a) **CRITICAL DEFECTS:** These defects must be rectified before charging. Critical defects are those which endanger life and property. Dangerous deficiencies on safety, ground clearances, equipment earthing and protection would come this category. These are defects in presence of which the Electrical Inspector would not allow charging of the electrical installation. That is, if equipment are already energized, it should be de-energized and rectified without delay. If critical equipment like distribution transformer HT and LT line have been installed dangerously, the defect type would fall under critical category of defect. *Example : LA is not connected , DT neutral earth is missing , Earth electrodes not installed, Ground clearance not as per IE rule, Oil level low in transformer etc.*
- b) **MAJOR DEFECTS:** These defects must be rectified before operational handover (to Operation and Maintenance wing). These are major deviations from drawing and specification. These are serious deviation with respect to contract. The electrical installation can be charged temporarily. However, the defects should preferably be rectified before charging. *Example : Pole not pitched at proper depth, Brick-bats/ foundation inadequate, use of undersized earth wire, precariously loose electrical connections and mechanical fitting.,*
- c) **MINOR DEFECTS:** These defects are very minor in nature. Such defects in electrical installations keep surfacing during operation and maintenance. The installation may be charged with these defects. However they must be rectified *Example: Danger board not proper, energy meter not installed before contractual handover (before final payment is released and contract is closed), missing barbed wire, stay wire loose, loose fasteners, vegetation too close to HT/Lt line.*

Note:

1. *These defects are broad in nature. Actual field defects need to be defined more accurately by inspectors.*
2. *All pictures depicting defects should be numbered. Their number mentioned in the report shown in the table*
3. *An infrastructure schematic (single line diagram) showing DTRs, HT and LT poles duly numbered by the inspector shall be submitted along with the report. Their number shall be used to describe location of defects to be rectified subsequently.*

The corresponding penalitied to be imposed has been captured below:

Sr. No.	Defect criteria	% Penalty imposed of contract cost
1	Critical Defects	1.0%
2	Major Defects	0.5%
3	Minor Defects	0% if rectified within 30 days

Annexure-A**Checklist for Quality Assurance****Distribution Transformer Substation**

S. No	Description	Status (Yes/No)	Observations	Location	Picture No.
1	Record capacity of DTR transformer used				
2	Record S. No., make and year of manufacturing of DTR transformer				
3	Safe and adequate access to distribution transformer (DTR) substation				
4	Availability of approved survey report				
5	Proper load survey is performed of the locality for perspective consumers while deciding capacity and location of DTR				
6	Expected loading of transformer using 5 years growth is performed in survey report				
7	Proper alignment of substation structure with 11 KV line				
8	Record type of poles/support used for DTR substation				
9	Record type of foundation used				
10	Proper muffing is provided on steel supports of DTR substation				
11	If DTR substation is in water logging area, its foundation is grouted in cement concrete				
12	Proper verticality of substation supports				
13	Proper pole to pole distance of substation supports.				
14	Proper erection of jumpers and connection to DTR transformers without any bent				
15	Proper binding of insulators				
16	Stay plates are properly grouted in cement concrete mixture to support DTR substation structure (if erected)				
17	Proper tensioning is there on stay set				
18	Proper alignment of stay wire with overhead conductor				
19	Proper erection of stay clamp using 12 mm dia nuts and bolts				
20	Proper galvanization of stay wire				
21	Thimble is provided on turn buckle of stay set				
22	Stay set installation is provided with guy insulator				
23	Proper phase to phase and phase to ground clearances maintained on the substation jumpers				

S. No	Description	Status	Observations	Location	Picture
24	Steel overhead structure is properly earthed using 8 SWG wire/G.I. flat?				
25	Each 11 kV overhead equipment including transformer are individually earthed using 8 SWG Earth wire/ GI flat				
26	Danger plate is installed at appropriate height using proper size clamp. Record type and size of clamp				
27	Proper anti-climbing device (barbed wire/spike) installed at appropriate height on individual support. Record quality of wrapping of barbed wire				
28	Substation is numbered				
29	Individual substation pole is imposed/painted with the name of scheme				
30	Surface of the PCC poles is finished and there are no steel wire visible				
31	No physical damages appeared on PCC pole surface				
32	GI flat to GI flat connection using at least 2 sets of GI nut bolts and washers				
33	8 SWG GI wire/GI Flat is properly dressed with support				
34	GI wire to GI wire jointing is provided using 12 SWG GI nut bolts and washers				
35	GI wire connection to earth pit is using GI nut bolt and washer				
36	GI earth pipe is properly inserted inside earth without hammering				
37	Number of earth pit used for substation earthing.				
38	Pit to pit distance in meters. Is it adequate?				
39	Masonry enclosure is provided over individual earth pits				
40	Funnel is provided over earth pit				
41	Proper jumpering using binding practices/PG clamp				
42	Proper clearances to avoid bird fault on conductors of substation supports				
43	Type and size of overhead conductors used in the substation				
44	Cement-concrete grouting foundation of substation supports				
45	Measure quantum of cement concreting in any one sample support				
46	Measure cement concreting foundation in any one sample of stay set pit				
47	Proper painting/galvanizing done on steel structure				
48	Any sign of rusting found on substation structure/hardware				

S. No	Description	Status	Observations	Location	Picture
49	Any broken insulator found in the substation				
50	Disc Insulators installed precariously (loose bolts/ missing cotter pins)				
51	Separate individual earth connection using GI wire/GI flat is used for neutral earthing with separate pit				
52	Dedicated transformer body earthing using GI wire/GI flat				
53	Bimetallic clamps are provided on 11 kV bushing				
54	No gap between busing seat and bimetallic clamp on LT as well as HT bushing while connecting conductor/cable				
55	Proper lugs are provided on termination of cables				
56	Oil is filled in cup of silica gel breather				
57	Silica gel is blue in colour				
58	Oil control valves are open between transformer tank and breather (wherever used)				
59	Oil leakage from the body/gasket of transformer and from conservator tank				
60	Record level of oil in conservator tank				
61	Transformer installed precariously (Nut / bolts / side bracing missing)				
62	Transformer is fitted with 12 mm dia nut bolts on its base channel				
63	Transformer belting is provided				
64	Dimension of transformer base channel				
65	Individual lightening arrestor are earthed with dedicated separate earth pit				
66	LA jumper connections is missing/ not proper				
67	LA is charged/ installed but not megged				
68	Isolators/AB switch are properly aligned and its operation is smooth				
69	Operating handle (not missing eye bolt) of isolator/AB switch is earthed using flexible cable				
70	No joint in between entire length of operating pipe of isolator/AB switch				
71	Guiding hook is provided for isolator pipe movement				
72	Alignment of male and female contacts of isolators/AB switch and no spark during normal use				
73	Proper fuse wire is used in DO fuse/HG fuse				
74	Arching Horn is missing/ not aligned / not proper				
75	Proper size of LT cable are used between transformer and LTDB/SMC LTDB/SMC				

S. No	Description	Status	Observations	Location	Picture
	LTDB/SMC LTDB				
76	lockability and proper closing of door of LTDB/SMC LTDB				
77	Gland plate and glands are used for cable entry in LTDB/SMC LTDB				
76	No unused holes on gland plates				
77	Availability of LTDB/SMC LTDB equipment as per approved drawing and scope of work like isolator, fuse, switch, bus bar, MCCB, MCB etc.				
78	Installation of DTR as per BIS specification				
79	LTDB/SMC LTDB earthing at different points using 8 SWG GI wire				
80	Proper painting and No physical damages on LTDB/SMC LTDB				
81	Suitable loop length of cables in LTDB/SMC LTDB				
82	3 Nos earthing pit and earth mat /risers using 50X6mm GI Flat are used as under:				
a	Earth Pit – 1 for Transformer Neutral,				
b	Earth pit - 2 for Lightening Arrester,				
c	Earth pit – 3 for Equipment body earthing				
83	Deleted				
84	Deleted				
85	Quality of painting/galvanizing on substation structure				
86	DTR is newly supplied				
87	PG Clamps are used (wherever needed as per drwg- Jumper etc)				
88	Deleted				
89	Earthing Electrodes short/missing				
90	Commissioning Defect: DT charged/installed but not merged				
91	Fasterers (Nuts/ Bolt/ Clamps /Connector) size not as per drawing /specification				
92	Fasteners (Nuts / bolts/ Clamps / connectors) in precarious state				
93	Poles not erected properly (inadequate or missing brick bat/ foundation)				
94	Stay installation is not proper : guy insulator missing ;inadequate depth				
95	Earthing wire diameter undersize				
96	Danger plate missing/improper				
97	Earthing wire not secured / not dressed				
98	Barbed wire missing/improper				

S. No	Description	Status	Observations	Location	Picture
99	DTR ground electrodes far too close				
100	Earth pit to earth pit clearance not maintained				
101	HT Fuse not provided				
102	HT fuse unit jumpering not connected properly				
103	MCCB of lower rating than specified in LOA				
104	MCCB not installed				
105	Inferior quality of Distribution Board used (makeshift, locally fabricated DBs)				
LT Line					
S. No	Description	Status (Yes/No)	Observations	Location	Picture No.
1	Availability of approved survey report with Single line diagram				
2	Correct alignment of LT line				
3	Type of poles used as per scope of the work				
4	Type of foundation used as per scope of work				
5	If line is passing through water logging area and its foundation is grouted in cement concrete				
6	Proper verticality of poles				
7	Any deflecting tension on LT pin insulator				
8	Proper tensioning of overhead conductor/LT cable/ABC Cable				
9	Any knot/wrapping of overhead conductor /LT cable /ABC Cable is there during erection				
10	Proper binding of insulators cable both / tension work is done				
11	Stay plates are properly grouted in cement concrete mixture				
12	Proper tensioning is there on stay set				
13	Proper alignment of Stay wire and stay set with overhead conductor is there to nullify tension				
14	Proper erection of stay clamp using 12 mm dia nuts and bolts and 50x6 mm (or more) size clamp				
15	If every 6th pole in a section of line is provided with stay sets to avoid line deflection				
16	Proper galvanization of stay wire/stay set				
17	Thimble is provided on turn buckle of stay set				
18	Proper phase to phase clearances are maintained on the line				
19	Steel overhead structure is properly earthed using 8 SWG wire				
20	Each LT pole individually earthed using 8 SWG Earth wire and separate Earth pit/Earthing coil/Earth spike				

S. No	Description	Status	Observations	Location	Picture
21	Quality and size of danger plates is as per scope of work				
22	Danger plate is installed at appropriate height using proper clamp as per scope of work				
23	Anti-climbing device (barbed wire/spike) are installed at appropriate height on individual support				
24	Individual pole is numbered				
25	Individual pole is imposed/painted with the name of scheme				
26	Surface of the PCC poles is finished and there are no steel wire visible				
27	No physical damages appeared on PCC pole surface				
28	Cradle guard earthing is provided on each road crossing or on each LT line crossing				
29	Proper tensioning of the cradle guard wires				
30	Separate earthing on both the sides of road/line for cradle guarding are there				
31	8 SWG G.I. wire is properly dressed with support for V-Cross arm/Channel/Top clamp earthing				
32	GI wire to GI wire jointing is provided using 12 SWG GI nut bolts and washers				
33	GI wire connection to earth pit is using 12 mm GI nut bolt and washer				
34	Earth pipe is properly inserted inside earth without pipe hammering				
35	Masonry enclosure is provided over individual pipe earth pits				
36	Funnel is provided over pipe earth pit				
37	Jumpering using best binding practices/PG clamp				
38	Proper conductor clearances to ground is there to avoid bird fault on end sectionizer support where disc insulator are used				
39	Average pole to pole span length in the line. It should not be less than 50 m.				
40	If Pole to pole span is less than 50 m, record the reason with pole numbers				
41	Number of poles used per kilometre of the line				
42	Type and size of overhead conductors/ABC cable used in the line				
43	Shuttering is used during casting of cement concrete foundation				
44	Cement-concrete grouting foundation of end supports				
45	Quantum of cement concreting in any one sample support				

S. No	Description	Status	Observations	Location	Picture
46	Cement concreting foundation in any one sample of stay set pit				
47	Proper painting is done on steel structure				
48	Any broken insulator found in the line				
49	Surface finish of painting on Steel tubular pole/RSJ/H Pole/Rail pole about 2 m from bottom and above 2 m				
50	Possible damage on ABC cable surface				
51	Piercing connections are used to take-off connection from ABC cable				
52	Muffing is used in steel steel tubular poles, rail pole, RS joint/H beam Supports				
53	Adequate tree cutting on either side of line done				
54	Pole to pole schedule enclosed with profarma				
11 KV Line					
S. No	Description	Status (Yes/No)	Observations	Location	Picture No.
1	Availability of approved survey report with single line diagram				
2	Correct alignment of 11 kV line				
3	Type of poles used as per scope of the work				
4	Type of foundation used as per scope of work				
5	Record whether line is passing through water logging area and its foundation is grouted in cement concrete				
6	Proper verticality of poles				
7	Cross-bracing on Double poles are provided				
8	Conductors are passing through the top groove of the insulator (creepage distance compromised)				
9	More than one joint in one span				
10	Any deflecting tension on 11 KV pin insulator				
11	Proper tensioning of overhead conductor				
12	Any knot/wrapping of overhead conductor is there during erection				
13	Proper binding of insulators is done				
14	Stay plates are properly grouted in cement concrete mixture				
15	Proper tensioning is there on stay set				
16	Proper alignment of Stay wire with overhead conductor is there to nullify tension				
17	Guy insulator, anchor plate/ thimble/ hardware are provided with stay set				
18	Proper erection of stay clamp using 12 mm dia nuts and bolts and 50x6 mm (or more) size clamp				
19	If every 6th pole in a section of line is provided with				

S. No	Description	Status	Observations	Location	Picture
	stay sets to avoid line deflection				
20	Proper galvanization of stay wire and stay set				
21	Thimble is provided on turn buckle of stay set				
22	Proper phase to phase clearances are maintained on the line				
23	Steel overhead structure is properly earthed using 8 SWG wire				
24	Each 11 kV pole individually earthed using 8 SWG wire and separate Earth pit/Earthing coil/Earth spike				
25	Quality and size of danger plates is as per scope of work				
26	Danger plate is installed at appropriate height using proper clamp as per scope of work				
27	Anti-climbing device (barbed wire/spike) are installed at appropriate height on individual support				
28	Individual pole is numbered				
29	Individual pole is imposed/painted with the name of scheme				
30	Surface of the PCC poles is finished and there are no steel wire visible				
31	No physical damages appeared on PCC pole surface				
32	Cradle guard earthing is provided on each road crossing or on each LT line crossing				
33	Proper tensioning of the cradle guard wires				
34	Proper Guard wires are provided in case of Road crossing as per drawing specification				
35	8 SWG G.I. wire is properly dressed with support for V Cross arm/Channel/Top clamp earthing				
36	GI wire to GI wire jointing is provided using 12 SWG GI nut bolts and washers				
37	GI wire connection to earth pit is using 12 mm GI nut bolt and washer				
38	Earth pipe is properly inserted inside earth without pipe hammering				
39	Masonry enclosure is provided over individual pipe earth pits				
40	Funnel is provided over pipe earth pit				
41	Proper jumpering using binding practices/PG clamp				
42	If under sized conductor used				
43	Proper conductor clearances to ground is there to avoid bird fault on end sectionizer support where disc insulators are used				
44	Proper pole to pole span length in the line. It should not be less than 50 m.				

S. No	Description	Status	Observations	Location	Picture
45	If Pole to pole span is less than 50 m, record the reason with pole numbers				
46	Number of poles used per kilometre of the line				
47	Record type and size of overhead conductors used in the line				
48	Shuttering is used during casting of cement concrete foundation				
49	Cement-concrete grouting foundation of end supports				
50	Measure quantum of cement concreting in any one sample support				
51	Measure cement concreting foundation in any one sample of stay set pit				
52	Proper painting is done on steel structure				
53	Disc Insulators are installed precariously (loose bolts missing cotter pins)				
54	D -shaped loop for jumpers are maintained				
55	Any broken insulator found in the line				
56	Surface finish and painting on Steel tubular pole/RSJ/H Pole/Rail pole				
57	Adequate tree cutting on either side of line done				
58	Pole to pole schedule enclosed with proforma				
59	Pole numbering with "KONKAN DISASTER MITIGATION PROJECT' " inscription not done properly)				
60	Engraving of poles (Name of Manufacturer, SL No etc.) not done				
61	Line Spacers not used				
62	Guy insulator not used in stay wire				
63	Inadequate length of barbed wire				

Checklist for inspection of REDB (Substation)

S.N.	Description	Status (Yes/No)	Observation	Picture No.	Location as per SLD
1	Major Materials (CT/PT/CB/X'mer/Battery/ Panels /Structures/Conductor) as per specifications				
2	Record S. No., make and year of manufacturing of Power transformer				
3	Major Materials dispatched without inspection				
4	Construction as per Approved Drawing				
5	Civil works FQP documentation maintained during construction				
6	Equipment (name it) provided in the BOQ/ drawing but not installed				

7	Verification of pre-commissioning and commissioning testes of substation equipment i.e. Circuit Breaker, CT, PT, transformer, Charger, Battery, Relays, Control Panels, Switchgear, 11 KV cable etc				
8	Present condition of main equipment				
9	Functional Status of Transformer: WTI, OTI etc, Relays, Battery Charger, Battery, CB, CT, PT, Energy Meter, Control & Relay panel				
10	Transformer oil tested				
11	Transformer Relays, CT, PT , CB , Switchgears, battery sets, etc charged after test				
12	Equipment charged after commissioning test				
13	Gravel size proper				
14	Earthing of main equipment, fence etc done properly				
15	Sub Station fencing provided				
16	Cable trench made with cable trays – or cables lying on trench floor				
17	Whether Cable trenches have suitable slope to ensure automatic draining of rainwater				
18	Proper storage of equipment				
19	Cables tied on cable trays				
20	Glands, lugs used (wherever need - at cable entries)				
21	Dead end marking for cables is done				
22	Earth mat provided				
23	Undersized conductor/ cables used				
24	Correct size of earthing conductor - flats, GI wires etc used				
25	Acid proof floor used in battery room				
26	Fasteners (nut, bolts, clamps connectors, hardwaresetc) as per specification				
27	Switchgear rubber mats, chequer plates not provided				
28	FQP for material receipt and storage maintained by IA				
29	Name of Feeder on Control Panel.				
30	Name of Feeder on Outgoing DP structure				
31	Working platform on 33 KV and 11 KV outdoor VCB				
32	Name of Substation board on the entrances				
33	Painting of control room, water supply position in Substation				
34	General sanitation arrangement in the control room building				
35	Internal Lighting in the substation control room				
36	Closed fencing of the substation yard				

37	Approach road to Power Transformer foundation				
38	Water logging/ Earth filling in the yard trench				
39	Partition wall between two Power Transformers				
40	Availability of Earthing Rod in the substation				
41	Availability of Permit & Work Book				
42	Tracing of Earth connection of Power/ Distribution Transformer up to Earth Pit				
43	Connection at Earth Pit				
44	Jointing & Clamping of Earth Conductors				
45	All Terminal Blocks at CTs/PTs/Breaker/Panels/Junction Box				
46	Earthing& Fencing is as per specification				
47	Cable trench cover inside the control room and in the yard.				
48	Exhaust Fan in the Battery Room				
49	Inter Battery connections				
50	Battery Charger connection				
51	Earthing of Control Panel				
52	Termination of power cables at 11 KV sides/LT sides of Power and Station Transformer.				
53	Inside pic of distribution board of station transformer				
54	Take Overall picture of station transformer				
55	Connection of Lightning arrestor				
56	Approximate clearance of live part in the substation				
57	Oil leakage in Power/Station Transformer				
58	Area lighting in the substation				
59	Material diagram of substation in the control room				
60	List of authorized operational personnel in the substation				
61	Connection at the bus-bar jumpers				
62	Loop cables LT/HT/Control				
63	Tagging on cable terminals				
64	Work clearance on control panels and sufficient lightening on the control panel				

5. Type and Acceptance test

The following type, acceptance and routine tests and tests during manufacture shall be carried-out on the material. For the purpose of this clause:

- 5.1. Contractor shall supply the materials of type & design which has already been Type Tested. Contractor shall provide copy of such tests at site in support of type-tested materials supplied under the contract. No extra payment or time shall be granted for type testing of materials. In exceptional case to case basis, IA will decide to permit type testing of material at Contractor's cost.
- 5.2. Acceptance Tests shall mean those tests which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.
- 5.3. Routine Tests shall mean those tests, which are to be carried out on the material/equipment to check requirements which are likely to vary during production.
- 5.4. Tests during Manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the Contractor to ensure the desired quality of the end product to be supplied by him.
- 5.5. The norms and procedure of sampling for these tests will be as per the Quality Assurance Programme to be mutually agreed to by the Contractor and the IA.
- 5.6. The standards and norms to which these tests will be carried out are listed against them. Where a particular test is a specific requirement of this Specification, the norms and procedure of the tests shall be as per IS/IEC Standard this specification or as mutually agreed to between the Contractor and the IA in the Quality Assurance Programme.
- 5.7. For all type test and acceptance tests, the acceptance values shall be the values specified in this Specification, Approved Quality Plan or guaranteed by the Bidder, as applicable.

6. Type Testing, Inspection, Testing & Inspection Certificate

- 6.1 All equipment being supplied shall conform to type tests including additional type tests, if any as per technical specification and shall be subject to routine tests in accordance with requirements stipulated under respective sections. The Contractor shall intimate the IA the detailed program about the tests at least three (3) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies.
- 6.2 The reports for all type tests and additional type tests as per technical specification shall be furnished by the Contractor alongwith equipment/material drawings. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO/IEC Guide 25/17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by the representative(s) of IA or Utility. The test-reports submitted shall be of the tests conducted within last 5 (five) years prior to the date of bid opening. In case the test reports are of the test conducted earlier than 5 (five) years prior to the date of bid opening, the Contractor shall repeat these test(s) at no extra cost to the IA, however the delay in supply due to type-test will not be acceptable during the project.
- 6.3 In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification or any/all additional type tests not carried out, same shall be carried out without any additional cost implication to the IA.

- 6.4 The IA, his duly authorized representative and/or outside inspection agency acting on behalf of the IA shall have at all reasonable times free access to the Contractor's/sub-vendors premises or Works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if part of the Works is being manufactured or assembled at other premises or works, the Contractor shall obtain for the Engineer and for his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the IA and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.
- 6.5 The Contractor shall give the IA/Inspector ten (10) days written notice of any material being ready for joint testing including Contractor and IA. Such tests shall be to the Contractor's account except for the expenses of the Inspector. The IA/Inspector, unless witnessing of the tests is virtually waived, will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test /inspection, failing which the Contractor may proceed alone with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of tests in triplicate.
- 6.6 The IA or Inspector shall, within seven (07) days from the date of inspection as defined herein give notice in writing to the Contractor, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the IA/Inspector giving reasons therein, that no modifications are necessary to comply with the Contract. If any modification is made on the equipment on the basis of test results not in conformity with the contract, the modified equipment shall be subject to same sequence of test again without any additional cost to IA.
- 6.7 When the factory tests have been completed at the Contractor's or Sub-Contractor's works, the IA/Inspector shall issue a certificate to this effect within seven (07) days after completion of tests but if the tests are not witnessed by the IA/Inspector, the certificate shall be issued within seven (07) days of receipt of the Contractor's Test certificate by the Engineer/Inspector. Failure of the IA/Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the Works. The completion of these tests or the issue of the certificate shall not bind the IA to accept the equipment should, it, on further tests after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of dispatch instruction by the IA.
- 6.8 In all cases where the Contract provides for tests whether at the premises or at the works of the Contractor or of any Sub-Contractor, the Contractor except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, transport, loading & unloading, packing, apparatus and instruments as may be reasonably demanded by the IA/Inspector or his authorized representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the IA/Inspector or to his authorized representative to accomplish testing. Contractor Contractor Contractor
- 6.9 The inspection by IA and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance programme forming a part of the Contract.
- 6.10 The IA will have the right of having at his own expenses any other test(s) of reasonable nature carried out at Contractor's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.
- 6.11 The IA reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the IA.

7. Pre-Commissioning Tests

On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the IA and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site. The list of pre-commissioning tests shall be provided by the IA as per its standard practices. or as included in the Contractor's quality assurance programme.

8. Commissioning Tests

All required instrumentation and control equipment will be used during such tests and the Contractor will use all such measuring equipment and devices duly calibrated as far as practicable. However, the Contractor, for the requirement of these tests, shall take immeasurable parameters into account in a reasonable manner. The tests will be conducted at the specified load points and as near the specified cycle condition as practicable. The Contractor will apply proper corrections in calculation, to take into account conditions, which do not correspond to the specified conditions.

- 8.1 Any special equipment, tools and tackles required for the successful completion of the Commissioning tests shall be provided by the Contractor, free of cost.
- 8.2 The specific tests to be conducted on equipment have been brought out in the respective chapters of the technical specification. However where the pre-commissioning tests have not been specified specifically they shall be as per relevant IS code of practice or as mutually agreed.
- 8.3 The Contractor shall be responsible for obtaining statutory clearances from the concerned authorities for commissioning and operation of the equipment including the Electrical Inspector. Necessary fee to perform these works shall be paid by IA.

9. GIS mapping through DGPS Survey & asset tagging

9.1 General Information

The State owned power distribution utilities(MSEDCL) have implemented GIS based asset tagging activities in the past and migrated asset information into GIS platform. Bidder should update various attributes of new / upgraded infrastructure created under 'KONKAN DISASTER MITIGATION PROJECT' over the same platform. Various electrical assets i.e Power Transformers, Distribution Transformer, HT & LT lines with over head conductor, poles, insulators, stay wire etc and Underground distribution system consists of Feeder pillar, UG cable etc; automation devises like RMU's FPI, Auto-reclosures etc needs to be updated in the existing GIS platform through DGPS Survey. The GIS platform and the associated mobile-app will be provided by the IA. The scope of the bidder is limited to updating the GIS co-ordinates and the associated mapping information of the new assets created/upgraded on the platform provided by the IA using the mobile app through DGPS Survey. However no additional payment shall be made to the Contractor for these works.

9.2 Key activities under the scope:

1. After successful award of the contract and finalization of Bill of Quantity (BoQ), the TKC should collect list of attributes (Data Model) for each of the assets purposed under the scheme from the project nodal / GIS incharge of the Utility.
2. The purposed methodology for delivery of these attributes as well as GPS coordinates of the assets up to the defined accuracy level to be decided mutually so that updating the same in existing GIS platform would not be a challenges at the later stage. A point of contact (PoC) is recommended at this stage to avoid any future complicity.
3. The vendor should create a physical marking procedure with consultation and approval of IA and mark each assets and consumer that have been surveyed

4. Vendor will start collecting intended data from newly commissioned and / or upgraded infrastructure commissioned in 'KONKAN DISASTER MITIGATION PROJECT' and submit the same with the IA/IA Representative for approval.
5. The IA's project in charge would get these data verified through their team, once completed they will get duly verified by Executive Engineer and circle SE and shall submit same to IT office for further review.
6. It is to be noted that updating of GIS asset information through DGPS Survey is mandatory requirement for the issuance of completion certificate by the IA. Survey to be provided in format approved by IA.

10. Documentation

10.1. General

- 10.1.1. To ensure that the proposed systems conform to the specific provisions and general intent of the Specification, the Contractor shall submit documentation describing the systems to IA for review and approval. The Contractor shall obtain approval of IA for the relevant document at each stage before proceeding for manufacturing, system development, factory testing, site testing, training etc. The schedule for submission/approval of each document shall be finalised during the discussions before placement of the contract, this schedule shall be in line to overall project schedule.
- 10.1.2. Each document shall be identified by a Contractor document number, the IA document number, and the IA purchase order number. Where a document is revised for any reason, each revision shall be indicated by a number, date, and description in a revision block along with an indication of official approval by the Contractor's project manager. Each revision of a document shall highlight all changes made since the previous revision.
- 10.1.3. All technical description, specifications, literature, correspondence, prints, drawings, instruction manuals, test reports(both factory and at site), progress photographs, booklets, schedules and all supplementary data or documents furnished in compliance with the requirements of the Contract, shall become the property of the IA and the costs shall be considered as included in the Contract price.
- 10.1.4. The Contractor shall be responsible for any time delay, misinterpretation, error and conflict during design, manufacturing, testing and erection of the Works resulting from non-compliance with the requirements of this Specification.
- 10.1.5. The IA shall have the right to make copies of any documents, data, reports, information etc. supplied by the Contractor in connection with the Works. The IA shall not impart the information of these documents to any other manufacturer or competitor but he shall be free to use these for preparation of technical papers, reports etc.
- 10.1.6. All documentation shall be in English language.

10.2. Requirements for submission of documents, information and data by the Contractor

- 10.2.1. The Contractor shall submit to the IA all documents in accordance with an approved schedule of submissions and shall submit any further information (in the form of drawings, documents, manuals, literature, reports etc.) when asked by the IA while commenting/approving any drawings/documents etc.
- 10.2.2. The documents which are subject to the approval of the IA shall be identified by the Contractor with the stamp "FOR APPROVAL". All other documents shall be submitted to the IA for information and shall be identified by the Contractor with the stamp "FOR INFORMATION".
- 10.2.3. The sequence of submission of the documents shall be subject to the approval of the IA. The sequence of submissions of all

documents shall be such that the necessary information is available to enable the IA to approve or comment the document.

10.2.4. The Contractor shall supply 4 hard copies of all drawings and documents.

10.2.5. In case a "SUBSEQUENT" revision of any document is made due to any reason whatsoever, a revision of the same, highlighting the changes shall be resubmitted for the IA's specific approval/ information.

10.3. Documents for approval

10.3.1. The IA shall be allowed fifteen (15) calendar days to approve the Contractor's submissions. The submissions for approval, shall be returned to the Contractor marked in one of the following ways :

Category I:	Approved
Category II:	Approved with Comments.
Category III:	Returned for correction.
Category IV :	For information

10.3.2. The first notations "I" or "II" shall be deemed to permit the Contractor to proceed with the work shown on the document, except in the case of notation "III" the work shall be done subject to the corrections indicated thereon and/or described in the letter of transmittal. The Contractor shall bear the full responsibility for proceeding with the Works prior to receipt of the release in notation "I" from the IA.

10.3.3. In case of notation "II", the Contractor shall include the alterations required & resubmit the document within fifteen (15) days from date of IA's letter of transmittal.

10.3.4. In case of notation "III", the Contractor shall include the alterations required and resubmit the document to the IA, within fifteen (15) days, from date of letter of transmittal, so that such document can be returned with the notation "I" or "II".

10.3.5. It may also be noted that the approval/commenting by the IA does not relieve the Contractor of any of his contractual obligations and his responsibilities for correctness of dimensions, materials, weights quantities or any other information contained therein, as well as the conformity of designs with Indian Statutory Laws and the Technical Specifications as may be applicable. The approval also does not limit the IA's rights under the Contract.

10.3.6. The approved documents shall be considered as the working documents. However the Technical Specification and connected documents shall prevail over these documents in case a decision is required on interpretation.

10.4. Documents for information

The Contractor shall not delay the Works pending the receipt by the Contractor of the comments on documents submitted to the IA for information. However, the IA shall have the right to comment on all the documents submitted by the Contractor, when, in the opinion of the IA the document does not comply with the Contract or otherwise. The Contractor shall satisfactorily demonstrate that the information contained in the aforesaid document does meet the requirements of the Contract or revise the document in order that the information shall comply with the requirements of the Contract.

10.5. Basic reference drawings

10.5.1. The reference drawings are enclosed with the bid document, which forms a part of the specification. The Contractor shall develop a new layout in line with the specification and take the approval of the IA. The Contractor shall maintain the overall dimensions of the substation, buildings, bay length, bay width, phase to earth clearance, phase to phase clearance and

sectional clearances, clearances between buses, bus heights but may alter the locations of equipment to obtain the statutory electrical clearances as required for the substation.

- 10.5.2. All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, dimensions, internal & the external connections, fixing arrangement required and any other information specifically requested in the specifications.
- 10.5.3. Each drawing submitted by the Contractor shall be clearly marked with the name of the IA, the unit designation, the specifications title, the specification number and the name of the Project. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.
- 10.5.4. Further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the IA, if so required.
- 10.5.5. The review of these data by the IA will cover only general conformance of the data to the specifications and documents interfaces with the equipment provided under the specifications. This review by the IA may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the IA shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.
- 10.5.6. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the IA. Approval of Contractor's drawing or work by the IA shall not relieve the Contractor of any of his responsibilities and liabilities under the Contract.
- 10.5.7. All engineering data submitted by the Contractor after final process including review and approval by the IA shall form part of the Contract Document and the entire works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the IA in Writing.

11. Return of replaced old materials to the area stores of MSEDCL

- Old PVC wire will be rolled into bundles. The bundles should be tightened firmly and properly with PVC sticker strip or string. A tag should be attached with each bundle to indicate the weight of the bundle. As far as possible, bundle should consist of wire of the same size and same metal. Similar action is required to be taken in case of GI wire.
- Old conductor of same size shall be rolled into bundles. Bundles should be tightened firmly and PVC sticker strip or string regarding size of conductor shall be mentioned. Size, type & Weight of each bundle shall also be indicated on the sticker strip.

- Materials released due to bay capacity augmentation and/or due to replacement like power transformers, distribution transformers, insulator, meter board, cut outs etc are also required to be returned to MSEDCL's stores through proper documentation.
- All other line materials released like, conductors, poles, cross arms; fabricated material, etc. shall be properly accounted for and returned to MSEDCL's store after recording all necessary details including weight, length etc. wherever necessary. A detailed procedure for return of the old materials shall be prescribed by the MSEDCL.
- In respect of accountal of devolution of released material, the process as formulated by IA/MSEDCL time to time shall be followed by the Contractor

12. Miscellaneous activities

- Commencement of Supply & Works: The Contractor shall ensure that the supply and installation of material and service under the contract is as per approved PERT / completion schedule of works. The Contractor is to commence supply with the type tested materials with necessary routine test/ acceptance test certificates for a particular lot duly approved by IA or the IA's authorized agencies.
- The Contractor shall submit Type test and routine test certificates as applicable, issued by NABL accredited / third party independent standard laboratories like CPRI, NPL etc.
- Unit rates: The unit rates quoted shall include details which are obviously and fairly intended, and which may not have been included in these documents but are essential for the satisfactory completion of work. The unit rate quoted shall be inclusive of deployment of all plants, equipments, men, materials, skilled & unskilled labour etc. essential for satisfactory completion of work.
- The prices for fabricated materials shall include all works relating to fabrication, galvanizing, insurance, storage and delivery ex-Contractors stores, unloading and loading. The quoted prices shall also include the cost of necessary quantity of steel and zinc, freight charges up to site store and other indirect charges incurred in connection with supply of finished materials.
- Quantities/ length of 33 KV, 11 KV Underground cable and LT cable, distribution transformers sub stations, 33/11 KV sub-station etc. indicated in the price schedules are provisional. Any quantity variation in individual item and in contract value shall be governed as per relevant clause of tender. The Contractor shall execute the work based on the actual survey and as approved by the Engineer-in-charge or person authorized by him.
- The scope of work also covers supply of other items, not specifically mentioned in this specification and/or bill of materials but are required for the successful installation, testing, commissioning and satisfactory performance of the 33 KV & 11 KV Underground Cables, 33/11 KV sub stations, distribution transformer sub stations, LT Cables, service lines etc.

The following works & services shall also be provided by the Contractor.

- a) Unloading the equipments from the rail or road transport and moving those to storage area. Demurrage/ wharf age charge, if any incurred, shall be paid by the Contractor

- b) Opening of packing cases, inspection and checking of materials for any damage or loss in transit shall be the responsibility of the Contractor. All claims with the concerned authorities e.g. rail, transport, insurance etc. shall be lodged by the Contractor.
- c) Complete erection of equipments, etc covered under the contract, final preparation for testing, commissioning, final run and acceptance tests and putting the sub-station/ plant/line etc. into operation.
- d) All consumable, stores required for the above erection and commissioning works.
- e) All erection tools, lifting tackles, and all equipments, tools & tackles for transportation at site.
- f) Workshop, as required within the work area.
- g) Third party insurance ^[1] at site and insurance of personnel employed at site as required under Workman's Compensation Act. Security arrangement for watch and guard as required shall be made by Bidder at his own cost.
- h) All the technical/ skilled staff deployed for the job must possess the required qualifications and necessary licenses and permits.
- i) Contractor shall take all safety precautions during work and the workmen must use safety belts, hand gloves, masks and other safety devices as may be necessary for safety of the personnel.
- j) The Contractor shall provide operating personnel during trial tests and till the PSS, DSS, lines and equipments etc. are taken over by IA/MSEDCL as specified in taking over Clause, defined later.
- k) Any other work not covered above but required for successful completion of the project has to be carried out by the Contractor at his own cost.

^[1] **Note:** Before receipt of equipment at site but without limiting his obligations and responsibilities under this clause hereof, the Contractor shall insure against his liability for any equipment, material or physical damage, loss or injury which may occur to any property, including that of IA, or to any person including employee of the IA, by or arising out of the execution of the contract or in the carrying out of contract. The third party insurance cover shall be provided for the period from date of Ex-factory dispatch till taking over of the entire equipment after testing, commissioning and trial operation, if any.

Third party insurance shall be affected for an adequate amount to cover for all marine, transportation, field transportation, erection, testing and commissioning till handing over to IA/End user (i.e MSEDCL),. Terms shall include a provision whereby, in the event of any claim being brought or made against IA in respect of which the Contractor would be entitled to receive indemnity under the policy, the insurer will indemnify IA against such claims and any costs, charges and expenses in respect hereof. Contractor shall lodge the claim if need so arise, the IA shall be the IA of the equipment/materials and the claims shall be settled in the name of IA.

13. Individual work components

13.1.New 33 KV underground Cable

1.00Survey

Mapping of route of proposed new 33 kV line by foot survey in rural/urban areas be performed mentioning various milestones. While surveying, existing electrical infrastructure in the locality should also be mapped. Line alignment

(single line diagram) on political map with fair correctness, be prepared. SLD and foot survey report shall be approved by IA/IA Representative and shall be used as basic document for assessment of works under the contract. On completion of line work, as built Single Line Diagram and pole wise line diagram showing pole wise materials used and pole-to-pole span should be submitted to IA/IA Representative. This details shall be used as reference documents by Quality and Quantity Inspecting officials to execute inspection works.

2.00 Support (pole):

Following type of supports are envisaged for new 33 KV overhead lines-

- a. 9.1 meter long /280 KG PCC Poles (PCC Pole as per state practice)
- b. 11/13 m long galvenised H-Beam 152x152 mm 37.1 kg/m
- c. 11 M long steel Tubular poles of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
- d. 13 M long steel Tubular poles of Designation 540 SP 72 (IS 2713, Pt I, II, III 1980)
- e. 11/33 m Wide Galvanised Parallel Beam GI Poles (160x160 mm) extendable with jointing plates – 30.44kg per meter

In rural area, PCC poles are to be used. In urban area, PCC or H-Beam or STP or Wide Parallel Beam supports are to be used of suitable length. In hilly areas where handling of material is a challenge, tubular poles or Wide Parallel Beam GI poles expandable with jointing plaes may be used. In location specific conditions like forest area, vicinity of other existing overhead lines or permanent structures etc, H- beam or tubular poles or Wide Parallel Beam supports may be used of suable length. Steel bottom plate shall be used in steel tubular poles/H-Beam / Wide parallel Beam and cement concrete reinforced plate shall be used as base plate for PCC poles. Steel tubular poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish. Steel tubular poles and H-Beams shall also be painted with 2 or more coats till good surface finish with anti-corrosive paint (in case of tubular poles shall also be painted on the inner walls) which goes in to the foundation. IA/IA Representative shall approved brand and shade of paints.

~~teel tubular poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish. Steel tubular poles and H Beams shall also be painted with 2 or more coats till good surface finish with anti-corrosive paint (in case of tubular poles shall also be painted on the inner walls) which goes in to the foundation. Project Manager shall approved brand and shade of paints.~~

~~Painting of H Beams and Steel Tubular Poles shall be performed at stores. Before shifting to site for erection, poles shall be offered for inspection and approval by Project Manager. In water bound areas and in NE areas, galavenized poles may be used. The minimum coating of the zinc on steel tubular poles or Wide Parallel Beam supports shall comply with IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.~~

The H beam poles shall be hot-dip galvanized thoroughly internally and externally as per according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Poles and other hollow items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before

pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

3.00 Fabricated steel items:

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Fabricated steel structure items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

4.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by IA/IA Representative.

5.00 Stay Set:

Galvanized Stay Set with 50x8 mm stay clamp, guy insulator (2Nos.), anchor plate (300x300x8mm) , nut-bolts, 2 Nos turn-buckles, 1.8 m long, 20 mm diameter solid GS stay rod & 7/4.00 mm dia GI stranded wire complete.

Stay set shall be used at all turning locations, conductor dead end location, double pole structure, triple pole structure, four pole structure to nullify the tension of conductor. At dead end locations, stay sets shall be used in pairs in separate foundations. Erection of storm guys at suitable location in straight line may also be provided.

0.3 cmt cement concreting in mixture 1 part cement, 3 part coarse sand, 6 part 40mm size aggregate stone chips (1:3:6) shall be provided in each stay set foundation. 2 Nos. guy insulator shall be provided in stranded GI wire at middle location between two turn buckles. Shuttering and vibrator shall be used for cement concreting works.

6.00 Earthing:

Following earthing arrangements are envisaged for new 33 kV lines:

- a. 40 mm dia., 3000 mm long GI pipe earth electrode with test link, RCC pit, RCC cover plate on GI frame, bentonite powder and other accessories complete
- b. GI Earthing spike made of 20mm solid rod
- c. Chemical rod earthing using Carbon powder/Bentonite powder / Conductive concrete powder including electrode with 2000mm long, 50 mm diameter GI pipe, GI Strip of 24x3mm minimum.
- d. 8 SWG GI Earthing Coil.
- e. 6 SWG GI wire for earthing and guarding
- f. 8 SWG GI wire for earthing and guarding

Each 33 kV line support shall be provided with one GI earthing spike made of 20 mm solid rod or 8 SWG GI Earthing Coil and connected with 8 SWG GI wire. Overhead line structure shall be connected to GI earthing spike or GI Earthing Coil using 8 SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod. IA shall decide use of GI Earthing Coil or GI Solid earth Road for earthing of individual poles.

At railway crossing, line crossing and other specific locations 40 mm dia, 3000 mm long GI pipe earth electrode with test link, RCC pit, RCC cover plate on GI frame, bentonite powder and other accessories shall be used. Overhead line structure at these locations shall be connected to GI earth pipe using 8 SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 40 mm GI earth pipe.

In rocky soil where getting required earth resistance is a challenge, chemical rod earthing shall be used. Overhead line structure shall be connected to chemical earth electrode using 8SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod.

GI flats and GI wires must be properly dressed, bundled and fixed on supporting structure at 1 to 2 feet intervals.

7.00 Insulator and hardware –

33 KV polymer/porcelain Disc/Pin insulator with suitable hardware fittings shall be used. Insulator should be tied properly using binding wire and tape/helical form fitting. In road crossing and line crossing locations bridling cross arms and pin insulator shall be used.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator should properly be cleaned before installation. No damage/crack insulator should be used.

8.00 ACSR/AAAC Conductors:

Following ACSR Conductors (or equivalent AAAC conductor) are envisaged for new 33 kV lines:

- a. 6/4.09 + 1/4.09 mm (80 mm² Al. Area) - Raccoon

- b. 6/4.72 mm + 7/1.57 mm (100 mm² Al. Area) – Dog
- c. 30/2.59 mm + 7/2.59 mm (150 mm² Al. Area) – Wolf
- d. 30/3.00 + 7/3.00 mm (200 mm² Al. Area) - Panther

Care should be taken while drawing conductor from the drum. Proper roller should be used while handling conductors during erection. Jointing sleeves, binding materials, PG clamps, bi-metallic conductor shall be used for conductor jointing, insulators fixing, jumpering and termination at equipment respectively.

Proper sag should be maintained using sag chart table. While tensioning, care should be taken to avoid tension on pin insulator. Therefore, proper alignment of line to be ensured. Conductor joint should not be in the middle span but may be planned nearer the support.

At terminal location, care should be taken while connecting two sections to avoid bird faults. Therefore, pin insulator is to be used to handle the conductor on DC cross arm (as per state practice).

9.00 Pole numbering:

Each support pole should be numbered properly labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words should be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles to site for erection. Base painting and marking of digits should be performed by a skilled and trained painter using branded enamel paint, IA shall approve type and brand of enamel paint. Warning instruction, if any, of availability of two sources of 33 kV supply on same structure, at source structure, at cut points should exclusively be provided as per state practice.

10.00 Anti-climbing device:

3.5 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each 33 kV support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

11.00 Danger board:

Each support should be provided with a danger board with pole clamps as per approved drawing. Danger board should be in bi-lingual languages (local language and English). Clamp for danger board, nut-bolts and washers shall be painted with two or more coats of red-oxide and aluminium paints respectively till smooth surface before installation.

12.00 33 KV AB Switch:

33 kV, 3-ph, 600 A, 3 Pin type, Vertical/Horizontal Mounting type, Gang Operated, AB Switch shall be installed at cut points and at suitable locations as per instructions of IA/IA Representative. B Class GI pipe shall be used (without any joints) for operation of switch. AB Switch structure and handle must be earthed using 8 SWG GI wire.

13.00 Support foundation:

Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40mm size aggregate stone chips (1:3:6) shall be used in all the types of 33 kV line supports.

While erecting supports (poles), shuttering must be used for concreting so that proper quantity of cement concrete mixture be used and assessed during inspection. During concreting proper compaction by means of mobile vibrator be provided. While starting work of support erection, gang wise shuttering and mobile vibrator shall be offered for inspection to IA/IA Representative. While erecting support, mercury level gauge must be used to ensure vertical erection of support.

250mm dia X 12" inch size muffing shall be provided on steel tubular/ H-Beam poles/wide parallel beam support to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles

Steel plate shall be used in steel tubular poles/Wide parallel Beam/ H-beam supports and cement concrete reinforced plate shall be used as base plate for PCC poles.

14.00 33 kV line for underground railway crossing –

A separate composite item of railway crossing is kept in BoQ. 2 Nos. separate cables shall be laid in separate GI pipe enclosures. At a time, one shall be used and another shall be kept idle as spare in ready to join condition. Cable termination, cable identification, protective covering, laying of jumpering cable etc shall all be completed in this head. This composite item shall contain following key items:

- a. 3Cx300 Sqmm XLPE armored cable (approx. length is 0.3 km each) – 2 sets
- b. 150mm dia GI pipe of A class (red color painted on edges) for cable protection in underground laying – 2 sets
- c. 150mm dia GI pipe of B class (blue color painted on edges) for cable support at DP structure – 2 sets
- d. Outdoor heat shrinkable cable jointing kits for main cable and jumpering cable – 4 Nos for main cable, 8 Nos for jumpering cables.
- e. 33 kV lightening arrestor station class 10kA (6 nos.),
- f. 4 Nos GI 3-meters long pipe earthing/chemical earthing,
- g. 6 SWG GI wires with GI nuts, bolts & washers,
- h. Cable markers,
- i. Bi-metallic clamps,
- j. Jumpering with 33 kV Arial Bunched Cables 200 Sqmm dia (10 mtr) etc – 4 sets

Detail survey of location of railway crossing be performed by Contractor to avoid multi-crossing at nearby location. Prior railway permission for execution of this work shall be obtained by TKC Project Manager for which necessary technical support shall be provided by Contractor. Line crossing shall be performed using underground cabling. Block on railway traffic shall be arranged by TKC Project Manager. Contractor should ensure timely completion of work during block period by mobilizing requisite man, materials and machine at crossing locations.

Horizontal drilling machine shall be used for horizontal bore below railway tracks.

15.00 Quality & Quantity inspection and compliance to the observation:

The line works, before or after commissioning/energisation, shall be inspected by Quality Inspectors and State Inspection Inspectorate. Contractor shall provide all requisite details of line like approved survey report, as built drawings and joint measurement sheet etc to the inspector. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

16.00 Tree-cutting/trimming of tree:

The Contractor shall count, mark and put proper numbers with suitable quality of paint at his own cost on all the trees that are to be cut/trim to obtain required tree clearance. Contractor shall pay compensation for any loss or damage for tree cutting due to Contractor's work. Wherever forest clearance is envisaged for execution of work, clearance of forest department for tree cutting, if required, shall be arranged by the Contractor and compensation shall also be paid by the Contractor . Necessary fee if required to pay to Govt. dept. for arranging such clearances shall paid by Contractor (which will be reimbursed by IA on submission of documentary proof) . However, the IA/IA representatives would require to provide all necessary assistance for execution of this work.

17.00 Statutory clearances:

During execution of 33 KV,11KV and LT UG Cable work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

13.2. 66/11KV new Substation.**1.00Electrical Details of New 66/11 KV Grid Substations –**

No	Name of Proposed Substation	Circle/ town	66 KV line LILO or Radial	Capacity in MVA	Nos of proposed 11 KV outgoing feeders

2.00Following works are in the scope of IA:

- a) Acquisition of land for the substation and its possession to start constructional activities,
- b) Approach road to the substation land,
- c) Availability of up-stream source and plan for incomer 66KV line (if the same is not part of package)
- d) General layout of the substation
- e) Three (3phase) 415V AC power supply at one point on Contractor's expense & as per prevailing electricity tariff provided LT network is available in the vicinity of the proposed substation.
- f) Space for construction office & store yard for agency provided free of charge provided if it is available at site.

Since above works are not covered under substation works, IA shall provide all above input before start of substation work by turnkey Contractor. A format protocol note for handing over/taking over of sub-station land, approach road, retaining wall(wherever needed) and layout plan shall be signed between Authorized IA/IA Representative and authorized representative of Turnkey Contractor.

3.00Following works are in the scope of Contractor:

The scope of works include on turnkey basis for design, engineering, manufacturing, shop testing, transportation, supply, storage, erection, testing & commissioning of the following:

- i. 66/11 KV new Sub-station at specified locations with 66 KV outdoor switchyard comprising ofnos. bays withnos. 66/11 KV 16/20/25/30 MVA Power Transformers, 66/11 KV transforms bays, 66 KV bus coupler bay and 11 KV indoor switchgear along with switchyard control room and all associated facilities (to be modified suitably by utility).

The Scope includes:

- a) Complete design and engineering of all the systems, sub-systems, equipment, material and services.
- b) Providing engineering data, drawings and O&M manuals for IA's review, approval and records.
- c) Manufacturing, supply, testing, packing, transportation and insurance from the manufacturer's work to the site including port and customs clearance, if required.
- d) Receipt, storage, insurance, preservation and conservation of equipment at site.

- e) All civil and structural works as required.
- f) Fabrication, pre-assembly (if any), erection, testing and putting into satisfactory operation of all the equipment/material including successful commissioning
- g) Satisfactory conclusion of the contract.
- h) Enabling work as per the site requirement.

In addition to the requirements indicated herein, all the requirements as stated in other sections shall also be considered as a part of this specification as if completely bound herewith.

The Bidder shall be responsible for providing all material, equipment and services specified or otherwise which are required to fulfill the intent of ensuring operability, maintainability and the reliability of the complete work covered under this specification.

It is not the intent to specify all aspects of design and construction of equipment mentioned herein. The systems, sub-systems and equipment shall conform in all respect to high standards of engineering, design and workmanship, and shall be capable of performing in continuous commercial operation.

Whenever a material or article is specified or described by the name of a particular brand, manufacturer or trade mark, the specific item shall be understood as establishing type, function and quality desired. Products of other manufacturers may also be considered, provided sufficient information is furnished so as to enable the IA to determine that the products are equivalent to those named.

The scope of work shall comprise, but not limited to the design, engineering, manufacture, testing and inspection at manufacture's works, packing, supply, transportation, transit insurance, delivery to site, unloading, and storage and equipment erection including associated civil and structural works. Further it shall include the cabling, lighting, earthing, supervision, site testing, inspection and commissioning of Sub-Station. The scope shall also include all enabling works required for modification to existing facilities within the project area.

a. Bay Details:

The Sub-Station shall comprise ofnos. of 66/11 kV Transformer bay, 1 No. 66 kV Bus-Coupler bay. The Sub-Station shall be with Double-Main bus-switching scheme for 66 kV (to be modified suitably by utility).

66 kV Bus bar shall be of ACSR zebra/..... conductor (to be filled by utility).

The equipment and materials to be supplied by the Bidder shall form a complete 66 kV Sub-Station.

Any items though not specifically mentioned but which are required to make the switchyard complete in all respects for its safe, efficient, reliable and trouble free operation shall also be deemed to be included and the same shall be supplied and erected by the Bidder without any additional cost to IA. The following items of works are covered under scope-

- 66 kV equipment including structures: Circuit Breakers, Isolators with/without earth-switch, current transformers, surge arresters, bus-post insulators and capacitor voltage transformers.
- Sub-Station Control Room Building or extension of existing one.
- 66/11 kV Power Transformer of rating as specified (16/20/25/30 MVA as specified in BOQ)

- Structures for supporting XLPE Power Cables connected to Secondary Terminals of Power Transformer.
 - 11 KV MVAR Capacitor bank, isolator, series reactor & associated equipments forbanks of MVAR with structure (details to be filled by utility).
 - 100 kVA, 11 kV / 415V Station Transformer.
 - 11kV metal clad indoor switchgear with draw out type VCB, CT and PT, all control, protection and mimic arrangement.
 - Vacuum Contactor Panel for capacitor feeder.
 - DC System: 220V.
 - 66 kV Sub-Station including internal roads, drains, boundary wall, gates, Barbed wire fencing for complete substation boundary & Chain Link fencing for Switchyard, Borewell, oil sump pit, Geo Technical Survey, soil investigation, Soil filling & compaction including construction of retaining wall for Civil Works as required.
 - Supply & Erection of material for all Civil Works including equipment & gantry structure complete for 66KV outdoor yard equipment for transformer bay & line bay including earthing system & lightening protection etc. Erection including supply of material for transformer foundation, cable trench extension, fire wall for new power transformer.
 - 66 kV Sub-Station Materials.
 - ACSR Zebra Conductor.
 - G.S. Earth wire.
 - Insulators and Hardware.
 - Clamps, Connectors and Spacers.
 - Bay Marshalling Box.
 - Fire Fighting Equipment
 - Complete earthing grid for a system fault current of 31.5 KA and 1s duration (to be modified suitably by utility if required), earthing of all switchyard equipment including transformers and direct stroke lightning protection system and its connection to earthing grid.
 - Bidder shall make earth resistivity measurements at site and design the earthing grid as per latest edition of relevant standards.
 - Complete Direct Stroke Lightning Protection using Lightning Mast and/or shield wire and its connection to earth mat.
 - Power & Control cables, cabling (including inter pole and inter panel), Cabling between equipment and panels, cable support angles, cable trays and accessories necessary for cable erection such as glands, lugs, clamps for cables, ferrules, cable ties, hume pipe etc., cable route markers for buried cables, cable trench with covers also included in the scope.
 - Power & Control cable schedule & termination schedules shall be prepared by the Bidder.
 - Internal and outdoor lighting system for control room building and 66 kV Sub-Station. The substation area inside the fencing should be illuminated provided with 100 Watts LED flood light fittings. Tubular poles 12m high as per IS: 2713 (Latest Version) shall be used for installation of area light fixtures in Urban as well as Rural substations. Internal electrification of the control room includes provision of fans, exhaust fans, LED illumination fixtures, switches and sockets. Control Room lighting shall be designed to ensure 300 lux illumination level through LED lamp fittings. The bidder shall submit calculation for achieving the above illumination before start of lighting work for approval of IA/IA Representative
- b. Services and Items:

The scope includes but not limited to the following services/items described herein and elsewhere in specification:

- a) System design and engineering
- b) Supply of equipment and material
- c) Civil works
- d) Structural works
- e) Erection works
- f) Project management and site supervision
- g) Testing and commissioning
- h) Clearances from statutory authorities.

c. System Design and Engineering:

- i. The Bidder shall be responsible for detailed design and engineering of overall system, sub-systems, elements, system facilities, equipments, auxiliary services, etc. It shall include proper definition and execution of all interfaces with systems, equipment, material and services of IA for proper and correct design, performance and operation of the project.
- ii. Bidder shall provide complete engineering data, drawings, reports, manuals etc. for IA's review, approval and records.
- iii. The scope shall also include the design and engineering as per details elaborated elsewhere in this specification.
- iv. The Bidder shall carry out earth resistivity measurements at the switchyard site
- v. Relay setting calculations shall also be submitted by the Bidder for approval.
- vi. For all civil and structural works, the Bidder shall carry out design calculations; prepare all the detailed construction and fabrication drawings.

4.00 Arrangement by the Contractor

Contractor shall make his own necessary arrangements for the following and for those not listed anywhere else:

- 1. Distributions of power supply at all work areas in the substation premises.
- 2. Construction of office and store (open & covered)
- 3. Construction of workshop and material/field testing laboratory
- 4. Fire protection and security arrangements during construction stage

5.00 Civil works:

Details scope under civil works have been provided in this Part 2, Section 6 – “Civil Works and Soil Investigation” mentioned subsequently.

6.00 Basic Reference Drawings

The reference drawings, which are indicative of the type of specifications IA intends to accept, shall be developed by Contractor and approved by IA/IA Representative. The Contractor shall maintain the overall dimensions of the substation, buildings, bay length, bay width, phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights but may alter the locations of equipment to obtain the statutory electrical clearances required for the substation.

13.3. New 33/11 kV Power Substation

1.00Electrical Details of New 33/11 KV Grid Substations –

No	Name of Proposed Substation	Division	33KV line LILO or Radial	Capacity in KVA	Nos of proposed 11 KV outgoing feeders

2.00Following works are in the scope of IA and shall be executed by IA Project Manager:

- a) Acquisition of land for the substation and its possession to start constructional activities,
- ~~b) Approach road to the substation land,~~
- ~~c) Leveling of the substation land,~~
- ~~d) Construction of retaining wall wherever required including cutting, digging or filling of earth as required,~~
- e) Availability of up-stream source and plan for incomer 33 KV line (if the same is not part of package)
- f) General layout/Area Location of the substation.
- g) Three (3phase) 415V AC power supply at one point on Contractor's expense & as per prevailing electricity tariff provided LT network is available in the vicinity of the proposed substation.
- h) Space for construction office & store yard for agency provided free of charge provided it is available at site. Otherwise Contractor has to make its own arrangement at its own expenses.

Since above works are not covered under substation works, IA/IA shall provide all above input before start of substation work by turnkey Contractor. A format protocol note for handing over/taking over of sub-station land, approach road, retaining wall(wherever needed) and layout plan shall be signed between Authorized IA/IA Representative and authorized representative of Turnkey Contractor.

3.00Types of substation: Two types of substations are envisaged under this head as per following:

- a. **Partly-Outdoor substation** – in this type, 33KV section comprising breakers, isolators, 11/0.4 KV station transformer, CTs, PT, Lightning Arrester, Power Transformer & 11 KV Capacitor Bank, 33KV gantry shall be installed in out-door switch yard. Control panels of breakers shall be installed inside the control room. All 11KV equipment like CTs, Breakers and control panels, feeder meter shall be installed inside the control room. 11 KV cables shall be used for connection of power transformer and breaker and Breaker to outgoing isolators. 11KV feeder isolators and 11KV Lightning Arresters shall be installed outdoor.
- b. **Fully-Outdoor substation** – in this type, all 33KV and 11 KV equipment comprising Breakers, Isolators, CTs, PT, 11/0.4 KV Station Transformer, Lightning Arrester, Power Transformer, metering equipment and 11 kV capacitor bank shall be installed in substation yard i.e. outdoor. Control panels and feeder meter shall be installed indoor. Fully outdoor substation shall be constructed using H-beam support or gantry structure supports as decided by IA/IA Representative.

4.00 Power Transformers:

Power Transformers shall be 33/11 kV, 3 ph, 50 Hz, ONAN, Cu Wound, Outdoor Conventional type Power Transformer along with transformer oil, Buchholtz relay, breather, OTI & WTI, Marshalling Box, Conservator tank, oil level indicator, valves, Vent explosion plug, control wiring between sensing equipment and marshalling box, cable supporting tray on the body of transformer, transformer wheels, LV/HV bushing etc as required. Following type and capacity of power transformers are envisaged under the scheme:

- a) 1.60 MVA without tap changer
- b) 3.15 MVA without tap changer
- c) 5.00 MVA with off load / on load tap changer
- d) 6.3 MVA with off load / on load tap changer
- e) 8.00 MVA with off load / on load tap changer
- f) 10.0 MVA with off load / on load tap changer
- g) 12.5 MVA with off load / on load tap changer

Or any other rating as per latest Indian Standard Specification. Corresponding bus conductor, gantry structures, LA, CT, Breaker, Isolators, Earth-switch, Power Cables may be added as per the requirement of the equipment.

Transformer foundations shall be designed by turnkey Contractor considering manufacturer's recommendations. Cement concrete including reinforcement steel shall be used for the foundation. IA/IA Representative shall approved design and drawings of foundations. Proper shuttering, vibrator, curing shall be performed while constructing the foundations. Transformer rails shall also be provided for mounting of transformers on wheels.

2 sets of 50x8 mm galvanized neutral earthing strips shall be supplied with the transformer along with braided copper conductor links for connections at bushing ends. Two distinct earth connection shall be provided for neutral earthing. The earthing strips shall be mounted on 11KV post insulators. An isolating link shall be provided on individual earth strips for testing purposes.

Transformer protective equipment like OTI, WTI and Buchholtz relay shall be tested during pre-commissioning stage. Their electric connection upto marshalling box shall be performed as per Original Equipment Manufacturer recommendations. Cable tray shall be installed for laying of control cable shall be laid on cable tray on transformer body so that cable shall not get heated by transformer temperature. While commissioning the transformer tripping of breaker through all these equipment must be checked.

5.00 Breaker:

33 kV & 11 kV Vacuum Circuit Breakers shall be used for protection and control of power circuits. In partly outdoor substation, all 11 KV switchgears shall be indoor mounted type and 33 KV breakers shall be outdoor mounting type whereas in fully outdoor substation, 11 KV as well as 33 KV breakers shall be outdoor mounting type. In both the type of substation, control panels shall be indoor type. Outdoor breakers are to be supplied with Current Transformers. The outdoor mounting type breakers shall be supplied with its mounting galvanized steel structures.

Detailed cable schedules, termination details and circuit diagrams of control panels, transformer marshalling box, breaker marshalling box, and capacitor banks equipment shall be prepared and submitted by turnkey Contractor (TKC) for approval of IA/IA Representative before commencing the work.

Cement concrete including reinforcement steel shall be used for the foundation. IA/IA Representative shall approved design and drawings of foundations. Proper shuttering, vibrator, curing shall be performed while constructing the foundations for breaker.

Permanent maintenance platform shall be constructed for outdoor breakers and CT. IA/IA Representative shall approve design of platform.

Control wiring between CT/breaker and control panel for outdoor mounting breakers/CT shall be routed through Junction box. Metallic Junction box shall be installed on support gantry structure of substation or on MS angle (50x50x6 mm) support. The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks shall be prepared and submitted. All CT terminals are to be ring type and other terminals are of fork type. 2.5 sqmm copper multi stands wiring 1.1 KV grade, ISI marked, IS 694 shall be used for control wiring. A terminal block be provided between CT and Meter keeping 20% spare terminals. The Junction box are to be earthed using 8 SWG GI wire direct connection to the earthing. 2 Nos Earthing bolts on the Distribution Box/SMC Distribution Box shall be provided of 10mm dia.

6.00 Station Transformer:

100 KVA, aluminium / copper wound, 11/0.4 KV (or 33/0.4 KV) Station Transformers shall be installed on DP structure made of H-Beam 152x152 mm 37.1 kg 8 meter long or parallel flanged beams WPB 160X30.44. Outdoor type Distribution Box/SMC Distribution Box/SMC Distribution Box/SMC Distribution Box complying to IS 13410 for station transformer shall be comprising of 200 A switch fuse unit, 6 Nos SP MCCB– 90 A, 2 Nos 32 A SP MCCB, 3-ph, 63A, contactor controlled yard lighting timer unit, tri-vector electronic energy meter (mounted in separate metallic LTCT cum meter box) with suitable CT, control/power cabling and terminals, 1 No 20 A Industrial socket and switch for local power supply requirements, mounting channel, clamps and hardware.

The Station Transformer substation shall be provided with Station Class LA, 33KV / 11KV AB Switch and 33KV / 11KV DO Fuse. Except type of Distribution Board, Lightening Arresters, and DP Structures, all other scope of work as mentioned under 100 KVA capacity Distribution Transformer work shall be the scope of work under 100 KVA Station Transformer on LT side.

7.00 Gantry structures:

There are two type of gantry structures envisaged under the scheme.

- a) Gantry structures made of H-Beam 152x152 mm 37.1 kg 8 meter long or parallel flanged beams WPB 160X30.44 kg/m, double MS Channel 100x50mm for bus bar supports (Beam), 65x65x6mm angle for cross arms/supporting structures and 50x8mm flats for clamps along with hardware items duly painted etc., and
- b) Gantry structures made of Lattice structures of equal angles sections, flat as per approved drawings. State practices are to be adopted in the design. All structural steel members and bolts shall be galvanized after fabrication as per IS:4759 and zinc coating shall not be less than 610gm/sq. meter for all structural steel members. All L45x45x5 will have 23 mm back mark. All L50x50x6 will have 28mm back mark. 3.5mm spring washers are to be used under each nut, structural steel shall conform to IS 2026. All weld shall be 6mm filled weld unless specified otherwise. All nuts and bolts shall be of property class 5.6 of IS 1367. Plain washers shall be as per IS 2016 & spring washers shall be IS: 3063.

The gantry steel structures materials shall be hot-dip galvanized thoroughly internally and externally as per according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

The gantry steel structure items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

0.5m³ cement concrete in mixture 1 part cement, 3 part coarse sand, 4 part 20mm size aggregate stone chips (1:3:4) shall be used in all the types of gantry supports.

While erecting supports (poles), shuttering must be used for concreting so that proper quantity of cement concrete mixture be used and assessed during inspection. During concreting proper compaction by means of mobile vibrator be provided. While starting work of support erection, gang wise shutting and mobile vibrator shall be offered for inspection to IA/IA Representative. While erecting support, mercury level gauge must be used to ensure vertical erection of support.

300x300mm X 12" inch height muffing shall be provided on gantry support to prevent direct entry of rain water along the support. Cement Concrete of 1:2:4 (1 part Cement, 4 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

8.00 AC Distribution board (ACDB)

415 Volts, ACDB (IP 54 protection) shall be indoor floor mounted with mounting arrangements, three phase-neutral voltmeter, three phase ammeter and Selector switches, 63 Amps TPN switch fuse unit in incomer circuit, 32 Amps TPN switches in outgoing circuits equals the number of indoor breaker control panels plus number of outdoor VCB kiosk panel and having 20% spare outgoing circuits, etc. Alternatively, ACDB can also be erected on separate MS frame made of 50x50x6 angle.

Substation flooring shall be provided with suitable inserts to fix ISMC 75 channel. This channel shall hold ACDB board. The board shall be installed on indoor trench. Cables shall have bottom entry. The board shall be grounded by 50x6mm GI strip at two distinct connections.

9.00 DC Distribution board (DCDB)

Indoor floor mounted, IP 54 protection, two pole 100 Amp 2 pole DC Switch Fuse unit as incomer, two pole 40 Amp Switch Fuse units in outgoing circuits equals the numbers of indoor breaker control panels plus numbers of outdoor VCB kiosks panels plus control room lighting panel and 20% spares outgoing circuits. Direct Current Distribution Board shall be installed in each substation. It would comprises of DC volt meter including mounting arrangements etc as required as

per technical specifications, approved drawings and scope of works. Alternatively, DCDB can also be erected on separate MS frame made of 50x50x6 angle.

Substation flooring shall be provided with suitable inserts to fix ISMC 75 channel. This channel shall hold DCDB board. The board shall be installed on indoor trench. Cables shall have bottom entry. The board shall be grounded by 50x6mm GI strip at two distinct connections.

10.00 Cables:

- a. **Control cables:** 1.1 KV grade 2.5 mm² PVC insulated and PVC sheathed, armored, stranded, copper control cable with 2 core, 6 core and 10 core are envisaged in the substation.
- b. **HT Power Cables:** In partly outdoor substation, 11KV XLPE Cables shall be used as per following requirements;
 - Between Power Transformer and Main transformer breaker
 - Between Feeder breaker and outdoor feeder DP structures
 - Between capacitor bank switch and capacitor bank
- c. **LT Power cables:** 1.1 KV grade, armored, stranded, aluminum power cable PVC insulated and PVC sheathed with complete accessories as per detailed engineering
 - 3.5Cx150mm² (between station transformer & Distribution Box/SMC Distribution Box/SMC Distribution Box/SMC Distribution Box)
 - 3.5Cx70mm² (between Distribution Box/SMC Distribution Box & yard receptacles)
 - 3.5Cx35mm² to be used from Station Transformer Distribution Board to:
 - Control room building Internal Electrification DB,
 - ACDB Board,
 - Tube well Start Panel,
 - Outdoor area lighting control and distribution panel
 - 2 core x16 mm² for supply to area lighting masts.
- d. **LT cable for Internal Electrification works:** following cables shall be used for internal electrification purpose:
 - 1.1 KV PVC insulated PVC sheathed ISI marked, IS 694, 10mm², copper conductor, stranded, for internal electrification works between main DB and Sub DB or Sub DB to switch board,
 - 1.1 KV PVC insulated PVC sheathed ISI marked, IS 694, 2.5mm² /4.00mm², copper conductor, stranded, for internal electrification works light & Fan and Power circuits respectively,
 - 1.1 KV PVC insulated PVC sheathed ISI marked, IS 694, 4.00mm², copper conductor, stranded weather proof cable for connection between outdoor area lighting luminary fixtures and its junction boxes,

Power Cables are to be laid as per best engineering practices. Power and control cables are to be laid in different alignments in cable trench. However, in case power/control cable is required to extend up to the equipment where cable trench is not constructed, they shall be laid in underground trench of width 300 – mm wide, provided with 2nd class brick protection (Approx. 10 bricks per meter length of laying) and sand protective covering (200 mm thick) and laid at the depth of 750mm minimum for LT cables and 1000mm for 11 kV cables. Laying specification of cable shall be as detailed in CPWD specification of laying power cables. Suitable loop length of 1.5 meter to be kept at the end points. Excessive loop lengths shall not be paid.

11.00 Metering & metering equipment:

Following two types of metering equipment are envisaged in the work comprising of:

- a. 33 kV/110 V Metering equipment (CTPT unit) with CT of ratio 400-200/5 A
- b. 11 kV/110 V Metering equipment (CTPT unit) with CT of ratio 300-150/5 A

Meter shall be HT trivector DLMS compliant category suitable for substation/feeder metering. Meter shall be 3 ph 4 w 110 V 5 A accuracy class 0.5s with GSM (GPRS compatible) modem.

12.00 Junction Box and Control Cabling:

Junction box is to be installed on support gantry structure of substation or erected on separate galvanized steel structures in the yard nearer to metering equipment. The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks shall be prepared and submitted.

All CT terminals are to be ring type and other terminals are of fork type. 2.5 sqmm copper multi stands wiring 1.1 KV grade, ISI marked, IS 694 shall be used for control wiring. A terminal block be provided between CT and Meter keeping 20% spare terminals.

The Meter-cum-meter box are to be earthed using 8 SWG GI wire direct connection to the earthing. 2 Nos Earthing bolts on the distribution boards shall be provided of 10mm dia.

13.00 Capacitor banks:

Capacitor banks of 600 KVAR, 1200 KVAR and 1500 KVAR capacity shall be provided with 3.15 MVA, 5.0 MVA and 8.0 MVA capacity power Transformer respectively. Capacitor bank shall comprises of switching vacuum circuit breaker, current transformers (100-50/5-5A), fully automatic control panel mounted inside the substation buildings, 11 KV residual voltage transformer, 11 KV three phase Isolator, Earthing system, capacitor banks complete with individual fuses, interconnection mounting rakes, external fuses mounting arrangement, base insulators & accessories, 3 Nos. 11 KV single phase Metal oxide (Gap less) lighting arresters, isolators etc as per requirements. Hot dip galvanized mounting structure made of sections of 100x50x6 mm channel or 75x40x6 mm channel or 75x75x8 mm equal angles only.

14.00 DC emergency lighting:

At-least four Philips make LED bulbs are to be provided of 7 watts {2 Nos in control room, 1 No in station battery room, 1 No in yard area). These bulbs shall be fed by DC station battery. The wiring of these bulbs shall be so designed that it will automatically turn ON in event of failure of normal power supply. Provision for putting these bulbs OFF by operator is also to be provided. Wiring is to be performed concealed using PVC insulated PVC sheathed 2.5 mm² stranded copper wire. An automatic change over switch is envisaged for this purpose. This may be installed at prominent location, generally easily approachable by operator in the substation control room.

15.00 Station Battery and battery Charger:

Station battery are to be supplied with wooden racks made of teak/sal wood planks of thickness not less than 25mm, support legs made of size not less than 2 inches X 2 inches. The battery may be placed on two-tier formation of stand. The construction of battery rack shall suit site conditions of their placement. The rack shall be painted with three coat of acid proof paint of reputed make as approved by IA/IA Representative. No metal fasteners / nails shall be used for construction of battery racks. The stand shall be supported on insulators to obtain necessary insulation from the earth and there shall be insulators between each cell and stand.

Initial charging of stationary battery shall strictly be as per Original Equipment Manufacturer (OEM) recommendations. Detail charging and discharging cycle readings shall be recorded and submitted to IA/IA Representative for approval.

Battery room shall be provided with exhaust fan of air displacement capacity more than six times volume of battery room per hour. Wooden doors and windows shall be provided in the battery room. Anti-acid tiles shall be used in the floor and upto six feet height of the wall of the battery room.

The battery connections / terminals are to be cleaned and provided with petroleum jelly. Terminals hardware is to be provided with connecting cables. The inter-battery wiring cable shall be neatly dressed using cable ties, clamped and wired using ferrules, tag mark. New battery sets are to be provided with battery chargers as per detail specifications enclosed. Interconnecting cables and power supply cables originating / terminating at the battery charger, shall be neatly dressed using cable ties, clamped and wired using ferrules, tag marks, double compression glands etc as applicable. Connecting cable and associated materials needed for commissioning of charger shall be treated as part of the battery charger. 1.1 KV multi-strands, 30 sqmm, copper conductors, PVC insulated and PVC sheathed cable for DC wiring between DCDB and Battery bank.

The agency shall provide following equipment at all the substations:

- a) Two copies of battery instruction sheet duly laminated,
 - b) Two sets of ISI marked electrical hand gloves,
 - c) One cell testing voltmeter 3 – 0 – 3 volts,
 - d) Two syringe hydrometers
 - e) One thermometer with specific gravity correction scale,
 - f) One set of suitable spanners,
 - g) Two acid resistant funnel,
 - h) One acid resisting jar of 2 liters capacity,
- 16.00 Outdoor type Current Transformer and Potential Transformer:

Outdoor type CTs are to be erected on supporting structure provided on the breaker structure or suitable structure as per state practices. Potential Transformers shall be erected on gantry structures and connected with bus. In both the case, separate metallic Junction Box shall be installed on support gantry structure of substation or erected on separate galvanized steel structures in the yard nearer to equipment. The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks shall be prepared and submitted for approval of IA/IA Representative.

All CT terminals are to be ring type and other terminals are of fork type. 2.5 sqmm copper multi stands wiring 1.1 KV grade, ISI marked, IS 694 shall be used for control wiring. A terminal block be provided in the junction box keeping 20% each spare ring type/fork type terminals.

The junction box shall be earthed using 8 SWG GI wire direct connection to the earthing. 2 Nos Earthing bolts on the junction box of 10mm dia.

Testing and pre commissioning checks shall be conducted in accordance with OEM recommendations and as approved by the IA/IA representaives. Terminal connectors at HT as well as LT side shall be provided with the CT/PT equipment.

17.00 Control Panels:

New panels as per the requirement of protection like feeder protection, transformer protection or incomer protection are to be supplied with each newly supplied breaker:

- a. In case of fully outdoor type substation, control Panel to be erected on ISMC75 (75x40x6 mm) MS channel duly welded on MS angle inserted on indoor trench. Panels shall then be properly aligned, Cables shall enter with double compression glands, codified, lugged, and dressed.
- b. Breaker cum control panel shall be erected on ISMC 100(75x50x6 mm) MS channel duly welded on MS angle inserted on indoor trench. Panels shall then be properly aligned, Cables shall enter with double compression glands, codified, lugged, and dressed.
- c. Functional checks shall be performed on the control panel as per control wiring diagram.
- d. All alarm, annunciation and trip circuits / indication & alarm circuits shall be tested and made operative,
- e. The indication lamp shall be LED type lamp as per given specifications and shall be made operative,
- f. Indicating instruments shall be calibrated,
- g. Grounding of panel at two different locations by 50x6mm flat shall be provided. ,
- h. Control relays shall be calibrated and checked for tripping and closing operations,
- i. Pick up time / trip time and tripping at normal and reduced voltages shall be checked, properly adjusted and recorded,
- j. Latching arrangement of relays shall be checked for operation,

18.00 Lightning Arrester:

Station Class LAs will be used in 33 KV and 11 KV with base steel structure, terminals bi – metallic connectors / PG clamps and earth connectors. LAs are to be connected with separate earth connection using 50x6mm GS flat. All LA terminals / connections are to be tightened. All lightening arresters installed in grid substations shall be Station Class Lightening Arresters.

19.00 Internal Electrification:

Indoor Distribution Board having 63A TPN MCB, outgoing MCBs of suitable ratings for power and light & fan circuits are to be installed. Internal electrification of the control room includes provision of fans, exhaust fans, LED illumination fixtures, switches and sockets.

Two nos separate 3 m long 40 mm dia earthing shall be provided for internal electrification works. 8 SWG GI wires shall connect following equipment:

- a. Main Distribution Board and Sub-Distribution Boards,
- b. ACDB, DCDB, Battery Chargers each at 2 distinct locations

Internal Electrification works' wiring shall be provided with single core PVC insulated & PVC sheathed 2.5 mm² stranded ISI 694 marked copper flexible wire (for light and fan circuits) and 4.0 mm² stranded ISI 694 marked copper

flexible wire (for power points) in conceal arrangement in 25 mm dia 2 mm thick PVC ISI marked pipe and 2.5mm thick switch boards in flash arrangement. Neutral links are to be used in each switchboards. Jointing in neutral conductor other than at switching board shall not be permitted.

Iron junction box made of 18 gauges CRCA sheet shall be used for switchboard; 2 mm thick cotton impregnated hylum sheet is to be used for the purpose of switch board. ISI marked switched and sockets are to be used for Internal Electrification works. Earth wire must be made available duly connected with earth circuit for Earthing in each and every switchboard.

Reputed make indoor double door Miniature circuit breaker DB fitted with Miniature Circuit Breakers of MDS/ Havells/ Standard make or equivalent ISI marked shall be used for the protection. Reputed make LED fittings and 5-star energy efficient BLDC fans are to be used for the substation. These materials are to be procured from authorized dealer of the materials manufacturers only. Documentary evidence may be submitted for source of supply of all electrical materials. Before procurement of materials IA/MSEDCL shall approve make, type and quality of materials.

Control Room lighting shall be designed to ensure 300 lux illumination level through LED lamp fittings. The bidder shall submit calculation for achieving the above illumination before start of lighting work for approval of IA/IA Representative.

20.00 Yard Lighting:

The substation area inside the fencing shall be illuminated provided with 100 Watts LED flood light fittings. Each fitting and its Junction box enclosures shall be IP 55 protection type. Water and vermin proof-ness is a must. At least 4 Nos. fittings at all the four corners shall be provided. Acceptable make of fitting, fixtures and lamp are Philips, Crompton, Alstom, and Bajaj only.

Area light supply from Substation DB to be extended through 2X16 mm² PVC insulated PVC Sheathed aluminum stranded armored power cable laid in underground trench of width 300 – mm wide, provided with 2nd class brick protection (Appro. 10 bricks per meter length of laying) and sand protective covering (200 mm thick) and laid at the depth of 750mm minimum. Laying specification of cable shall be as detailed in CPWD specification of laying power cables. Suitable loop length of 1.5 metre to be kept at the end points.

Pole mounted junction box (and not the Control Gear Box supplied with the fitting) shall be made of 2mm thick CR steel sheet of size 300X300X200mm fitted with SPN terminal block of 32A capacity, 10A SPN miniature circuit breaker of ISI mark and reputed manufacture. The JB shall be hot dip galvanized. The JB shall also conform to IP 55 protection for enclosure. Neoprene gasket shall be used in JB. 2 Nos. earthing terminals of 10 – mm dia shall be provided with 25X6mm size of mounting clamps. Bidders shall get JB drawing approved before start of manufacturing.

4 Sq.mm, 1100V grade, weather proof three core (One core for phase, one core for Neutral and one core for earthing) aluminum stranded flexible conductor PVC sheathed and PVC insulated cable conforming to IS 694 shall be used for connection of fitting and its Control Gear Box from pole mounted Junction Box. Control Gear box must provide ISI approved components. Copper wound heavy chocks shall be acceptable.

Tubular poles 12m high as per IS: 2713 (Latest Version) or WPB 160x23.83 kg/m parallel flanged beams. embossed with ISI certification mark and pole designation shall be used for installation of area light fixtures in Urban as well as Rural substations. Pole shall be designated as 410 – SP - 60. Poles and fitting structures shall be painted with two coat of anti – rusting bitumen paint inside and outside up to the planting depth and two coat zinc oxide paint followed by 2 or more coats of aluminum paint of approved make, brand and shade on portion of pole which will remain above ground level.

Steel tubular Poles/Wide Parallel Beams shall be hot-dip galvanized thoroughly internally and externally as per according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Steel tubular Poles/Wide Parallel Beams shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

21.00 ACSR / AAAC Conductor:

Following ACSR conductors (or equivalent AAAC conductor) are envisaged for bus bars, jumpers, droppers:

- a. 6/4.72 mm + 7/1.57 mm (100 sqmm Dog conductor),
- b. 30/2.59 mm + 7/2.59 mm (150 sqmm Wolf conductor), and
- c. 30/3.00 mm + 7/3.00 mm (200 sqmm Panther conductor)

Conductor shall be provided with hardware fittings, T-clamps, bi-metallic clamps and PG clamps as per requirements. T – Clamps shall be provided on each jumper on bus bars. Line jumpers shall be provided with adequate size of PG Clamps (Two numbers PG Clamps at each end of jumper). Clamp shall be made of aluminium grade T-1F as per IS – 8309 having good electrical quality aluminium material and shall not be brittle in nature. Suitable Bi – metallic clamps shall be provided at bushings of transformers and circuit breakers. Also at all those points where joining of two different materials is found, bi –metallic clamps shall be provided.

Care shall be taken while drawing conductor from the drum. Proper roller shall be used while handling conductors during erection.

22.00 Insulator, hardware and connections to equipment:

33 KV and 11 KV polymer/porcelain Disc/Pin insulator with suitable hardware fittings shall be used. Insulator shall be tied properly using binding wire/helical form fitting. In road crossing and line crossing locations bridling cross arms and pin insulator shall be used.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator shall properly be cleaned before installation. No damage/crack insulator shall be used.

23.00 Power receptacles:

Two power receptacles are envisaged in switch yard area to provide power supply to Transformer Oil Filtration machine and other testing and commissioning related works. Each receptacles shall house 63A MCCB as incomer, 40A 3 phase socket/switch and 1 No, 20A single phase Industrial type socket/switch of reputed brand and type.

24.00 Tube well:

Deep Tube is envisaged for all the substations. Depending on the depth of the bore, suitable capacity of submerged pump shall be installed. Bore diameter shall be 6" which must be penetrated vertically in all type of soil condition. Before digging the bore, soil Resistivity needs to be checked to ascertain the location of the best site for the tube well. Following works are envisaged under this scope:

- Digging bore of diameter six inches. Providing MS casing on bore up to the suitable depth finalized during detailed engineering.
- Providing new 3 phase submersible pump 32 stages or 30 stages depending on technical requirements.
- Providing Start Panel of reputed make like L&T, Havells or equivalent make having single phase protection, Over load protection, Pre – set timer of L&T make, Star Delta Starter, Indications for Load currents in all three phases, Indications for Supply voltages in all three phases etc. Starting panel must conform to IP 52 protection for enclosure. It shall be mounted indoor inside the Control room on 50x50x6 mm GS angle supports. Start panel must be earthed with 2 Nos 8 SWG wires. 4 core 16 Sq mm aluminum armored cable must be used for energizing this Start Panel.
- Three phase, 4 wires, copper flexible supply cables suitable for submersible pump operations, ISI marked, 1100V grade shall be connected to submersible pump through underground trench up to the well as per CPWD specifications duly protected from brick and sand cushioning.
- A Heavy-duty gunmetal wheel valve (tap) may be provided on the discharge line for drinking water requirements.
- Provision for lifting the pump in case of overhauling / breakdown maintenance may also be provided.
- ISI marked PVC or 2nd GI Pipes are to be used for suction as well as discharge water lines.
- An open drain must be provided in the vicinity of the tube well. Detail arrangement shall be finalized in detailed engineering.

25.00 Yard Earthing:

Earthing shall be provided with GI earth pipe, GS solid rod 25 mm dia and 75x8mm GS flat forming earth mat. 50x6mm GI flat shall be used for earth-riser along with GI wires / Stay wires as per requirement of IA/IA Representative. IA/IA Representative shall approve arrangement of earthing network. Following arrangement envisaged for grid/earth rod/ earth pipe: (Indicative drawing is enclosed with the document)

Description of equipment	Fully outdoor Substation
Earth Pit made of 3 m long, 40 mm dia GI pipe	2 Nos for power transformer neutral direct connection, 1 No for 33 kV & 11 kV Lightning Arresters direct connection, 3 Nos. for station transformer, 2 Nos. for indoor panels, 2 Nos. for internal electrification works of control room, and 2 Nos. for substation fencing
Earth rod GI solid 25 mm dia	19 Nos (+/-) 20%

Earth mat	75X8 mm GS Flat
Laying of earth mat	Below ground 0.5 meter
Earth riser	50x6mm and 25x3 mm GI Flats

Description of equipment	Partly outdoor Substation
Earth Pit made of 3 m long, 40 mm dia GI pipe//Chemical earthing	2 Nos for power transformer neutral direct connection, 1 No for 33 kV & 11 kV Lightning Arresters direct connection , 3 Nos. for station transformer, 2 Nos. for indoor panels, 2 Nos. for internal electrification works of control room, and 2 Nos. for substation fencing Earth circuit should not be connected with Grid mesh/other earthing pits.
Earth rod GS solid 25 mm dia	14 Nos (+/-) 20%
Earth mat	75X8 mm GS Flat
Laying of earth mat	Below ground 0.5 meter
Earth riser	50x6mm and 25x3 mm GI Flats

Standard requirements / provisions of earthing are enclosed herewith. Connections of earth-grid / earth – pit with Lightning Arrester and Power Transformer Neutral and Transformer body (at two distinct points) are to be made using 50X6mm GS flat. Connections of other equipment may be provided with 8 SWG GI wire or GI Stay wire as per approval of IA/IA Representative. Following arrangements are envisaged for earth connection:

- | | | |
|-----|---|-----------------|
| 1. | Power Transformer Neutral
(Two distinct connections) | 50x8 mm GS Flat |
| 2. | Transformer Body | 50x6 mm GS Flat |
| 3. | Breaker body / legs (Two distinct connections) | 50x6 mm GS Flat |
| 4. | Lightning Arrester | 50x6 mm GS Flat |
| 5. | Station transformer Neutral
(Two distinct connections) | 25x3 mm GI flat |
| 6. | Fencing | 50x6 mm GI Flat |
| 7. | Control Panels (Two distinct connections) | 50x6 mm GI Flat |
| 8. | Isolator structure / handle | 50x6 mm GI Flat |
| 9. | Steel structure of substation | 50x6 mm GI Flat |
| 10. | Line meters | 25x3 mm GI Flat |
| 11. | CT, PT and Cable Tray | 25x3 mm GI Flat |

Fencing and gate shall be grounded. Moving portion of gate shall be grounded with flexible braided conductors of equivalent aluminum 25 mm² sizes of conductors duly lugged and bolted.

In rocky soil where getting required earth resistance is a challenge, chemical rod earthing shall be used. Overhead line structure shall be connected to chemical earth electrode using 8SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod.

In areas with poor with poor earth resistance where it is generally difficult to perform maintenance activities, maintenance free earth pits shall be provided.

GI flats and GI wires must be properly dressed, bundled and fixed on supporting structure at 1 to 2 feet intervals.

26.00 33 KV & 11 KV Isolators:

33 KV & 11 kV, 3-ph, 3 Pin type, Horizontal Mounting type, Gang Operated, Isolator Switch shall be installed at suitable locations as per instructions of IA to isolate line section, power transformer, bus bars etc. B Class GI pipe shall be used (without any joints) for operation of isolator switch. Isolator Switch structure and handle must be earthed using 50x6 GI flat.

Isolator cum earth switch – The IA may also opt for 33kV and 11kV Isolator cum earth switch, In this case the Contractor is required to make provision for its power supply, control supply and indications in control panel.

27.00 Fabricated steel items:

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally as per according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Fabricated steel structure items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

28.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc

shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by IA/IA Representative.

29.00 Fire Protection System:

Fire Buckets filled with sand: The fire buckets confirming to IS 2546/1974 filled with sand shall be installed at two places in new s/s – in control room and in switchyard near power transformer. There shall be 4 no. of buckets at each location in a s/s. The buckets shall be hanging on a steel stand. The buckets and the stand shall be as per relevant standards and will be filled with sand.

In case of 66 kV power substation, The Contractor is required to make the provision of sprinkler system, deluge valves, jockey pumps, Diesel pump etc including oil sock pits etc.

30.00 Portable Fire Extinguishers:

Carbon dioxide type and Dry chemical powder type fire extinguishers are also to be installed in newly constructed substation. All the portable extinguishers shall be of free standing type and shall be capable of discharging freely and completely in upright position. Each extinguisher shall have the instructions for operating the extinguishers on its body itself. All extinguishers shall be supplied with initial charge and accessories as required. Portable type extinguishers shall be provided with suitable clamps for mounting on walls or columns. All extinguishers shall be painted with durable enamel paint of fire red color conforming to relevant Indian Standards. Capacities of each type shall be as indicated in the schedule of quantities. Carbon dioxide (CO₂, type) extinguisher shall of 4.5 kg for control room conform to IS:2878. Dry chemical powder type extinguisher shall be of 6 kg capacity for control room conform to IS:2171.

31.00 Safety and operation equipment:

The substation shall be equipped with one following equipment for smooth operation and maintenance:

- a. Megger 1000 Volt (Electrically as well as manually operated) of Megger/Fluke/Motwane or equivalent make
- b. Earth resistance meter, Megger/Fluke/Motwane or equivalent make
- c. Crimping tool for cable from 2.5 sqmm to 185 sqmm,
- d. Torque wrench M8 to M16
- e. Multi-meter Motwane make analogue type,
- f. Tong tester digital 0-600A capacity,
- g. Allen key set,
- h. ISI marked, Discharge rod 66 KV rating with discharging copper cables & terminals – 6 Nos
- i. Electrician tool box – Taparia standard kit
- j. Set of D-spanners
- k. 12’’ size electrical screw driver
- l. 12’’ size electrical hexagonal head screw driver
- m. Pipe wrench suitable for 2 ½ inch dia pipe
- n. ISI marked rubber mat rated for 11 KV insulation, ¾’’ thick, size 1000mm x 2000 mm – in front of all the control panels.

IA shall approve make and type of equipment.

32.00 Following details shall be provided at each substations:

For suitable information to operating staff or the other related persons visiting the substation, following facilities shall be provided before commissioning of substation or on date of inauguration of the substation.

- Sketch of substations electrical circuit inside the substation in white cotton impregnated 2 mm thick hylum sheet 2x2 feet size installed on the wall,
- Notice board 3x3 feet made out of 10 mm thick water proof ply, painted suitably and provided with 1st class teak wood ribs at the sides of 2 x ½ inches size,
- Electrical safety charts,
- Provision for notifying name, address, telephone numbers, qualification details etc of the operational staff IA intends to post at the substations and their officials in hierarchy,
- Depicting working drawings of cable terminals details and cable laying details in laminated sheets
- Color coding of bus bars and terminal conductors of the feeders using enamel painting round marks and labeling name of feeders, equipment, etc as defined.

33.00 Others:

Buildings for substation control room – shall be 10mx12m size. Details are enclosed in the tender drawing. The buildings should also has provision for dedicated washrooms for female employees in addition to male washrooms.

Indoor trenches covered with 6 mm thick chequirred plates: Concrete trench are required inside control room with 50x50x6 mm GS angle inserted at the edges for erection of control panels. Unused part of cable trench shall be covered with 6mm thick MS chequirred plates inside control room. At the entry point of trench in control room, proper sealing arrangement shall be provided so as to stop entry of reptiles and rainwater inside control room through trench.

Bi-metallic connectors shall be provided wherever there is a connection between two metal parts on all electrical equipment like 33/11 KV Power transformer, 11/0.4 KV station transformer, vacuum circuit breakers, isolators, DO Fuse, Lighting Arrester, etc.

34.00 Labelling:

Each substation equipment shall be labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words shall be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles and equipment to site for erection. Base painting and marking of digits shall be performed by a skilled and trained painter using branded enamel paint, IA shall approve type and brand of enamel paint. The identification of phases through Red, Yellow and Blue circles shall be provided on transformer, CT, PT, 33 KV and 11 KV feeder Double Pole structures.

Control panels shall be labelled from front as well as from the back by providing serial number and name of feeder/transformer. The color coding sign on two adjacent panels shall also be provided with 100mm dia color circle overlapping two adjacent panel sheet for safety purpose.

Labeling of following information is intended by the IA preferably in local HINDI language:

1. Transformer capacity and designated name like T - 1 or T – 2,
2. VCB designated name

3. Identification of CT & PT
4. Color coding of bus bars, transformer terminals, feeders phases (R-Y-B)
5. Name of incoming / outgoing feeder – like 11 KV Nandlapur Feeder I
6. Warning instruction, if any, of availability of two sources of HT supply on same structure.
7. Earth pit designation and date of checking,

35.00 Danger board:

Each substation equipment and structures shall be provided with a danger board as per approved drawing. Danger board shall be in bi-lingual languages (local language and English). Clamp for danger board, nut-bolts and washers shall be painted with two or more coats of red-oxide and aluminium paints respectively till smooth surface before installation.

36.00 Site Testing and Pre – Commissioning Checks:

An indicative list of tests is given below. Contractor shall perform any additional test based on specialties of the items as per the Field Quality Plan/ instructions of the equipment manufacturer or IA without any extra cost to the IA. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall furnish the list of instruments to the IA for approval. Detail test certificates duly signed by IA's representative & agency representative of tests jointly carried out at site before putting the equipment in use, shall be submitted by the Contractor in three copies.

Agency shall also be responsible to prepare Single Line Diagram of substations and an overall power distribution network of the circle showing 400KV, 220KV, 132KV, 33 KV network and point of metering. A set of drawings which includes drawing of Single phasing AB Switch, Substation earthing arrangement are enclosed for basic information. These drawings are not necessarily showing the exact dimensions of the substations.

37.00 Equipment test records, commissioning test records and drawings –

Factory test certificates of equipment, test certificates at the time of pre-dispatch inspections, pre-dispatch inspection reports, pre-commissioning check results and post commissioning check results shall be compiled and provided in Three sets to IA/IA Representative for his approval and records.

A copy of such test record shall be offered to electrical inspector and other inspecting officials during his/her visit to substation for inspection.

38.00 Electrical Inspection by state Electrical Inspectorate:

The substations shall be subjected to the inspection of state owned Electrical Inspectorate for which payment of fees shall be made by Contractor.

The responsibility of Contractor shall include rectification / alteration / addition of installation as per advice of electrical inspector for successful commissioning of the substations within timelimit.

39.00 Arrangement by the Contractor:

Contractor shall project-wise make his own separate arrangements for the following:

1. Opening of a site office-cum-store,
2. Distributions of power supply at all work areas in the substation premises.

3. Construction of office and store (open & covered)
4. Construction of steel fabrication workshop and material/field testing laboratory
5. Round the clock fire protection and security arrangements for site store-cum-office during construction stage

40.00 Civil works:

Details scope under civil works have been provided in “**Civil Works and Soil Investigation**” at **Section 6 of Part 2**.

Foundation design for power transformer, outdoor type vacuum circuit breaker, control room building, fencing, gantry structure etc shall be submitted by Contractor. While designing OEM recommendations must be considered. Foundation for power transformer, outdoor type vacuum circuit breaker, control room building and fencing shall be provided with reinforcement steel. IA/IA Representative shall approve foundation designs.

41.00 Basic Reference Drawings:

The reference drawings, which are indicative of the type of specifications IA intends to accept, are annexed with the specification. The Contractor shall maintain the overall dimensions of the substation, buildings, bay length, bay width, phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights but may alter the locations of equipment to obtain the statutory electrical clearances required for the substation.

The enclosed drawings give the basic scheme, layout of substation, associated services, earthing arrangement. These drawings are provided for general information only.

Note: The insulation and RIV levels of the equipment shall be as per values given in the respective chapter of the equipment.

42.00 Commissioning spares:

The Contractor shall supply spares, which he expects to consume during installation testing and commissioning of system. The quantity of these spares shall be decided based on his previous experience, such that site works shall not be hampered due to non-availability of these spares. Contractor shall submit a complete list of such spares along with the bid, the cost of which shall be deemed to have been included in the lump-sum proposal price of the package. The Contractor, if so agreed at a cost to be negotiated may leave the unused commissioning spares at the site for use of IA.

43.00 Recommended spares:

The Contractor shall provide a list of recommended spares giving unit prices and total prices for 3 years of normal continuous operation of equipment. This list shall take into consideration and shall be given in a separate list. The IA reserves the right to buy any or all the recommended spares. The recommended spares parts shall be delivered at the site. The list of recommended spares to be furnished by the Bidder shall also contain the following:

1. Location of each item installed along with reference drawing number.
2. Service life expectancy of each item.
3. Offer validity period

Price of recommended spares will not be used for evaluation of bids. The prices of these spares will remain valid for a period of not less than 120 days after the date on which the validity of main bid expires. Whenever recommended spares

are the same as mandatory spares, then the prices of the mandatory spares and such common recommended spares shall be the same. Further, the prices of any recommended spares shall be subject to review by the IA and shall be finalized after mutual discussions.

13.4. New 11 KV Lines

1.00 Survey

Mapping of route of proposed new 11 kV line by foot survey in rural/urban areas be performed mentioning various milestones. While surveying, existing electrical infrastructure in the locality should also be mapped. Line alignment (single line diagram) on political map with fair correctness, be prepared. SLD and foot survey report shall be approved by IA/IA Representative and shall be used as basic document for assessment of works under the contract. On completion of line work, as built Single Line Diagram and pole wise line diagram showing pole wise materials used and pole-to-pole span should be submitted to IA/IA Representative. This details shall be used as reference documents by Quality Inspecting officials to execute inspection works.

In case of feeder separation, existing agriculture load shall be mapped during survey. A report to be presented indicating location wise pumps to be fed through separate feeder. Percentage voltage regulation at farthest point on various spur sections shall be examined during survey and submitted to IA/IA Representative who will take a decision for feeder separation works.

2.00 Support (pole):

Following types of support are envisaged for 11 KV overhead line:

- a) 8 m/140 kgs PCC Poles - (PCC Pole as per state practice)
- b) 13 m long galvanized H-Beam 152x152 mm, 37.1 kg/mtr
- c) 11 m long galvanized H-Beam 152x152 mm, 37.1 kg/mtr
- d) 11 M/13 M long Steel Tubular poles of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
- e) 9 M long Steel Tubular poles of Designation 540 SP 28 (IS 2713, Pt I, II, III 1980)
- f) 11 m long WPB 160x23.83 kg/m beams
- g) 13 m long WPB 160x23.83 kg/m beams

All poles should be RSJ.

~~Steel tubular poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish. Steel tubular poles and H Beams shall also be painted with 2 or more coats till good surface finish with anti-corrosive paint (in case of tubular poles shall also be painted on the inner walls) which goes in to the foundation. Project Manager shall approved brand and shade of paints.~~

3.00 Fabricated steel items:

Fabricated steel items like V cross arm, top clamp, DC cross arm, bracket, clamps, cross bracings, bracings, strain plate, guarding channels, back clamp, transformer mounting structure etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electrical cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Fabricated steel structure items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

4.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by IA/IA representatives.

5.00 Stay Set:

Galvanized Stay Set with 50x8 mm stay clamp, guy insulator (2Nos.), anchor plate (200x200x6mm) , nut-bolts, 2 Nos turn-buckles, 1.8 m long, 16 mm diameter solid GS stay rod & 7/3.15 mm dia GI stranded wire complete.

Stay set shall be used at all turning locations, conductor dead end supports, double pole structure, triple pole structure, four pole structure to nullify the tension of conductor. Erection of storm guys at suitable location in straight line may also be provided. Erection of storm guys at suitable location in straight line may also be provided.

0.2 cmt cement concreting in mixture 1 part cement, 3 part coarse sand, 6 part 40mm size aggregate stone chips (1:3:6). 2 Nos. guy insulator shall be provided in stranded GI wire at middle location between two turn buckles.

6.00 Earthing:

Following earthing arrangements are envisaged for new 11 kV lines:

- a) 40 mm dia., 3000 mm long GI pipe earth electrode with test link, RCC pit, RCC cover plate on GI frame, bentonite powder and other accessories complete
- b) GI Earthing spike made of 20mm solid rod, Chemical rod earthing using Carbon powder/Bentonite powder / Conductive concrete powder including electrode with 2000mm long, 50 mm diameter GI pipe, GI Strip of 24x3mm minimum. 6 SWG GI wire for earthing and guarding
- c) 8 SWG GI wire for earthing and guarding
- d) Maintenance free type earthing

Each 11 kV line support shall be provided with one GI earthing spike made of 20 mm solid rod or GI Earth Coil and connected with 8 SWG GI wire. Overhead line structure shall be connected to GI earthing spike or GI Earth Coil using 8 SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod. IA shall decide use of GI Earth Coil or 20mm dia GI Solid Rod for individual pole earthing.

At railway crossing, line crossing and other specific locations 40 mm dia, 3000 mm long GI pipe earth electrode with test link, RCC pit, RCC cover plate on GI frame, bentonite powder and other accessories shall be used. Overhead line structure at these locations shall be connected to GI earth pipe using 8 SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 40 mm GI earth pipe.

In rocky soil where getting required earth resistance is a challenge, chemical rod earthing shall be used. Overhead line structure shall be connected to chemical earth electrode using 8SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod.

In road crossings and line crossings, 6 SWG GI wire shall be used for cross lacing and 8 SWG wire shall be used for guard wires.

GI flats and GI wires must be properly dressed, bundled and fixed on supporting structure at 1 to 2 feet intervals.

7.00 Insulator and hardware –

11 KV polymer/porcelain Disc/Pin insulator with suitable hardware fittings shall be used. Insulator should be tied properly using binding wire & tape/helical form fitting. In road crossing and line crossing locations bridling cross arms and pin insulator shall be used.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator should properly be cleaned before installation. No damage/crack insulator should be used.

8.00 ACSR / AAAC Conductors:

Following ACSR Conductors (or equivalent AAAC Conductor) are envisaged for new 11 kV lines:

- a) 6/2.11 + 1/2.11 mm (20 mm² Al. Area) - Squirrel
- b) 6/2.59 + 1/2.59 mm (30 mm² Al. Area) - Weasel
- c) 6/3.35 + 1/3.35 mm (50 mm² Al. Area) - Rabbit
- d) 6/4.09 + 1/4.09 mm (80 mm² Al. Area) - Raccoon
- e) 6/4.72 mm + 7/1.57 mm (100 mm² Al. Area) - Dog

IA shall decide size of conductor on proposed 11 KV line.

Care should be taken while drawing conductor from the drum. Proper roller should be used while handling conductors during erection. Jointing sleeves, binding materials, PG clamps, bi-metallic conductor shall be used for conductor jointing, insulators fixing, jumpering and termination at equipment respectively. There must not be uneven sag between conductor/spans.

Proper sag should be maintained using sag chart table. While tensioning, care should be taken to avoid tension on pin insulator. Therefore, proper alignment of line to be ensured.

At terminal location, care should be taken while connecting two sections to avoid bird faults. Therefore, pin insulator is to be used to handle the conductor on DC cross channel.

9.0011 KV AB Switch:

11 kV, 3-ph, 600 A, 3 Pin type, Vertical/Horizontal Mounting type, Gang Operated, AB Switch shall be installed at cut points and at suitable locations as per instructions of IA/IA Representative. B Class GI pipe shall be used (without any joints) for operation of switch. AB Switch structure and handle must be earthed using 8 SWG GI wire.

10.00 Pole numbering:

Each support pole shall be numbered properly labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words should be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles to site for erection. Base painting and marking of digits should be performed by a skilled and trained painter using branded enamel paint, IA shall approve type and brand of enamel paint. Warning instruction, if any, of availability of two sources of 33 kV supply on same structure, at source structure, at cut points should exclusively be provided as per state practice.

11.00 Anti-climbing device:

3.5 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each 11 kV support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

12.00 Danger board:

Each support shall be provided with a danger board with pole clamps as per approved drawing. Danger board should be in bi-lingual languages (local language and English). Clamp for danger board, nut-bolts and washers shall be painted with two or more coats of red-oxide and aluminium paints respectively till smooth surface before installation.

13.00 Support foundation:

0.5m³ Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40 mm size aggregate stone chips (1:3:6) shall be used in steel tubular poles and H-Beam 11 kV line supports.

In rural areas, PCC pole pit shall be refilled with 200 mm average size of bolder mixed with excavated earth. Proper ramming shall be performed for better compaction. All Double pole (DP), Triple pole (TP), cut point poles, Distribution

Transformer substation poles and poles erected on water logging area shall be grouted using cement concrete mixture similar to H-beams/STP/Wide Parallel Beams . Prior approval of IA/IA Representative shall be obtained for concreting of PCC poles in water logging area. While preparing route survey report, water logging areas shall be earmarked.

While erecting supports (poles), shuttering must be used for concreting so that proper quantity of cement concrete mixture be used and assessed during inspection. During concreting proper compaction by means of mobile vibrator be provided. While starting work of support erection, gang wise shuttering and mobile vibrator shall be offered for inspection to IA/IA Representative. While erecting support, mercury level gauge must be used to ensure vertical erection of support.

250mm dia X 12" inch size muffing shall be provided on H- beams / STP/ Wide Parallel Beams to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

Steel plate shall be used in steel tubular poles and cement concrete reinforced plate shall be used as base plate for PCC poles.

14.00 11 kV line for underground railway crossing –

Two separate composite items of 11 kV line railway crossing is kept in BoQ. One is with 300 sq.mm cable & another one with 185 sq.mm cable.

2 Nos. separate cables shall be laid in separate GI pipe enclosures. At a time, one shall be used and another shall be kept idle as spare in ready to connect condition. Cable termination, cable identification, protective covering, laying of jumpering cable etc shall all be completed in this head. These composite items shall contain following sub-items:

- a) 3Cx185 (3Cx300) sqmm XLPE armored cable (approx. length is 0.3 km each) – 2 sets
- b) 150mm dia GI pipe of A class (red color painted on edges) for cable protection in underground laying – 2 sets
- c) 150mm dia GI pipe of B class (blue color painted on edges) for cable support at DP structure – 2 sets
- d) Outdoor heat shrinkable cable jointing kits for main cable and jumpering cable – 4 Nos for main cable and 8 Nos for jumpering cables.
- e) 11 kV lightening arrestor station class 10kA (6 nos.),
- f) 4 Nos GI 3-meters long pipe earthing,
- g) 6 SWG GI wires with GI nuts, bolts & washers,
- h) Cable markers,
- i) Bi-metallic clamps,
- j) Jumpering with 11 kV Arial Bunched Cables 200 Sqmm dia (10 mtr) etc – 4 sets
- k) Maintenance free type earthing

Detail survey of location of railway crossing be performed by Contractor to avoid multi-crossing at nearby location. Prior railway permission for execution of this work shall be obtained Contractor which necessary technical support shall be provided by Contractor. Line crossing shall be performed using underground cabling. Block on railway traffic shall be arranged by Contractor. Contractor should ensure timely completion of work during block period by mobilizing requisite man, materials and machine at crossing locations.

Horizontal drilling machine shall be used for horizontal bore below railway tracks.

15.00 Quality & Quantity inspection and compliance to the observation:

The line works, before or after commissioning/energisation, shall be inspected by Quality Inspectors and State Inspection Inspectorate. Contractor shall provide all requisite details of line like approved survey report, as built drawings and joint measurement sheet to the inspector to conduct. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

16.00 Tree-cutting/trimming of tree:

The Contractor shall count, mark and put proper numbers with suitable quality of paint at his own cost on all the trees that are to be cut/trim to obtain required tree clearance. Contractor shall pay compensation for any loss or damage for tree cutting due to Contractor's work. Wherever forest clearance is envisaged for execution of work, clearance of forest department for tree cutting, if required, shall be arranged by TKC & shall also be paid by the TKC. Necessary fee if required to pay to Govt. dept. for arranging such clearances shall paid by TKC (which will be reimbursed). However, the IA/IA representatives would require to provide all necessary assistance for execution of this work.

17.00 Statutory clearances:

During execution of 11 KV Line work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

13.5. Distribution Transformer Substations**1.00 Survey of Distribution Transformer Substations:**

A detailed survey of existing habitation shall be performed in presentable document showing population residing in the un-electrified area/existing electrified area of habitation, best location of installation of a new distribution transformer substation and the capacity of transformers to be selected for installation. The capacity of DTR shall be governed by following technical aspects:

- a) Optimistic lengths of LT lines needed to feed the beneficiaries,
- b) Space available for installation of support/transformers,
- c) Probable load expected to come on the transformer due to existing BPL beneficiaries /others connected /un-connected probable beneficiaries in the locality taking care of their expected load growth in next 5 years.
- d) Distribution Transformers of capacity 16 KVA to 315 KVA (single phase as well as three phase) shall be decided as per standard rating of distribution transformer as depicted in IS specifications. Nonstandard ratings of DTR shall not be installed.
- e) Distribution Transformers of capacity 16 KVA to 315 KVA (single phase as well as three phase) shall be installed on double pole structures. Hence, three phase 11 KV lines shall be laid for 16 KVA to 315 KVA (single phase as well as three phase) capacity sub-stations. Single phase lines shall only be permitted for 10 KVA single phase transformers mounted on single pole structure.
- f) Double pole support galvanized steel structures for 16 KVA and 25 KVA distribution transformers shall be designed in such a way that they can be augmented to 63 KVA transformer structures without any addition in near future on technical requirements.

Based on survey report, IA/IA Representative shall decide type, capacity and location of Distribution Transformer sub-station.

2.00 Following types of support are envisaged for 11/0.4 or 11/0.25 KV Distribution Transformer Substation support:

- a) 8 m/140 kgs PCC Poles - (PCC Pole as per state practice) – up to 100 KVA rating only
- b) 13 m long H-Beam 152x152 mm, 37.1 kg/mtr
- c) 11 m long H-Beam 152x152 mm, 37.1 kg/mtr
- d) 11 M long Steel Tubular poles of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
- e) 9 M long Steel Tubular poles of Designation 540 SP 28 (IS 2713, Pt I, II, III 1980)
- f) For DTR Substation up to 63 KVA WPB 160x23.83 kg/m beams of 11 meter or 13meter length
- g) For DTR Substation above 63 KVA up to 315 KVA WPB 160x30.44 kg/m beams of 11 meter or 13meter length

In rural area, IA may use PCC poles are to be used. In urban area, IA may use PCC or H-Beam or STP or Wide Parallel Beam supports of suitable length. In hilly areas where handling of material is a challenge, tubular poles or Wide Parallel Beam GI poles expandable with jointing plaes may be used. In location specific conditions like forest area, vicinity of other existing overhead lines or permanent structures etc, H- beam or tubular poles or Wide Parallel Beam supports may be used of suable length. Steel bottom plate shall be used in steel tubular poles/H-Beam / Wide parallel Beam and cement concrete reinforced plate shall be used as base plate for PCC poles.

PCC supports shall be used for distribution transformer substation up to 100 KVA capacity only. Beyond 100 KVA rating, Galvanized Wide parallel beams 160x30.44 kg/m supports shall be used for mounting of distribution transformer.

Steel tubular poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish. Steel tubular poles and H-Beams shall also be painted with 2 or more coats till good surface finish with anti-corrosive paint (in case of tubular poles shall also be painted on the inner walls) which goes in to the foundation. IA shall approved brand and shade of paints.

3.00 Fabricated steel items:

Fabricated steel items like DC cross arm (100x50x6 mm), back clamps (65x8 mm), pole clamp (65x8 mm), DO mounting channel (100x50x6 mm), transformer mounting channel (100x50x6 mm), transformer clamping set (50x50x6 mm), transformer belting set (50x50x6 mm), V cross arm, top clamp, DC cross arm, bracket, clamps, cross bracings, bracings, strain plate, back clamp, transformer mounting structure etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electric cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The minimum coating of the zinc on steel tubular poles or Wide Parallel Beam supports shall comply with IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Poles and other hollow items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

4.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by IA.

5.00 Stay Set:

Galvanized Stay Set with 50x8 mm stay clamp, guy insulator (2Nos.), anchor plate (200x200x6mm) , nut-bolts, 2 Nos turn-buckles, 1.8 m long, 16 mm diameter solid GS stay rod & 7/3.15 mm dia GI stranded wire complete.

Stay set shall be used at all sub-station location to nullify the tension of conductor/cable/transformer on the supports. 0.2 cmt cement concreting in mixture 1 part cement, 3 part coarse sand and 6 part 40mm size aggregate stone chips (1:3:6) shall be provided in the foundation of the stay set. 2 Nos. guy insulator shall be provided in 7/3.15 mm dia stranded GI wire at middle locations between two turn buckles.

6.00 Distribution Transformer:

Following type and sizes of minimum 3 star rated {as per Bureau of Energy Efficiency (BEE)}, BIS stamped, distribution transformers are standardized in the project:

- a) 5/6 KVA 1 phase Aluminium / Copper wound DTR
- b) 10 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- c) 16 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- d) 25 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- e) 63 KVA 3 phase Aluminium / Copper wound DTR (as per technical specification)
- f) 100 KVA 3 phase Aluminium / Copper wound DTR
- g) 200 KVA 3 phase Aluminium / Copper wound DTR

- h) 250 KVA 3 phase Aluminium / Copper wound DTR
 - i) 315 KVA 3 phase Aluminium / copper wound DTR
- Or any other rating as per latest Indian Standard Specification

3ph/1ph Distribution Transformers shall be 11/0.4 KV or 11KV/230 V or 22/0.44 KV non-sealed type, ~~type-BEE specified minimum 3 Star Distribution Transformers. The transformers shall be~~ double wound, three phase, CRGO or amorphose core type having energy efficiency level 1 as specified in latest IS:1980 (Part-1) 2014 with Amendments 1,2 3 &4.

Distribution Transformers shall be subject to inspection during manufacturing (stage inspection), pre-delivery inspection, and inspection at site during pre-erection/post erection/post commissioning conditions. IA shall select samples from the core laminations and get the same tested in NABL Accredited laboratory to prove the quality of the core material.

The distribution transformers shall be supplied with transformer oil filled up-to maximum permissible level and breather with silica gel.

The distribution transformers must have been successfully type tested within five years from date of Letter of Intent and the designs should have been in satisfactory operation for a period not less than two years as on the date of bid opening. Compliance shall be demonstrated by submitting, (i) authenticated copies of the type test reports and (ii) performance certificates from the users, specifically from Central Govt./State Govt. or their undertakings.

The losses in Distribution Transformer should be as per **Energy Efficiency Level 1 as specified in IS 1180 (Part-1):2014 and amendment 1,2,3 &4** for all kVA ratings of distribution transformers.

Bimetallic connectors of suitable capacities are to be provided on LT side and on HT side of the transformer.

Transformers must be of standard preferred ratings as specified in scope of works.

T-Clamps should be provided on each jumper on bus bars. Line jumpers should be provided with adequate size of PG Clamps (Two numbers PG Clamps at each end of jumper). Clamp should be made of aluminum grade T-1F as per IS-8309 having good electrical quality aluminum material and should not be brittle in nature.

Transformers should be tested for pre-commissioning checks which includes Insulation Resistance Test, ratio test and oil breakdown voltage test. Before formal energisation, oil leakages from the parts of the transformer, oil level in conservator tank, condition of silica gel, earth connection (two separate) between neutral and earthing, proper jointing of earth wires/flats at the joints and earth resistance of the individual earthing pits are to be checked and recorded. On commissioning of the transformer, phase current and phase to phase voltage, phase to neutral voltage are to be recorded. The loading on the transformers should be balanced. The quantum of neutral current flowing through neutral shall be recorded. A record of pre-commissioning checks/tests are to be prepared and submitted to the IA/IA Representative.

7.00 ACSR / AAAC Conductor:

ACSR raccoon conductor (or equivalent AAAC Conductor) is to be used for connection between overhead lines to transformer studs/bushing upto 100 KVA ratings. For transformers having ratings more than 100KVA, higher size of conductors matching with its current carrying rating be used.

8.00 Distribution Box/SMC Distribution Box and Power Cabling:

Distribution Box/SMC Distribution Boxes are to be installed as per specifications enclosed. The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks should be prepared and submitted.

All CT terminals are to be ring type and other terminals are fork type. 2.5 sqmm copper multi stands wiring 1.1 KV grade, ISI marked, IS 694 shall be used for control wiring. A terminal block be provided between CT and Meter keeping 20% spare terminals.

The Distribution Box/SMC Distribution Boxes are to be earthed using 8 SWG GI wire direct connection to the earthing. 2 Nos Earthing bolts on the distribution boards should be provided of 10mm dia.

The single core power cables should be terminated with proper size lugs and gland. Necessary tagging, identification of cores and dressing of cables with nylon cable ties shall be in the scope of work. The unutilized holes in the DBs provided for cable entry needs to be plugged properly in a manner that it must stop access to reptiles, dust and water ingress.

The Low Tension bus bars are to be painted with two or more coats of brush-able epoxy compound suitable to insulate the bus bars for 415 volts exposure.

The Distribution Box/SMC Distribution Box, for transformers upto and including 25 KVA, should also house three phase tri-vector energy meter / single phase meter depending on capacity and type of distribution transformer as per specifications. For higher capacity transformers where CT operated meters are to be installed, separate LTCT cum Meter Box at eye height shall be installed for housing of meter, CTs, terminal block and wiring.

The single core un-armored power cables shall be used for connection from Distribution Transformer to Distribution Box/SMC Distribution Box and Distribution Box/SMC Distribution Box to Outgoing LT lines. Cable should not be used in underground laying arrangement. Cables should be dressed & tied properly using clamps /cable ties at 1 meter intervals and tied with substation structure/poles. At-least one meter cable is to be kept as spare at the individual ends.

Following arrangements shall be made for LT Distribution Transformers and LT Cables:

No	Type of DTR	Incomer		Outgoing	Cable	
		<i>MCB/Isolator</i>	<i>HRC fuse</i>	<i>MCCB</i>	<i>1</i>	<i>2</i>
1	5/6/10 KVA 1 Ph	45A SPN MCCB		2x32A SP MCCB	1Cx16 sqmm UA	
2	16 KVA 1 Ph	80A SPN MCCB		2x50A SP MCCB	1Cx16 sqmm UA	
3	16 KVA 3 Ph	25A TPN MCCB		6x16A SP MCCB	1Cx16 sqmm UA	
4	25 KVA 1 Ph	40A SPN MCCB		3x25A SP MCCB	1Cx35 sqmm UA	
5	25 KVA 3 Ph	40A TPN MCCB		6x25A SP MCCB	1Cx35 sqmm UA	
6	63 KVA 3	200A TPN Isolator	100 A	6x60A SP MCCB	1Cx50/70	1Cx70 sqmm

	Ph				sqmm UA	UA
7	100 KVA 3 Ph	200A TPN Isolator	160 A	6x90A SP MCCB	1Cx50/70 sqmm UA	1Cx150 sqmm UA
8	200 KVA 3 Ph	600A TPN Isolator	315 A	9x120A SP MCCB	1Cx150 sqmm UA	1Cx300 sqmm UA
9	315 KVA 3 Ph	600A TPN Isolator	500 A	12X120A SP MCCB	1CX150 sqmm UA	1CX300 sqmm UA

1.1 KV XLPE Aluminium Conductor, Stranded, un-armored cable be used for connection of transformer LV bushing to Distribution Box/SMC Distribution Box and Distribution Box/SMC Distribution Box to overhead line.

9.00 Earthing:

Distribution Transformer Earthing shall be provided with 3 Nos earthing and making earth mat /risers using 50X6mm GI Flat. Earthing should be provided with GI earth pipe or Chemical Earthing depending of strata of soil in the location. IA shall decide the type of earthing.

25x3mm GI Flat and 8 SWG GI shall be used for making earthing connection to various sub-station equipment as per given details. GI Flat and GI wire shall be properly dressed, bunched and clamped with the support at 2 feet intervals. An overlapping of 35mm shall be used at the place of flat to flat joint. Two sets of GI nuts, bolts and washers shall be used for flat-to-flat joints. GI nuts, bolts and washers must be used for GI Flat-to-GI wire & GI wire-to-GI wire joints.

Substation wise measurement of earth resistance of earth pits / mesh and corresponding drawing of existing earthing arrangement shall be recorded and submitted to IA.

Description of equipment	Earth connection
Earthing pits	3 Nos. Earth Pipe 3 m long, 40 mm dia or Chemical Earthing
Earth mat and riser	50X6 mm GI Flat / 8 SWG GI wire
Laying of earth mat	Below ground 0.5 meter

Standard requirements of earthing shall be as under:

- Earth Pit – 1 for Transformer Neutral,
- Earth pit - 2 for Lightning Arrester,
- Earth pit – 3 for Equipment body earthing.
- Maintenance free earthing

Following arrangement is envisaged for various equipment of distribution transformer substation:

- Transformer Neutral (Two distinct connections) : GS Flat 25X3mm
- Transformer Body : GS Flat 25X3mm
- Lightning Arrester : GS Flat 25X3mm
- Fencing (Wherever required) : GI wire 8 SWG
- LT Distribution Box/SMC Distribution Box (Two distinct connections) : GI wire 8 SWG
- AB Switch handle : GI wire 8 SWG

- g) Steel structure of substation
- h) Line meters

: GI wire 8 SWG
: GS wire 8 SWG

The location of earth pits should be at-least 3m apart, so that their earth conductive areas do not overlap. In rocky soil where getting required earth resistance is a challenge, chemical rod earthing shall be used in place of normal GI pipe type earthing. IA shall decide type of earthing pits.

10.00 Insulator and hardware:

11 KV polymer/porcelain Disc/Pin insulator with suitable hardware fittings shall be used. Insulator should be tied properly using binding wire/helical form fitting. Bi-metallic clamps must be used at terminals.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator should properly be cleaned before installation. No damage/crack insulator should be used.

11.00 Substation numbering:

Each Substation should be numbered properly labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words should be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles to site for erection. Base painting and marking of digits should be performed by a skilled and trained painter using branded enamel paint, IA shall approve type and brand of enamel paint.

12.00 Anti-climbing device:

3.5 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each sub-station support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

13.00 Danger board:

Each support should be provided with a danger board with pole clamps as per approved drawing. Danger board should be in bi-lingual languages (local language and English). Clamp for danger board, nut-bolts and washers shall be painted with two or more coats of red-oxide and aluminium paints respectively till smooth surface before installation.

14.00 Support foundation:

0.5 m³ Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40 mm size aggregate stone chips (1:3:6) shall be used in PCC Pole, steel tubular poles and H-Beam support foundation.

While erecting supports (poles), shuttering must be used for concreting so that proper quantity of cement concrete mixture be used and assessed during inspection. During concreting proper compaction by means of mobile vibrator be provided. While starting work of support erection, gang wise shuttering and mobile vibrator shall be offered for inspection to IA/IA Representative. While erecting support, mercury level gauge must be used to ensure vertical erection of support.

250mm dia X 12" inch size muffing shall be provided on steel tubular and H-Beam poles to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

Steel plate shall be used in steel tubular poles and cement concrete reinforced plate shall be used as base plate for PCC poles.

15.00 11 KV AB Switch:

11 kV, 3-ph, 200 A, 3 Pin type, Horizontal/Vertical Mounting type, Gang Operated, AB Switch shall be installed on 100 KVA and more capacity distribution transformer substation only. B Class GI pipe shall be used (without any joints) for operation of switch. AB Switch structure and handle must be earthed using 8 SWG GI wire.

16.00 11 KV Drop Out Fuses:

11 kV, 3-ph, Drop Out fuse units (set of 3 units) along with Support Insulators, Base Channel, fuse barrel etc. shall be used for all capacity Distribution Transformer Substations. DO Fuse structure shall be earthed using 8 SWG GI wire.

17.00 Lighting Arrester:

Distribution Class LAs on each phase shall be provided in the sub-station with base steel structure, terminals bi – metallic connectors / PG clamps and earth connectors. LAs are to be connected with separate earth connection. 25x3 mm GI flat shall be used for earth connection.

13.6. New LT Line

1. Survey:

Mapping of route of proposed new LT line by foot survey in rural/urban areas be performed mentioning various milestones. While surveying, existing electrical infrastructure in the locality should also be mapped. Line alignment (single line diagram) on political map with fair correctness, be prepared. SLD and foot survey report shall be approved by IA/IA Representative and shall be used as basic document for assessment of works under the contract. On completion of line work, as built Single Line Diagram and pole wise line diagram showing pole wise materials used and pole-to-pole span should be submitted to IA/IA Representative. This details shall be used as reference documents by Quality & Quantity Inspecting officials to execute inspection works.

2. The LT line between distribution transformer and consumers shall be on LT Areal Bunched cables.

3. Support for LT overhead Line:

- a) 8 M/140 kgs PCC Poles (PCC Pole as per state practice)
- b) 11 M long galvanized H-Beam 152x152 mm, 37.1kg/mtr
- c) 11 M long Steel Tubular poles of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
- d) 9 M long Steel Tubular poles of Designation 540 SP 28 (IS 2713, Pt I, II, III 1980)
- e) 11 m Parallel Flanged beams WPB 160x23.83 kg/m for hilly and urban areas

In rural area, IA may use PCC poles are to be used. In urban area, IA may use PCC or H-Beam or STP or Wide Parallel Beam supports are to be used of suitable length. In hilly areas where handling of material is a challenge, tubular poles or Wide Parallel Beam GI poles expandable with jointing plates may be used. In location specific conditions like forest area, vicinity of other existing overhead lines or permanent structures etc, H- beam or tubular poles or Wide Parallel Beam supports may be used of suitable length. Steel bottom plate shall be used in steel tubular poles/H-Beam / Wide parallel Beam and cement concrete reinforced plate shall be used as base plate for PCC poles. Steel tubular poles shall be cleaned till good surface finish and painted with 2 or more coats of red oxide paint and 2 or more coats of aluminium paint till good finish. Steel tubular poles and H-Beams shall also be painted with 2 or more coats till good surface finish with anti-corrosive paint (in case of tubular poles shall also be painted on the inner walls) which goes in to the foundation. IA/IA Representative shall approved brand and shade of paints.

4. Fabricated steel items:

Fabricated steel items like clamps, stay clamp, etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electrical cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Fabricated steel structure items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

5. Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure wherever required.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by IA/IA Representative.

6. Galvanized Stay Set with 50x8 mm stay clamp, guy insulator (1 No.), anchor plate (200x200x6mm), nut-bolts, 2 Nos turn-buckles, 1.8 m long, 16 mm diameter solid GS stay rod shall be used with 7/3.15 mm dia GI stranded wire.

Stay set shall be used at all turning locations, cable dead end locations to nullify the tension of the cable. Erection of storm guys at suitable location in straight line may also be provided. Erection of storm guys at suitable location in straight line may also be provided.

0.2 cmt cement concreting in mixture 1 part cement, 3 part coarse sand, 6 part 40mm size aggregate stone chips (1:3:6). 2 Nos. guy insulator shall be provided in stranded GI wire at middle location between two turn buckles.

7. Following earthing arrangements are envisaged for new LT lines:

- 7.1.1. 40 mm dia., 3000 mm long GI pipe earth electrode with test link, RCC pit, RCC cover plate on GI frame, bentonite powder and other accessories complete
- 7.1.2. GI Earthing spike made of 20mm solid rod or 8 SWG, 50 turns earthing coil
- 7.1.3. Chemical rod earthing using Carbon powder/Bentonite powder / Conductive concrete powder including electrode with 2000mm long, 50 mm diameter GI pipe, GI Strip of 24x3mm minimum. 8 SWG GI wire for earthing and guarding

Every sixth LT line support shall be provided with one GI earthing spike made of 20 mm solid rod or GI Earth Coil and connected with 8 SWG GI wire. Overhead steel items shall be connected to GI earthing spike or GI Earth Coil using 8 SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod. IA shall decide use of GI Earth Coil or 20mm dia GI Solid Rod for individual pole earthing.

In rocky soil where getting required earth resistance is a challenge, chemical rod earthing shall be used. Overhead line structure shall be connected to chemical earth electrode using 8SWG GI wire. GI nuts, bolts & washers shall be used to join two GI wires and 20 mm solid spike rod.

GI wires must be properly dressed and fixed on supporting structure at 1 to 2 feet intervals.

8. LT line shall form following areal bunched XLPE cables:

8.01	1X16 (Ph) + 1X25 (bare messenger cum neutral) SQ. MM.
8.02	1X16 (Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting)SQ. MM.
8.03	3X16(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
8.04	3 X 16(Ph) +1x25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
8.05	1X25(Ph)+1x25 (bare messenger cum neutral) SQ. MM.
8.06	1X25(Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
8.07	3X25(Ph)+1X25 (bare messenger cum neutral) SQ. MM.

8.08	3 X 25(Ph) +1x25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
8.09	1X35(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
8.10	1x35(Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
8.11	3X35(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
8.12	3X35 (Ph) + 1x25 (bare messenger cum neutral)+ 1x16 (insulated Street lighting) SQ. MM.
8.13	3X50(Ph)+1X35 (bare messenger cum neutral) SQ. MM.
8.14	3X50 (Ph)+1x35 (bare messenger cum neutral) +1x16 (insulated Street lighting) SQ. MM.
8.15	3X95(Ph)+1X70 (bare messenger cum neutral) SQ. MM.
8.16	3X95(Ph)+1X70 (bare messenger cum neutral) +1x16 (insulated Street lighting) SQ. MM.

9. Distribution Box/SMC Distribution Box:

Single phase or three phase Distribution Box/SMC Distribution Box/SMC Distribution Box/SMC Distribution Box shall be provided for extending power supply to LT consumers. Distribution Box/SMC Distribution Box (DB) shall be mounted on LT pole with galvanized MS clamp of 40x3 mm size. DB shall be earthed using 8 SWG GI wire.

Single phase DB shall be suited for two core 25 sqmm aluminium conductor cable as incomer and 8 nos. two core 10 sqmm conductor cables as outgoing cables. Three phase DB shall be suited for four core 35 sqmm aluminium conductor cable as incomer and 4 nos. four core 16 sqmm conductor cables as outgoing cables.

The Distribution Box/SMC Distribution Box shall be installed only at locations where BPL connections are provided.

10. Connection from ABC cable:

2Cx25 sqmm **stranded** cable or 4Cx35 sqmm **stranded** cable shall be used between LT line and Distribution Box/SMC Distribution Box. T-connector shall be used at LT line for tapping. While tapping connection from ABC cable, highly skilled lineman/wireman shall be deployed along with sophisticated cutting plier/tool so that no damage should result in ABC cable conductor. T-connector should be crimped properly for resistance free/maintenance free electric connection. Alternately, piercing type connector may be used for tapping of LT connection from ABC cable conductor.

11. Distribution Box/SMC Distribution Box Pole numbering:

Each support pole should be numbered properly labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words should be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles to site for erection. Base painting and marking of digits should be performed by a skilled and trained painter using branded enamel paint, IA shall approve type and brand of enamel paint.

12. Anti-climbing device:

3.5 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each LT line support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

13. Danger board:

Each support should be provided with a danger board with pole clamps as per approved drawing. Danger board should be in bi-lingual languages (local language and English). Clamp for danger board, nut-bolts and washers shall be painted with two or more coats of red-oxide and aluminium paints respectively till smooth surface before installation.

14. Support foundation:

Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40 mm size aggregate stone chips (1:3:6) shall be used in steel tubular poles and H-Beam LT line supports and wide parallel beam supports.

In rural areas, PCC pole pit shall be refilled with 200 mm average size of bolder mixed with excavated earth. Proper ramming shall be performed for better compaction. PCC pole at cut point and PCC poles erected on water logging area shall be grouted using cement concrete mixture similar to H-Beam & Tubular poles. Prior approval of IA shall be obtained for concreting of PCC poles in water logging area. While preparing route survey report, water logging areas shall be earmarked.

While erecting supports (poles), shuttering must be used for concreting so that proper quantity of cement concrete mixture be used and assessed during inspection. During concreting proper compaction by means of mobile vibrator be provided. While starting work of support erection, gang wise shuttering and mobile vibrator shall be offered for inspection to IA/IA Representative. While erecting support, mercury level gauge must be used to ensure vertical erection of support.

250mm dia X 12" inch size muffing shall be provided on steel tubular and H-Beam poles to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

Steel plate shall be used in steel tubular poles and cement concrete reinforced plate shall be used as base plate for PCC poles.

15. Quality & Quantity inspection and compliance to the observation:

The line works, before or after commissioning/energisation, shall be inspected by Quality Inspectors and State Inspection Inspectorate. Contractor shall provide all requisite details of line like approved survey report, as built drawings and joint measurement sheet to the inspector to conduct. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

16. Tree-cutting/trimming of tree:

The Contractor shall count, mark and put proper numbers with suitable quality of paint at his own cost on all the trees that are to be cut/trim to obtain required tree clearance. Contractor shall pay compensation for any loss or damage for tree cutting due to Contractor's work. Wherever forest clearance is envisaged for execution of work, clearance of forest department for tree cutting, if required, shall be arranged by the Contractor and compensation shall also be paid by the

TKC. Necessary fee if required to pay to Govt. dept. for arranging such clearances shall paid by TKC. However, the IA would require to provide all necessary assistance for execution of this work.

17. Statutory clearances:

During execution of LT Line works, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance etc.

18. The earthing point of distribution transformer should be extended to the single phase beneficiary premises having en-route earth connection at every 6th supports. The earth conductor is to be connected with earth point provided in the premises of single phase consumers. The bearer wire shall be earthed at every sixth pole.

19. Bearer wire of LT AB cable shall be anchored through eyehook or dead end (anchor) clamps.

20. Extra length of continuous AB cable along with messenger / bearer wire shall be properly dressed and clamped.

13.7. Augmentation and Renovation

1. 33/11 kV substation augmentation

Following types of augmentation works are envisaged in 33/11 kV substation:

- a. Installation of additional 3.15 MVA Transformer with two additional bay on 11 KV side.
- b. Installation of additional 5 MVA Transformer with two additional bay on 11 KV side.
- c. Installation of additional 6.3 MVA Transformer with three additional bay on 11 KV side.
- d. Installation of additional 8 MVA Transformer with four additional bay on 11 KV side.
- e. Installation of additional 10 MVA Transformer with four additional bay on 11 KV side.
- f. 11 KV out-door yard extension for additional bay H-beam structure.
- g. 11 KV out-door yard extension for additional bay by providing PCC support (pole).
- h. 33 KV out-door yard extension for additional bay by providing H-beam structure.
- i. Installation of 33 KV VCB for 1.6 MVA, 3.15 MVA, 5.0 MVA Transformer.
- j. Augmentation of Power Transformer without additional bay on 11 KV side 1.65 MVA to 3.15 MVA.
- k. Augmentation of Power Transformer without additional bay on 11 KV side 3.15 MVA to 5.0 MVA.
- l. Augmentation of Power Transformer without additional bay on 11 KV side 5.00 MVA to 8.0 MVA.
- m. Augmentation of Power Transformer without additional bay on 11 KV side with old transformer 1.6 MVA to 3.15 MVA.
- n. Augmentation of Power Transformer without additional bay on 11 KV side with old transformer 3.15 MVA to 5.0 MVA.
- o. Augmentation of Power Transformer using old transformer with 2 no. additional bay on 11 KV side 1.6 MVA to 3.15 MVA.
- p. Augmentation of Power Transformer using old transformer with 2 no. additional bay on 11 KV side 3.15 MVA to 5.0 MVA.
- q. Augmentation of Power Transformer with 2 no. additional bay on 11 KV side 1.6 MVA to 3.15 MVA.
- r. Augmentation of Power Transformer with 2 no. additional bay on 11 KV side 3.15 MVA to 5.0 MVA.

- s. Augmentation of Power Transformer with 2 no. additional bay on 11 KV side 5.00 MVA to 8.0 MVA.
- t. Capacitor Bank 600 KVAR - Fixed type.
- u. Capacitor Bank 1200 KVAR - Auto type.
- v. Capacitor Bank 1500 KVAR - Auto type.
- w. Revamping of 33/11 kV substation earth mat.

Above list is of various options of substation renovation/augmentation. The list of works is indicative. IA shall provide location wise exact details of works to be executed on existing substation. Accordingly, various BoQ items (extracted from items of new 33/11 kV substations) shall be utilized. Item-wise scope of works under new 33/11 kV substations is detailed out under scope of new substation. It shall be utilized on item to item requirement under renovation/augmentation of 33/11 kV substation also. Under this head, only damaged/defective items with approval of IA/IA Representative shall be replaced by good ones. All removed defective/damaged items and good replaced power transformers received should be returned to MSEDCL stores within a time limit decided by the IA in the same condition as replaced.

2. Renovation/Augmentation of 33 kV line

- 1.00 Augmentation of 3 phase 33 kV line using additional supports matching with length and type of existing support is envisaged on following type of supports:
 - i. 9.1 meter long /280 KG PCC Poles (PCC Pole as per state practice)
 - ii. 11 m or 13 m long H-Beam 152x152 mm 37.1 kg/m
 - iii. 11 M long steel Tubular poles with welded steel base plate of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
 - iv. 13 M long steel Tubular poles with welded steel base plate of Designation 540 SP 72 (IS 2713, Pt I, II, III 1980)
- 2.00 Augmentation of existing conductor with following type of new ACSR conductor including jointing sleeves, binding materials and helical formed fittings etc as required are envisaged under this work-
 - i. 6/4.72 mm+7/1.57 mm (100 mm² Al. Area) - Dog replacing existing raccoon conductor
 - ii. 6/4.09 + 1/4.09 mm (80 mm² Al. Area) - Raccoon replacing existing rabbit/weasel conductor
 - iii. 30/2.59 + 7/2.59 mm (150 mm² Al. Area) - Wolf replacing existing dog/raccoon conductor
 - iv. 30/3.00 + 7/3.00 mm (200 mm² Al. Area) - Panther replacing existing dog/raccoon/wolf conductor
- 3.00 While executing this work, mid span pole with all fittings may be provided matching with existing poles of the line.
- 4.00 Following works shall also be executed by Contractor under this head –
 - a. Replacement of damaged insulators
 - b. Straightening of tilted supports by providing additional foundation or by providing boulders etc as required.
 - c. Revamping of pole earthing and replacement of GI earth wire.
 - d. Labelling, providing danger board, providing anti climbing device and painting of all the poles shall be in the scope of work
 - e. Replacement of damaged/bent V-cross arms & top clamps with new ones
 - f. Providing of stay set wherever required
 - g. Providing of guarding wherever required
 - h. Removal of old conductor in coil form, removal of old steel structure, removal of old conductor fittings, removal of any other worn out/defective material and deposit them in MSEDCL store within a reasonable time as decided by IA.

Item-wise scope of works under renovation/augmentation of 33 kV line is detailed out under scope of new 33 kV line. It shall be utilized on item to item requirement under renovation/augmentation of 33 kV line also.

3. Renovation/Augmentation of 11 kV line

- 1.00 Augmentation of 3 phase 11 kV line using additional supports matching with length and type of existing support is envisaged on following type of supports:
 - a. 8 meter long /140 KG PCC Poles (PCC Pole as per state practice)
 - b. 9 m or 11 m or 13 m long H-Beam 152x152 mm 37.1 kg/m
 - c. 11 M long steel Tubular poles with welded steel base plate of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
 - d. 13 M long steel Tubular poles with welded steel base plate of Designation 540 SP 72 (IS 2713, Pt I, II, III 1980)
- 2.00 Augmentation of existing conductor with following type of new ACSR conductor including jointing sleeves, binding materials and helical formed fittings etc as required are envisaged under this work-
 - a. 6/3.35 + 1/3.35 mm (50 mm² Al. Area) - Rabbit by replacing existing weasel/squirrel conductor
 - b. 6/4.09 + 1/4.09 mm (80 mm² Al. Area) - Raccoon by replacing existing rabbit/weasel/squirrel conductor
 - c. 6/4.72 mm+7/1.57 mm (100 mm² Al. Area) - Dog by replacing existing raccoon/rabbit conductor
- 3.00 While executing this work, mid span pole with all fittings may be provided matching with existing poles of the line.
- 4.00 Following works shall also be executed by Contractor under this head –
 - a. Replacement of damaged insulators
 - b. Straightening of tilted supports by providing additional foundation or by providing boulders etc as required.
 - c. Revamping of pole earthing and replacement of GI earth wire.
 - d. Labelling, providing danger board, providing anti climbing device and painting of all the poles shall be in the scope of work
 - e. Replacement of damaged/bent V-cross arms & top clamps with new ones
 - f. Providing of stay set wherever required
 - g. Providing of guarding wherever required
 - h. Removal of old conductor in coil form, removal of old steel structure, removal of old conductor fittings, removal of any other worn out/defective material and deposit them in MSEDCL store within a reasonable time as decided by IA.

Item-wise scope of works under renovation/augmentation of 11 kV line is detailed out under scope of new 11 kV line. It shall be utilized on item to item requirement under renovation/augmentation of 11 kV line also.

4. R & M and augmentation of Distribution Transformer Substations

- 1.00 Survey of Distribution Transformer Substations:

A detailed survey of overloaded Distribution Transformer substation shall be performed. Existing electrical connected loading and habitation shall be surveyed and a presentable document showing population residing in the un-electrified area/existing electrified area of habitation shall be performed. Based on survey, best option for augmentation of distribution transformer substation and the capacity of new transformer shall be decided. The capacity of augmented DTR shall be governed by following technical aspects:

- a) Optimistic lengths of LT lines needed to feed the existing consumers, existing un-connected consumers and future growth in electrical loading,
- b) Space available for installation of support/transformers,
- c) Probable load expected to come on the transformer due to existing BPL beneficiaries /others connected /un-connected probable beneficiaries in the locality taking care of their expected load growth in next 5 years.
- d) Distribution Transformers of capacity 16 KVA to 315 KVA (single phase as well as three phase) shall be decided as per standard rating of distribution transformer as depicted in IS specifications. Nonstandard ratings of DTR shall not be installed.
- e) Distribution Transformers of capacity 16 KVA to 315 KVA (single phase as well as three phase) shall be installed on existing structures/plinth.

Based on survey report, IA/IA Representative shall decide type, capacity and location of Distribution Transformer sub-station for augmentation/R&M works.

2.00 Following types of works are envisaged for Distribution Transformer sub-station for augmentation/R&M works:

- a. Replacement of defective materials of DTR substations
- b. Re-erection/re-concreting of substation supports
- c. Dismantling of defective/worn-out steel structure materials, 11 kV/LT equipment like Lightning Arrester, DO Fuse, Distribution Box/SMC Distribution Box, LT cable, jumpering conductor, terminal clamps, insulators etc as required. Shifting of dismantled material to MSEDCL store within reasonable period of time.
- d. Installation of stay set for strengthening of DTR substation structure.
- e. Topping up of new and filtered transformer oil wherever required.
- f. De-moisturizing of silica gel, filling of transformer oil in silica gel breather.
- g. Providing new DTR substation equipment like steel structure materials, 11 kV/LT equipment like Lightning Arrester, DO Fuse, Distribution Box/SMC Distribution Box, LT cable, jumpering conductor, terminal clamps, insulators etc
- h. Renovation of DTR substation earthing by providing new earth pits, inter connection of earth pits and their connection to various equipment
- i. Cleaning of metallic structure items by rubbing through emery paper and re-painting using two coats of red oxide paint and two coats of aluminium oxide paints of reputed type and make as approved by IA using painting brush.

3.00 Fabricated steel items:

Fabricated steel items like DC cross arm (100x50x6 mm), back clamps (65x8 mm), pole clamp (65x8 mm), DO mounting channel (100x50x6 mm), transformer mounting channel (100x50x6 mm), transformer clamping set (50x50x6 mm), transformer belting set (50x50x6 mm), V cross arm, top clamp, DC cross arm, bracket, clamps, cross bracings, bracings, strain plate, back clamp, transformer mounting structure etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electric cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Fabricated steel structure items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

4.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by IA.

5.00 Stay Set:

Galvanized Stay Set with 50x8 mm stay clamp, guy insulator (2Nos.), anchor plate (200x200x6mm) , nut-bolts, 2 Nos turn-buckles, 1.8 m long, 16 mm diameter solid GS stay rod & 7/3.15 mm dia GI stranded wire complete.

Stay set shall be used at all sub-station location to nullify the tension of conductor/cable/transformer on the supports. 0.2 cmt cement concreting in mixture 1 part cement, 3 part coarse sand and 6 part 40mm size aggregate stone chips (1:3:6) shall be provided in the foundation of the stay set. 2 Nos. guy insulator shall be provided in 7/3.15 mm dia stranded GI wire at middle locations between two turn buckles.

6.00 Distribution Transformer:

Following type and sizes of Energy efficiency Level 1 rated DT as per IS 1980 (Part-1) 2014 with Amendments 1, 2, 3, & 4. , distribution transformers are standardized in the project for augmentation. (if not mentioned in technical specifications).

- a) 5/6 KVA 1 phase Aluminium / Copper wound DTR
- b) 10 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- c) 16 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- d) 25 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- e) 63 KVA 3 phase Aluminium / Copper wound DTR
- f) 100 KVA 3 phase Aluminium / Copper wound DTR
- g) 200 KVA 3 phase Aluminium / Copper wound DTR
- h) 250 KVA 3 phase Aluminium / Copper wound DTR
- i) 315 KVA 3 phase Aluminium / copper wound DTR

Or any other rating as per latest Indian Standard Specification

3ph/1ph Distribution Transformers shall be 11/0.4 KV or 11KV/230 V or 22/0.44 KV non-sealed type, ~~type-BEE specified minimum 3 Star Distribution Transformers. The transformers shall be~~ double wound, three phase, CRGO or amorphose core type having energy efficiency level 1 as specified in latest IS:1980 (Part-1) 2014 with Amendments 1,2 3 &4(if not mentioned in technical specifications) .

Distribution Transformers shall be subject to inspection during manufacturing (stage inspection), pre-delivery inspection, and inspection at site during pre-erection/post erection/post commissioning conditions. IA shall select samples from the core laminations and get the same tested in NABL Accredited laboratory to prove the quality of the core material.

The new distribution transformers shall be supplied with transformer oil filled up-to maximum permissible level and breather with silica gel.

The distribution transformers must have been successfully type tested within five years from date of Letter of Intent and the designs should have been in satisfactory operation for a period not less than two years as on the date of bid opening. Compliance shall be demonstrated by submitting, (i) authenticated copies of the type test reports and (ii) performance certificates from the users, specifically from Central Govt./State Govt. or their undertakings.

.The losses in Distribution Transformer should be as per **Energy Efficiency Level 1 as specified in IS 1180 (Part-1):2014 and amendment 1,2,3 &4** for all kVA ratings of distribution transformers.

Bimetallic connectors of suitable capacities are to be provided on LT side and on HT side of the transformer.

T-Clamps should be provided on each jumper on bus bars. Line jumpers should be provided with adequate size of PG Clamps (Two numbers PG Clamps at each end of jumper). Clamp should be made of aluminum grade T-1F as per IS-8309 having good electrical quality aluminum material and should not be brittle in nature.

Transformers should be tested for pre-commissioning checks which includes Insulation Resistance Test, ratio test and oil breakdown voltage test. Before formal energisation, oil leakages from the parts of the transformer, oil level in conservator tank, condition of silica gel, earth connection (two separate) between neutral and earthing, proper jointing of earth wires/flats at the joints and earth resistance of the individual earthing pits are to be checked and recorded. On commissioning of the transformer, phase current and phase to phase voltage, phase to neutral voltage are to be recorded. The loading on the transformers should be balanced. The quantum of neutral current flowing through neutral shall be recorded. A record of pre-commissioning checks/tests are to be prepared and submitted to the IA/IA Representative.

7.00 ACSR / AAAC Conductor:

ACSR raccoon conductor (or equivalent AAAC conductor) is to be used for connection between overhead lines to transformer studs/bushing.

8.00 Distribution Box/SMC Distribution Box and Power Cabling:

Distribution Box/SMC Distribution Boxes are to be installed as per specifications enclosed. The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks should be prepared and submitted.

All CT terminals are to be ring type and other terminals are fork type. 2.5 sqmm copper multi stands wiring 1.1 KV grade, ISI marked, IS 694 shall be used for control wiring. A terminal block be provided between CT and Meter keeping 20% spare terminals.

The Distribution Box/SMC Distribution Boxes are to be earthed using 8 SWG GI wire direct connection to the earthing. 2 Nos Earthing bolts on the distribution boards should be provided of 10mm dia.

The single core power cables should be terminated with proper size lugs and gland. Necessary tagging, identification of cores and dressing of cables with nylon cable ties shall be in the scope of work. The unutilized holes in the DBs provided for cable entry needs to be plugged properly in a manner that it must stop access to reptiles, dust and water ingress.

The Low Tension bus bars are to be painted with two or more coats of brush-able epoxy compound suitable to insulate the bus bars for 415 volts exposure.

The Distribution Box/SMC Distribution Box 16 KVA should also house three phase tri-vector energy meter / single phase meter depending on capacity and type of distribution transformer as per specifications.

For higher capacity transformers where CT operated meters are to be installed, separate LTCT cum Meter Box at eye height shall be installed for housing of meter, CTs, terminal block and wiring.

The single core un-armored power cables shall be used for connection from Distribution Transformer to Distribution Box/SMC Distribution Box and Distribution Box/SMC Distribution Box to Outgoing LT lines. Cable should not be used in underground laying arrangement. Cables should be dressed & tied properly using clamps /cable ties at 1 meter intervals and tied with substation structure/poles. At-least one meter cable is to be kept as spare at the individual ends.

Following arrangements shall be made for LT Distribution Transformers and LT Cables:

No	Type of DTR	Incomer		Outgoing	Cable	
		<i>MCB/Isolator</i>	<i>HRC fuse</i>	<i>MCCB</i>	<i>1</i>	<i>2</i>
1	5/6/10 KVA 1 Ph	45A SPN MCCB		2x32A SP MCCB	1Cx16 sqmm UA	
2	16 KVA 1 Ph	80A SPN MCCB		2x50A SP MCCB	1Cx16 sqmm UA	
3	16 KVA 3 Ph	25A TPN MCCB		6x16A SP MCCB	1Cx16 sqmm UA	
4	25 KVA 1 Ph	40A SPN MCCB		3x25A SP MCCB	1Cx35 sqmm UA	
5	25 KVA 3 Ph	40A TPN MCCB		6x25A SP MCCB	1Cx35 sqmm UA	
6	63 KVA 3 Ph	200A TPN Isolator	100 A	6x60A SP MCCB	1Cx50/70 sqmm UA	1Cx70 sqmm UA
7	100 KVA 3 Ph	200A TPN Isolator	160 A	6x90A SP MCCB	1Cx50/70 sqmm UA	1Cx150 sqmm UA
8	200 KVA 3 Ph	600A TPN Isolator	315 A	9x120A SP MCCB	1Cx150 sqmm UA	1Cx300 sqmm UA
9	315 KVA 3 Ph	600A TPN Isolator	500 A	12X120A SP MCCB	1CX150 sqmm UA	1CX300 sqmm UA

1.1 KV XLPE Aluminium Conductor, Stranded, un-armored cable be used for connection of transformer LV bushing to Distribution Box/SMC Distribution Box and Distribution Box/SMC Distribution Box to overhead line.

9.00 Earthing:

Distribution Transformer Earthing shall be provided with 3 Nos earthing and making earth mat /risers using 50X6mm GI Flat. Earthing should be provided with GI earth pipe or Chemical Earthing depending of strata of soil in the location. IA shall decide the type of earthing.

25x3mm GI Flat and 8 SWG GI shall be used for making earthing connection to various sub-station equipment as per given details. GI Flat and GI wire shall be properly dressed, bunched and clamped with the support at 2 feet intervals. An overlapping of 35mm shall be used at the place of flat to flat joint. Two sets of GI nuts, bolts and washers shall be used for flat-to-flat joints. GI nuts, bolts and washers must be used for GI Flat-to-GI wire & GI wire-to-GI wire joints.

Substation wise measurement of earth resistance of earth pits / mesh and corresponding drawing of existing earthing arrangement shall be recorded and submitted to IA/IA Representative.

Description of equipment	Earth connection
Earthing pits	3 Nos. Earth Pipe 3 m long, 40 mm dia or Chemical Earthing
Earth mat and riser	50X6 mm GI Flat / 8 SWG GI wire
Laying of earth mat	Below ground 0.5 meter

Standard requirements of earthing shall be as under:

- Earth Pit – 1 for Transformer Neutral,
- Earth pit - 2 for Lightning Arrester,
- Earth pit – 3 for Equipment body earthing.

Following arrangement is envisaged for various equipment of distribution transformer substation:

- Transformer Neutral (Two distinct connections) : GS Flat 25X3mm
- Transformer Body : GS Flat 25X3mm
- Lightning Arrester : GS Flat 25X3mm
- Fencing (Wherever required) : GI wire 8 SWG
- LT Distribution Box/SMC Distribution Box (Two distinct connections) : GI wire 8 SWG
- AB Switch handle : GI wire 8 SWG
- Steel structure of substation : GI wire 8 SWG
- Line meters : GS wire 8 SWG

The location of earth pits should be at-least 3m apart, so that they their earth conductive areas do not overlap. In rocky soil where getting required earth resistance is a challenge, chemical rod earthing shall be used in place of normal GI pipe type earthing. IA shall decide type of earthing pits.

10.00 Insulator and hardware:

11 KV polymer/porcelain Disc/Pin insulator with suitable hardware fittings shall be used. Insulator should be tied properly using binding wire/helical form fitting. Bi-metallic clamps must be used at terminals.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator should properly be cleaned before installation. No damage/crack insulator should be used.

11.00 Substation numbering:

Each Substation should be numbered properly labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words should be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles to site for erection. Base painting and marking of digits should be performed by a skilled and trained painter using branded enamel paint, IA shall approve type and brand of enamel paint.

12.00 Anti-climbing device:

3.5 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each sub-station support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

13.00 Danger board:

Each support should be provided with a danger board with pole clamps as per approved drawing. Danger board should be in bi-lingual languages (local language and English). Clamp for danger board, nut-bolts and washers shall be painted with two or more coats of red-oxide and aluminium paints respectively till smooth surface before installation.

14.00 Support foundation:

Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40 mm size aggregate stone chips (1:3:6) shall be used in PCC Pole, steel tubular poles, WPB Poles and H-Beam support foundation.

While erecting supports (poles), shuttering must be used for concreting so that proper quantity of cement concrete mixture be used and assessed during inspection. During concreting proper compaction by means of mobile vibrator be provided. While starting work of support erection, gang wise shuttering and mobile vibrator shall be offered for inspection to IA/IA Representative. While erecting support, mercury level gauge must be used to ensure vertical erection of support.

250mm dia X 12" inch size muffing shall be provided on steel tubular, WPB poles and H-Beam poles to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

Steel plate shall be used in steel tubular poles and WPB poles and cement concrete reinforced plate shall be used as base plate for PCC poles.

15.00 11 KV AB Switch:

11 kV, 3-ph, 200 A, 3 Pin type, Horizontal/Vertical Mounting type, Gang Operated, AB Switch shall be installed on 100 KVA and more capacity distribution transformer substation only. B Class GI pipe shall be used (without any joints) for operation of switch. AB Switch structure and handle must be earthed using 8 SWG GI wire.

16.00 11 KV Drop Out Fuses:

11 kV, 3-ph, Drop Out fuse units (set of 3 units) along with Support Insulators, Base Channel, fuse barrel etc. shall be used for all capacity Distribution Transformer Substations. DO Fuse structure shall be earthed using 8 SWG GI wire.

17.00 Lighting Arrester:

Distribution Class LAs on each phase shall be provided in the sub-station with base steel structure, terminals bi – metallic connectors / PG clamps and earth connectors. LAs are to be connected with separate earth connection. 25x3 mm GI flat shall be used for earth connection.

5. Renovation/Augmentation of LT line

1.00 Conversion of LT line using additional supports with all fittings matching with length and type of existing support is envisaged on following type of supports:

- 8 m/140 kgs PCC Poles (PCC Pole as per state practice)
- 13 m long galvanized H-Beam 152x152 mm, 37.1kg/mtr
- 11 m long galvanized H-Beam 152x152 mm, 37.1kg/mtr
- 11 M long Steel Tubular poles with welded steel base plate of Designation 540 SP 52 (IS 2713, Pt I, II, III 1980)
- 9 M long pSteel Tubular poles with welded steel base plate of Designation 540 SP 28 (IS 2713, Pt I, II, III 1980)
- Galvanized Wide parallel beams 160/23.83 kg/m expandable with jointing plates

2.00 Conversion of existing LT line of bare conductor with following type of new ABC cable LT line as required are envisaged under this work-

2.01	1X16 (Ph) + 1X25 (bare messenger cum neutral) SQ. MM.
2.02	1X16 (Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting)SQ. MM.
2.03	3X16(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.04	3 X 16(Ph) +1x25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.05	1X25(Ph)+1x25 (bare messenger cum neutral) SQ. MM.
2.06	1X25(Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.07	3X25(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.08	3 X 25(Ph) +1x25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.09	1X35(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.10	1x35(Ph) + 1X25 (bare messenger cum neutral) + 1x16 (insulated Street lighting) SQ. MM.
2.11	3X35(Ph)+1X25 (bare messenger cum neutral) SQ. MM.
2.12	3X35 (Ph) + 1x25 (bare messenger cum neutral)+ 1x16 (insulated Street lighting) SQ. MM.

2.13	3X50(Ph)+1X35 (bare messenger cum neutral) SQ. MM.
2.14	3X50 (Ph)+1x35 (bare messenger cum neutral) +1x16 (insulated Street lighting) SQ. MM.
2.15	3X95(Ph)+1X70 (bare messenger cum neutral) SQ. MM.
2.16	3X95(Ph)+1X70 (bare messenger cum neutral) +1x16 (insulated Street lighting) SQ. MM.

3.00 While executing this work, mid span pole with all fittings may be provided matching with existing poles of the line or wherever the sag is high and need so arise.

4.00 Following works shall also be executed by Contractor under this head –

- a) Straightening of tilted supports by providing additional foundation or by providing boulders etc as required.
- b) Revamping of pole earthings and replacement of GI earth wire.
- c) Labelling, providing danger board, providing anti climbing device and painting of all the poles shall be in the scope of work
- d) Providing of stay set wherever required
- e) Removal of old bare conductor and depositing in MSEDCL's store

Item-wise scope of works of LT line is detailed out under scope of new LT line. It shall be utilized on item to item requirement under renovation/augmentation of LT line also.

13.8. High voltage distribution system (HVDS)

1.00 HVDS system shall be used in following three situations:

- a. To provide LT power supply to remote/farthest locations particularly in hilly areas or farthest location in newly developed plain areas. In this case entire work of erecting 11 kV lines, providing Distribution Transformers shall be executed. While executing HVDS scheme, extreme care to be taken to estimate loading on distribution transformer as capacity of distribution transformer shall be between 10 KVA to 25 KVA.
- b. In areas where length of LT line is more than 300 meters causing line losses and in theft prone areas where unauthorized hooking is observed, HVDS is recommended. Existing LT line supports shall be used for erection of 11 kV lines.
- c. To provide dedicated distribution transformer at location of agriculture pump (for maximum two pumps) connections by either extending 11kV new line or by converting existing LT lines to 11 kV line.

2.00 Survey of 11 kV line:

Mapping of route of proposed new HVDS system or conversion of LT line to 11 kV line by foot survey in rural/urban areas be performed mentioning various milestones. While surveying, existing electrical infrastructure in the locality should also be mapped. Line alignment (single line diagram) on political map with fair correctness, be prepared. SLD and foot survey report shall be approved by IA/IA Representative and shall be used as basic document for assessment of works under the contract. On completion of line work, as built Single Line Diagram and pole wise line diagram showing pole wise materials used and pole-to-pole span should be submitted to IA/IA Representative. This details shall be used as reference documents by Quality Inspecting officials to execute inspection works.

3.00 Survey of Distribution Transformer Substations:

A detailed survey of existing habitation shall be performed in presentable document showing population residing in the un-electrified area/existing electrified area of habitation, best location of installation of a new distribution transformer substation and the capacity of transformers to be selected for installation. The capacity of DTR shall be governed by following technical aspects:

- a) Optimistic lengths of service lines needed to feed the beneficiaries,
- b) Space available for installation of support/transformers,
- c) Probable load expected to come on the transformer due to existing BPL beneficiaries /others connected /un-connected probable beneficiaries in the locality taking care of their expected load growth in next 5 years.
- d) Distribution Transformers of capacity 16 KVA to 25 KVA (single phase as well as three phase as per detailed given) shall be installed on double pole structures. Hence, three phase 11 KV lines shall be laid for 16 KVA to 25 KVA (single phase as well as three phase) capacity sub-stations. Single phase 11 KV lines (2-wire) shall only be permitted for 10 KVA single phase transformers mounted on single pole structure. However, V-cross arms and top clamp shall be used on each line support so that whenever needed, this 2-wire line may be converted to 3-phase 11 kV line by erecting an additional conductor.
- e) Double pole support steel structures for 16 KVA and 25 KVA distribution transformers shall be designed in such a way that they can be augmented to 63 KVA transformer structures without any addition in near future on technical requirements.

- f) Single phase 10 KVA distribution transformer shall be installed on single pole structure.

Based on survey report, IA shall decide type, capacity and location of Distribution Transformer sub-station.

4.00 Existing LT infrastructure:

Existing LT lines' conductor and fittings shall be dismantled. Tilted supports, if any, shall be straightened. Poles erected in water logging areas or loose soil areas shall be provided with cement concrete foundation.

5.00 Mid span support:

Requirement of mid span pole with all fittings, to suit 11 kV line conductor shall be examined during survey. IA/IA Representative shall approve requirement of mid span poles and extra concreting on existing poles.

While deciding mid span poles, IA/IA Representative shall decide type and length of poles matching with existing supports available in the field. Stay set wherever required in existing line to be converted may be provided.

6.00 Support for conversion of existing LT line into 11 KV overhead line and for new 11 kV line:

- i. 8 m/140 kgs PCC Poles (PCC Pole as per state practice)
- ii. 11 m long H-Beam 152x152 mm, 37.1 kg/mtr
- iii. 9 M long Steel Tubular poles of Designation 540 SP 28 (IS 2713, Pt I, II, III 1980) WPB 160/30.44kg/m of similar length as per existing support in LT line. This will improve mechanical strength of 11 KV line. And also facilitate line to line crossing clearance.

Steel plate shall be used in steel tubular poles and cement concrete reinforced plate shall be used as base plate for PCC poles.

7.00 Fabricated steel items:

Fabricated steel items like DC cross arm (100x50x6 mm), back clamps (65x8 mm), pole clamp (65x8 mm), DO mounting channel (100x50x6 mm), transformer mounting channel (100x50x6 mm), transformer clamping set (50x50x6 mm), transformer belting set (50x50x6 mm), V cross arm, top clamp, DC cross arm, bracket, clamps, cross bracings, bracings, strain plate, guarding channels, back clamp, transformer mounting structure etc shall be made of MS Channels, MS angle, MS flats as per approved drawings.

While fabricating, good quality electric cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set should not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement.

The fabricated steel structures materials shall be hot-dip galvanized thoroughly internally and externally according to IS: 2629 and IS: 2633 (with latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633.

Fabricated steel structure items shall be galvanized both inside and out. The zinc coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale, blister or be removable by handling or packing. There shall be no impurities in the zinc or additives to the smelter bath that could have a detrimental effect on the durability of the zinc coating. Before pickling, all welding, drilling, cutting and grinding shall be completed and all grease, paint, varnish, oil and welding slag shall be completely removed.

All protuberances which could affect the life of galvanizing shall also be removed. To avoid the formation of white rust all galvanized material shall be packaged in such a way to ensure adequate ventilation between parts during shipping and storage.

Testing of galvanizing shall be performed for Uniformity of thickness as per IS 2633/1986, Mass of coating as per IS 6745/1972 and quantity of zinc, water quenching & centrifuging as per IS 2629/1985.

8.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.

While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by IA/IA Representative.

9.00 Stay Set:

Galvanized Stay Set with 50x8 mm stay clamp, guy insulator (1No.), anchor plate (200x200x6mm) , nut-bolts, 2 Nos turn-buckles, 1.8 m long, 16 mm diameter solid GS stay rod & 7/3.15 mm dia GI stranded wire complete.

Stay set shall be used at all sub-station location to nullify the tension of conductor/cable/transformer on the supports. 0.2 cmt cement concreting in mixture 1 part cement, 3 part coarse sand and 6 part 40mm size aggregate stone chips (1:3:6) shall be provided in the foundation of the stay set. 2 Nos. guy insulator shall be provided in 7/3.15 mm dia stranded GI wire at middle locations between two turn buckles. Erection of storm guys at suitable location in straight line may also be provided.

10.00 Distribution Transformer: As per technical specifications of MSEDCL attached

~~Following type and sizes of minimum level 1 (as per Bureau of Energy Efficiency (BEE)), distribution transformers with all accessories are standardized in the project under HVDS:~~

- a) 5/6 KVA 1 phase Aluminium / Copper wound DTR
- b) 10 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- c) 16 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- d) 25 KVA 1 phase / 3 phase Aluminium / Copper wound DTR
- e) 63 KVA 3 phase Aluminium / Copper wound DTR
- f) 100 KVA 3 phase Aluminium / Copper wound DTR
- g) 200 KVA 3 phase Aluminium / Copper wound DTR

- h) 250 KVA 3 phase Aluminium / Copper wound DTR
 - i) 315 KVA 3 phase Aluminium / copper wound DTR
- Or any other rating as per latest Indian Standard Specification

3ph/1ph Distribution Transformers shall be 11/0.4 KV or 11KV/230 V or 22/0.44 KV non-sealed type, ~~type-BEE specified minimum 3 Star Distribution Transformers. The transformers shall be~~ double wound, three phase, CRGO or amorphose core type having energy efficiency level 1 as specified in latest IS:1980 (Part-1) 2014 with Amendments 1,2 3 &4.

Distribution Transformers shall be subject to inspection during manufacturing (stage inspection), pre-delivery inspection, and inspection at site during pre-erection/post erection/post commissioning conditions. IA/IA Representative shall select samples from the core laminations and get the same tested in NABL Accredited laboratory to prove the quality of the core material at any time during pre-dispatch instruction/inspection at site etc.

The distribution transformers shall be supplied with transformer oil filled up-to maximum permissible level and all accessories viz. breather with silica gel etc.

The distribution transformers must have been successfully type tested within five years from date of Letter of Intent and the designs should have been in satisfactory operation for a period not less than two years as on the date of bid opening. Compliance shall be demonstrated by submitting, (i) authenticated copies of the type test reports and (ii) performance certificates from the users, specifically from Central Govt./State Govt. or their undertakings.

The losses in Distribution Transformer should be as per **Energy Efficiency Level 1 as specified in IS 1180 (Part-1):2014 and amendment 1,2,3 &4** for all kVA ratings of distribution transformers.

Bimetallic clamps of suitable capacities and size are to be provided on LT side and on HT side of the transformer.

T-Clamps should be provided on each jumper on bus bars. Line jumpers should be provided with adequate size of PG Clamps (Two numbers PG Clamps at each end of jumper). Clamp should be made of aluminum grade T-1F as per IS-8309 having good electrical quality aluminum material and should not be brittle in nature.

Transformers should be tested for pre-commissioning checks which includes Insulation Resistance Test, ratio test and oil breakdown voltage test. Before formal energisation, oil leakages from the parts of the transformer, oil level in conservator tank, condition of silica gel, earth connection (two separate) between neutral and earthing, proper jointing of earth wires/flats at the joints and earth resistance of the individual earthing pits are to be checked and recorded. On commissioning of the transformer, phase current and phase to phase voltage, phase to neutral voltage are to be recorded. The loading on the transformers should be balanced. The quantum of neutral current flowing through neutral shall be recorded. A record of pre-commissioning checks/tests are to be prepared and submitted to the IA/IA Representative.

11.00 ACSR / AAAC Conductor:

ACSR raccoon is to be used for connection between overhead lines to transformer studs/bushing. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support. ACSR raccoon conductor (or equivalent AAAC Conductor) is to be used for connection between overhead lines to transformer studs/bushing upto 100 KVA ratings. For transformers having ratings more then 100KVA, higher size of conductors matching with its current carrying rating be used.

12.00 11 KV AB Switch:

11 kV, 3-ph, 600 A, 3 Pin type, Vertical/Horizontal Mounting type, Gang Operated, AB Switch shall be installed at cut points and at suitable locations as per instructions of IA/IA Representative. B Class GI pipe shall be used (without any joints) for operation of switch. AB Switch structure and handle must be earthed using 8 SWG GI wire.

13.00 Distribution Box/SMC Distribution Box and Power Cabling:

Distribution Box/SMC Distribution Boxes are to be installed as per specifications enclosed. The boxes are to be erected, electrically connected with the existing system, properly earthed, and labeled. The test report of pre-commissioning checks should be prepared and submitted.

The Distribution Box/SMC Distribution Boxes are to be earthed using 8 SWG GI wire direct connection to the earthing. 2 Nos Earthing bolts on the Distribution Box/SMC Distribution Box should be provided of 10mm dia.

The single core power cables should be terminated with proper size lugs and gland. Necessary tagging, identification of cores and dressing of cables with nylon cable ties shall be in the scope of work. The unutilized holes in the DBs provided for cable entry needs to be plugged properly in a manner that it must stop access to reptiles, dust and water ingress.

The Low Tension bus bars are to be painted with two or more coats of brush-able epoxy compound suitable to insulate the bus bars for 415 volts exposure.

The Distribution Box/SMC Distribution Box should also house three phase tri-vector energy meter / single phase meter depending on capacity and type of distribution transformer as per specifications.

The single core un-armored power cables shall be used for connection from Distribution Transformer to Distribution Box/SMC Distribution Box and Distribution Box/SMC Distribution Box to Outgoing LT lines. Cable should not be used in underground laying arrangement. Cables should be dressed & tied properly using clamps /cable ties at 1 meter intervals and tied with substation structure/poles. At-least one meter cable is to be kept as spare at the individual ends.

Following arrangements shall be made for LT Distribution Transformers and LT Cables:

No	Type of DTR	Incomer		Outgoing		Cable	
		<i>MCB/Isolator</i>	<i>HRC fuse</i>	<i>MCCB</i>		<i>1</i>	<i>2</i>
1	5/6/10 KVA 1 Ph	45A SPN MCCB		2x32A MCCB	SP	1Cx16 sqmm UA	
2	16 KVA 1 Ph	80A SPN MCCB		2x50A MCCB	SP	1Cx16 sqmm UA	
3	16 KVA 3 Ph	25A TPN MCCB		6x16A MCCB	SP	1Cx16 sqmm UA	
4	25 KVA 1 Ph	40A SPN MCCB		3x25A MCCB	SP	1Cx35 sqmm UA	
5	25 KVA 3	40A TPN MCCB		6x25A	SP	1Cx35 sqmm UA	

No	Type of DTR	Incomer			Outgoing		Cable	
		MCB/Isolator	HRC fuse		MCCB		1	2
	Ph				MCCB			
6	63 KVA 3 Ph	200A Isolator	TPN 100 A		6x60A SP MCCB		1Cx50/70 sqmm UA	1Cx70 sqmm UA
7	100 KVA 3 Ph	200A Isolator	TPN 160 A		6x90A SP MCCB		1Cx50/70 sqmm UA	1Cx150 sqmm UA
8	200 KVA 3 Ph	600A Isolator	TPN 315 A		9x120A SP MCCB		1Cx150 sqmm UA	1Cx300 sqmm UA
9	315 KVA 3 Ph	600A Isolator	TPN 500 A		12X120A SP MCCB		1CX150 sqmm UA	1CX300 sqmm UA

1.1 KV XLPE Aluminium Conductor, Stranded, un-armored cable be used for connection of transformer LV bushing to Distribution Box/SMC Distribution Box and Distribution Box/SMC Distribution Box to overhead line.

14.00 Earthing:

Distribution Transformer Earthing shall be provided with 3 Nos earthing and making earth mat /risers using 50X6mm GI Flat. Earthing should be provided with GI earth pipe or Chemical Earthing depending of strata of soil in the location. IA shall decide the type of earthing.

25x3mm GI Flat and 8 SWG GI wire shall be used for making earthing connection to various sub-station equipment as per given details. GI Flat and GI wire shall be properly dressed, bunched and clamped with the support at 2 feet intervals. An overlapping of 35mm shall be used at the place of flat to flat joint. Two sets of GI nuts, bolts and washers shall be used for flat-to-flat joints. GI nuts, bolts and washers must be used for GI Flat-to-GI wire & GI wire-to-GI wire joints.

Substation wise measurement of earth resistance of earth pits / mesh and corresponding drawing of existing earthing arrangement shall be recorded and submitted to IA/IA Representative.

Description of equipment	Earth connection
Earthing pits	3 Nos. Earth Pipe 3 m long, 40 mm dia or Chemical Earthing
Earth mat and riser	50X6 mm GI Flat / 8 SWG GI wire
Laying of earth mat	Below ground 0.5 meter

Standard requirements of earthing shall be as under:

- Earth Pit – 1 for Transformer Neutral,
- Earth pit - 2 for Lightning Arrester,
- Earth pit – 3 for Equipment body earthing.

Following arrangement is envisaged for various equipment of distribution transformer substation:

- Transformer Neutral (Two distinct connections) : GS Flat 25X3mm

- | | |
|---|------------------|
| b) Transformer Body | : GS Flat 25X3mm |
| c) Lightning Arrester | : GS Flat 25X3mm |
| d) Fencing (Wherever required) | : GI wire 8 SWG |
| e) LT Distribution-cum-meter Box (Two distinct connections) | : GI wire 8 SWG |
| f) Steel structure of substation | : GI wire 8 SWG |

The location of earth pits should be at-least 3m apart, so that they their earth conductive areas do not overlap. In rocky soil where getting required earth resistance is a challenge, chemical rod earthing shall be used in place of normal GI pipe type earthing. IA shall decide type of earthing pits.

15.00 Insulator and hardware –

11 KV polymer/porcelain Disc/Pin insulator with suitable hardware fittings shall be used. Insulator should be tied properly using binding wire/helical form fitting. Bi-metallic clamps must be used at terminals.

The individual insulator shall be checked for insulation resistance before overhead line installation. Insulator should properly be cleaned before installation. No damage/crack insulator should be used.

16.00 Substation numbering:

Each Substation should be numbered properly labelled using yellow base and black indication marks (number or digits). 40/50 mm height digits/words should be used for this purpose. Base shall be made using 2 or more coats of yellow enamel paint till good surface finish. Base preparation shall be completed before shifting of poles to site for erection. Base painting and marking of digits should be performed by a skilled and trained painter using branded enamel paint, IA shall approve type and brand of enamel paint.

17.00 Anti-climbing device:

3.5 kgs, 2.5mm dia (12 SWG) galvanized barbed wire shall be used on each sub-station support. Galvanized barbed wire should be properly dressed and crimped at termination. While wrapping the wire on support, proper tension should be maintained.

18.00 Danger board:

Each support should be provided with a danger board with pole clamps as per approved drawing. Danger board should be in bi-lingual languages (local language and English). Clamp for danger board, nut-bolts and washers shall be painted with two or more coats of red-oxide and aluminium paints respectively till smooth surface before installation.

19.00 Support foundation:

0.5 m³ Cement concrete in mixture 1 part cement, 3 part coarse sand, 6 part 40 mm size aggregate stone chips (1:3:6) shall be used in PCC Pole, steel tubular poles and H-Beam support foundation.

While erecting supports (poles), shuttering must be used for concreting so that proper quantity of cement concrete mixture be used and assessed during inspection. During concreting proper compaction by means of mobile vibrator be provided. While starting work of support erection, gang wise shutting and mobile vibrator shall be offered for inspection to IA/IA Representative. While erecting support, mercury level gauge must be used to ensure vertical erection of support.

250mm dia X 12" inch size muffing shall be provided on steel tubular and H-Beam poles to prevent direct entry of rain water along the poles. Cement Concrete of 1:2:4 (1 part Cement, 2 parts coarse sand and 4 parts 20mm aggregate stones chips) shall be used for individual poles.

Steel plate shall be used in steel tubular poles and cement concrete reinforced plate shall be used as base plate for PCC poles.

20.00 11 KV Drop Out Fuses:

11 kV, 3-ph, Drop Out fuse units (set of 3 units) along with Support Insulators, Base Channel, fuse barrel etc. shall be used for all capacity Distribution Transformer Substations. DO Fuse structure shall be earthed using 8 SWG GI wire.

21.00 Lighting Arrester:

Distribution Class LAs shall be provided in the sub-station with base steel structure, terminals bi – metallic connectors / PG clamps and earth connectors. LAs are to be connected with separate earth connection. 25x3 mm GI flat shall be used for earth connection.

13.9. Civil Works And Soil Investigation

1.00 General

The provisions of this section of specification shall only be applicable to the extent of scope of works indicated in Bid Proposal Sheet (BPS). The intent of specification covers the following:

Design, engineering, and construction of all civil works at power sub-station, 66 kV line, 33 kV line, 11 kV line, DTR substation, LT line, HVDS, augmentation/renovation of system etc. All civil works shall also satisfy the general technical requirements specified in other Sections of this Specification and as detailed below. They shall be designed to the required service conditions/loads as specified elsewhere in this Specification or implied as per National/ International Standards.

All civil works shall be carried out as per applicable Indian Laws, Standards and Codes. All materials shall be of best quality conforming to relevant Indian Standards and Codes.

The Contractor shall furnish all design, drawings, labour, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with approved drawings, specifications and direction of IA.

The work shall be carried out according to the design/drawings to be developed by the Contractor and approved by the IA/IA Representative based on Tender Drawings Supplied (if any) to the Contractor by the IA/IA Representative and Original Equipment Manufacturer recommendation. For all buildings, structures, foundations etc. necessary layout and details shall be developed by the Contractor keeping in view the functional requirement of the substation facilities and providing enough space and access for operation, use and maintenance based on the input provided by the IA/IA Representative. Certain minimum requirements are indicated in this specification for guidance purposes only.

In case of R&M of existing substations, Contactor shall visit site to ascertain the amount of repair and strengthening of structures and foundations, dismantling and new construction of structures and foundations works are to be done before quoting.

Contractor must furnish the design and drawings in support of the activities mentioned above that are to be carried out in the R&M of existing substation site.

The rate quoted by the bidder for all type of civil work shall be firm irrespective of the type of terrain and depth of filling.

This specification covers all the work required for detailed soil investigation and preparation of a detailed report. The work shall include mobilisation of necessary equipment, providing necessary engineering supervision and technical personnel, skilled and unskilled labour etc. as required to carry out field investigation as well as, laboratory investigation, analysis and interpretation of data and results, preparation of detailed Geo-technical report including specific recommendations for the type of foundations and the allowable safe bearing capacity for different sizes of foundations at different founding strata for the various structures of the substation. The Contractor shall make his own arrangement for locating the co-ordinates and various test positions in field as per the information supplied to him and also for determining the reduced level of these locations with respect to the benchmark indicated by the IA/IA Representative.

All the work shall be carried out as per latest edition of the corresponding Indian Standard Codes.

a. Geotechnical Investigation

The Contractor shall perform a detailed soil investigation to arrive at sufficiently accurate, general as well as specific information about the soil profile and the necessary soil parameters of the site. So that the foundation of the various structures can be designed and constructed safely and rationally.

A report to the effect will be submitted by the Contractor for IA/IA Representative specific approval giving details regarding data proposed to be utilised for civil structures design.

The Contractor should visit the site to ascertain the soil parameters before submitting the bid. The topography is uneven steeply sloping at few places requiring cutting and filling operations including slope stability and protection measures (if slopes encountered). Any variation in soil data shall not constitute a valid reason for any additional cost & shall not affect the terms & condition of the Contract. Tests must be conducted under all the critical locations i.e. Control Room Building. Tower locations, transformer etc.

b. Bore Holes

Drilling of bore holes of 150 mm dia. in accordance with the provisions of IS: upto 10 m depth or to refusal which ever occur earlier. (By refusal it shall mean that a standard penetration blow count (N) of 100 is recorded for 30 cm penetration). For a new substation, minimum three (3) bore holes shall be done to find out the geological profile of the area. If any unconformity encountered then more bore holes shall be drilled with the approval of IA for the new projects. However in case deep pile foundations are envisaged the depths have to be regulated as per codal provisions. In cases where rock is encountered, coring in one borehole per bay shall be carried out to 1.5 M in bedrock and continuous core recovery is achieved.

Performing Standard Penetration Tests at approximately 1.5 m interval in the borehole starting from 1.5 m below ground level onwards and at every change of stratum. The disturbed samples from the standard penetrometer shall also be collected for necessary tests.

Collecting undisturbed samples of 100/75 mm diameter 450 mm long from the boreholes at intervals of 2.5 m and every change of stratum starting from 1.0 m below ground level onwards in clayey strata.

The depth of Water table shall be recorded in each borehole.

All samples, both disturbed and undisturbed, shall be identified properly with the borehole number and depth from which they have been taken.

The sample shall be sealed at both ends of the sampling tubes with wax immediately after the sampling and shall be packed properly and transported to the Contractor's laboratory without any damage or loss.

The logging of the boreholes shall be compiled immediately after the boring is completed and a copy of the bore log shall be handed over to the IA/IA Representative.

c. Electrical Resistivity Test

This test shall be conducted to determine the Electrical resistivity of soil required for designing safe grounding system for the entire station area. The specifications for the equipments and other accessories required for performing electrical resistivity test, the test procedure, and reporting of field observations shall confirm to IS: 3043. The test shall be conducted using Wagner's four electrode method as specified in IS: 1892, Appendix-B2. Unless otherwise specified at each test location, the test shall be conducted along two perpendicular lines parallel to the coordinate axis. On each line a minimum of 8 to 10 readings shall be taken by changing the spacing of the electrodes from an initial small value of 0.5 m upto a distance of 10.0 m.

d. Water Sample

Representative samples of ground water shall be taken when ground water is first encountered before the addition of water to aid drilling of boreholes. The samples shall be of sufficient quantity for chemical analysis to be carried out and shall be stored in airtight containers.

e. Back Filling of Bore Holes

On completion of each hole, the Contractor shall backfill all bore holes as directed by the IA/IA Representative. The backfill material can be the excavated material and shall be compacted properly.

f. Laboratory Test

1. The laboratory tests shall be carried out progressively during the field work after sufficient number of samples have reached the laboratory in order that the test results of the initial bore holes can be made use of in planning the later stages of the field investigation and quantum of laboratory tests.

2. All samples brought from field, whether disturbed or undisturbed shall be extracted/prepared and examined by competent technical personnel, and the test shall be carried out as per the procedures laid out in the relevant I.S. Codes.

The following laboratory tests shall be carried out

- a) Visual and Engineering Classification
- b) Liquid limit, plastic limit and shrinkage limit for C- \square soils.
- c) Natural moisture content, bulk density and specific gravity.
- d) Grain size distribution.

- e) Swell pressure and free swell index determination for expensive soil only.
- f) Consolidated un-drained test with pore pressure measurement.
- g) Chemical tests on soil and water to determine the carbonates, sulphates, nitrates, chlorides, Ph value, and organic matter and any other chemical harmful to the concrete foundation.
- h) C.B.R value
 - i) Rock quality designation (RQD), RMR in case of rock is encountered

2.00 Test Results and Reports

1. The Contractor shall submit the detailed report in two (2) copies wherein information regarding the geological detail of the site, summarized observations and test data, bore logs, and conclusions and recommendations on the type of foundations with supporting calculations for the recommendations. Initially the report shall be submitted by the Contractor in draft form and after the draft report is approved, the final report in two (3) copies shall be submitted. The test data shall bear the signatures of the Investigation Agency, Vendor and also site representative of IA.

2. The report shall include but not limited to the following:

- i. A plan showing the locations of the exploration work i.e. bore holes, dynamic cone penetration tests etc.
- ii. Bore Logs: Bore logs of each bore holes clearly identifying the stratification and the type of soil stratum with depth. The values of Standard Penetration Test (SPT) at the depths where the tests were conducted on the samples collected at various depths shall be clearly shown against that particular stratum.

Test results of field and laboratory tests shall be summarised strata wise as well in combined tabular form. All relevant graphs, charts tables, diagrams and photographs, if any, shall be submitted along with report. Sample illustrative reference calculations for settlement, bearing capacity, pile capacity shall be enclosed.

a. Recommendations: The report should contain specific recommendations for the type of foundation for the various structures envisaged at site. The Contractor shall acquaint himself about the type of structures and their functions from the IA/IA Representative. The observations and recommendations shall include but not limited to the following:

- i. Geological formation of the area, past observations or historical data, if available, for the area and for the structures in the nearby area, fluctuations of water table etc. Slope stability characteristics and landslide history of the area shall be specifically highlighted. Remedial measures to be adopted shall also be given.
- ii. Recommended type of foundations for various structures. If piles are recommended the type, size and capacity of pile and groups of piles shall be given after comparing different types and sizes of piles and pile groups.
- iii. Allowable bearing pressure on the soil at various depths for different sizes of the foundations based on shear strength and settlement characteristics of soil with supporting calculations. Minimum factor of safety for calculating net safe bearing capacity shall be taken as 3.0 (three). Recommendation of liquefaction characteristics of soil shall be provided.
- iv. Recommendations regarding slope of excavations and dewatering schemes, if required. Required protection measures for slope stability for cut & fill slopes of switchyard and approach road with stone pitching/retaining walls shall be clearly spelt out. Calculation shall also be provided for stability adequacy.

- v. Comments on the Chemical nature of soil and ground water with due regard to deleterious effects of the same on concrete and steel and recommendations for protective measures.
- vi. If expansive soil is met with, recommendations on removal or retaining the same under the structure, road, drains, etc. shall be given. In the latter case detailed specification of any special treatment required including specification of materials to be used, construction method, equipment to be deployed etc. shall be furnished. Illustrative diagram of a symbolic foundation showing details shall be furnished.
- vii. Recommendations for additional investigations beyond the scope of the present work, if considered such investigation as necessary.

3.00 Site Preparation

The TKC shall be responsible for proper leveling of switchyard site as per layout and levels of switchyard finalised during detailed engineering stage. The TKC at his own cost shall make the layout and levels of all structure etc from the general grids of the plot and benchmarks set and approved by the IA. The Contractor shall give all help in instruments, materials and personnel to the IA/IA Representative for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels. Site leveling shall be in the scope of the TKC. Bidder may decide the level of the sites. However, the level shall be such that it is 300 mm higher than the highest flood level (HFL) of the site. If HFL is not available, then nearby road level shall be assumed as HFL.

Whenever for bay extension works the existing substation are to be modified or strengthen, Contractor should keep same as EGL of existing sub-station so that FFL shall be same for both and all the necessary arrangements are to be carried out in this regard by the Contractor.

This clause covers the design and execution of the work for site preparation, such as clearing of the site, the supply and compaction of fill material, slope protection by stone pitching/retaining walls depending on the site location & condition, excavation and compaction of backfill for foundation, road construction, drainage, trenches and final topping by brick soling/stone filling.

- 1) The TKC shall develop the site area to meet the requirement of the intended purpose. The site preparation shall conform to the requirements of relevant sections of this specification or as per stipulations of standard specifications. TKC shall also carry out necessary protection of slope of switchyard area and approach road.
- 2) The fill material if required shall be suitable for the above requirement. The fill shall be such material and the site so designed as to prevent the erosion by wind and water of material from its final compacted position or the in-site position of undisturbed soil.
- 3) Material unsuitable for founding of foundations shall be removed and replaced by suitable fill material and to be approved by the IA/IA Representative.
- 4) Backfill material around foundations or other works shall be suitable for the purpose for which it is used and compacted to the density described under Compaction. Excavated material not suitable or not required for backfill shall be disposed off in areas as directed by IA/IA Representative upto a maximum lead of 1 km.

- a. Excavation and backfill

1. Excavation and backfill for foundations shall be in accordance with the relevant code.
2. Whenever water table is met during the excavation, it shall be dewatered and water table shall be maintained below the bottom of the excavation level during excavation, concreting and backfilling.
3. When embankments are to be constructed on slopes of 15% or greater, benches or steps with horizontal and vertical faces shall be cut in the original slope prior to placement of embankment material. Vertical faces shall measure not more than 1 m in height.
4. Embankments adjacent to abutments, culverts, retaining walls and similar structures shall be constructed by compacting the material in successive uniform horizontal layers not exceeding 20 cm in thickness (of loose material before compaction). Each layer shall be compacted as required by means of mechanical tampers approved by the IA/IA Representative. Rocks larger than 10 cm in any direction shall not be placed in embankment adjacent to structures.
5. Earth embankments of roadways and site areas adjacent to buildings shall be placed in successive uniform horizontal layers not exceeding 20 cm in thickness in loose stage measurement and compacted to the full width specified. The upper surface of the embankment shall be shaped so as to provide complete drainage of surface water at all times.
6. The land required for borrowing earth shall be arranged & selected by Contractor. The identified land shall be got approved by IA/IA Representative. The quoted rates shall include cost of earth, taxes, duties, royalty, compensation for the land identified for borrow earth. The rate shall also be inclusive of all leads, lifts, ascent, descent and testing required for completion of work in all respect.
7. The ground levels for all measurements shall be taken at every 5 meter distance in uniformly sloping ground and at closer distance where pits/undulations are met with. In fairly leveled area, levels shall be taken at 15 mt. apart at the discretion of IA/IA Representative. The ground levels shall be recorded and plotted on plans. The same shall be recorded by IA/IA Representative before the earth work is started. All labor, material, tool, equipment etc required for the above work shall be arranged by the TKC at his own cost.

b. Compaction

1. The density to which fill materials shall be compacted shall be as per relevant IS and as per direction of IA/IA Representative. All compacted sand filling shall be confined as far as practicable. Backfilled earth shall be compacted to minimum 95% of the Standard Proctor's density at OMC. The sub-grade for the roads and embankment filling shall be compacted to minimum 95% of the Standard Proctor's density at OMC. Cohesion less material sub grade shall be compacted to 70% relative density (minimum).
2. At all times unfinished construction shall have adequate drainage. Upon completion of the road's surface course, adjacent shoulders shall be given a final shaping, true alignment and grade.
3. Each layer of earth embankment when compacted shall be as close to optimum moisture content as practicable. Embankment material, which does not contain sufficient moisture to obtain proper compaction, shall be wetted. If the material contains any excess moisture, then it shall be allowed to dry before rolling. The rolling shall begin at the edges overlapping half the width of the roller each time and progress to the center of the road or towards the building as applicable. Rolling will also be required on rock fills. No compaction shall be carried out in rainy weather.

c. Requirement for fill material under foundation

All foundations shall rest below virgin ground level and the minimum depth of foundation below the virgin ground level shall be at least 500 mm. For small equipment and minor foundations like marshalling kiosk, Switch board stand, earth switch and main box support etc. may be reduced to 300 mm with specific approval of the IA/IA Representative.

4.00 Stone Filling & Antiweed Treatment

The Contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the drawings, specification and direction of the IA/IA Representative.

Stone filling shall be done in the areas of the switchyard wherever equipment and or structures are to be provided under present scope of work covering entire fencing area.

Prevailing practice of stone filling is to be adopted for the bay extension works of existing substations. Contractor shall verify the existing practice prevailing at site before quoting.

Before taking up stone rolling, antiweed treatment shall be applied in the switchyard area where stone filling is to be done and the area shall be thoroughly de-weeded including removal of the roots. The recommendation of local agriculture/horticulture department shall be sought where ever feasible while choosing the type of chemical to be used. Nevertheless the effectiveness of chemical shall be demonstrated by the Contractor in a test area of size 10 meterx 10 meter (approx..). The final approval based on the result shall be given by IA/IA Representative. Antiweed treatment shall be procured from reputed manufacturer. The dosage and application of chemical shall be strictly as per the manufacturer's recommendation. The Contractor shall be requested to maintain the area free of weed for a period of one year from the date of application of the first dose of the chemical.

5.00 General Requirement

a. The material required for site surfacing shall be free from all types of organic materials and shall be of standard quality, and as approved by the IA/IA Representative.

The material to be used for stone filling/ site surfacing shall be uncrushed/ crushed/ broken stone of 20 mm nominal size (single sized) conforming to table 2 of IS: 383- 1970. Hardness, flakiness shall be as required for wearing courses are given below.

(a) Sieve analysis limits/Gradation

Sieve size	% passing by weight
40mm	100
20mm	85-100
10mm	0-20
4.75mm	0-5

(b) Hardness

Abrasion value (IS: 2386 part-IV) not more than 40%

Impact value (IS: 2386 part-IV) not more than 30%

(c) Flakiness Index

As per (IS: 2386 part-IV) and maximum value is 25.

- b. After all the structures/equipment are erected, the surface of the switchyard area shall be maintained, rolled/compacted to the lines and grades as decided by IA/IA Representative. De-weeding including removal of roots shall be done before rolling is commenced. IA/IA Representative shall decide final formation level so as to ensure that the site appears uniform. The final formation level shall however be very close to the formation level indicated in the drawing using half-ton roller with suitable water sprinkling arrangement to form a smooth and compact surface.
- c. A base layer of uncrushed/crushed/broken stone of 20 mm nominal size (single sized) shall be spread and rolled/compacted by using half ton roller with 4 to 5 passes and water sprinkling to form a minimum 50 mm layer on the finished ground level of the specified switchyard area excluding roads, drains, cable trench and tower and equipment foundations as indicated in the drawing.
- d. Over the base layer of site surfacing material, a final surface course of minimum 50 mm thickness of 20 mm nominal size (single sized) broken stone as specified above shall be spread and compacted by light roller using half tones steel roller (width 30" and 24" dia meter) with water sprinkling as directed by the IA/IA Representative. The water shall be sprinkled in such a way that bulking does not take place.
- e. In areas that are considered by the IA/IA Representative to be too congested with foundations and structures for proper rolling of the site surfacing material by normal rolling equipment, the material shall be compacted by hand, if necessary. Due care shall be exercised so as not to damage any foundation structures or equipment during rolling compaction.

6.00Site Drainage

- a. Adequate site drainage system shall be provided by the Contractor in new and existing substation. In case of bay extension of existing substation, drainage layout shall be prepared by the Contractor in such away that it should satisfy the technical parameters stated below while designing the drainage system so that flow of water of the existing part of substation remain uninterrupted and the same should be approved by the IA/IA Representative. The technical parameters stated below also to be taken into account while designing the drainage system for new substation as well.

The Contractor shall obtain rainfall data and design the storm water drainage system, (culverts, ditches, drains etc.) to accommodate run off due to the most intense rainfall that is likely to occur over the catchments area in one hour period on an average of once in ten years. The surface of the site shall be sloped to prevent the ponding of water.

- b. The maximum velocity for pipe drains and open drains shall be limited to 2.4m/sec and 1.8m/sec respectively. However, minimum non-silting velocity of 0.6m/sec shall be ensured. Longitudinal bed slope shall not be milder than 1 in 1000.
- c. The drains shall be constructed using Brick masonry except at road crossings etc. where RCC pipe shall be used. The RCC pipe for drains and culverts shall be as per IS:456 and IS:783.
- d. The Contractor shall ensure that water drains are away from the site area and shall prevent damage to adjacent property by this water. Adequate protection shall be given to site surfaces, roads, ditches, culverts, etc. to prevent erosion of material by water.
- e. The drainage system shall be adequate without the use of cable/pipe trenches. (Pipe drains shall be provided in areas of switchyard where movement of crane will be necessary in operating phase of the substation).

- f. For pipe drains, concrete pipe of class NP2 shall be used. However, for road crossings etc. higher strength pipe of class NP3 shall be provided. For rail crossings, pipes conforming to railway loading standards or at least NP4 class shall be provided. Manholes shall be provided at every 30m interval, at connection points and at every change of alignment.
- g. Open surface drains for new s/s shall be provided with brick masonry in 1:6 (1 cement: 6 coarse sand) cement mortar with 12 mm thick, 1:4 (1 cement: 4 sand) cement plaster inside and exposed surface of drains as per approved drawing. For bay extension at existing substations, prevailing practice of the respective substation shall be adopted.
- h. Pipe drains shall be connected through manholes at an interval of max. 30m. Effluents shall be suitably treated by the Contractor to meet all the prevalent statutory requirements and local pollution control norms and treated effluents shall be conveyed to the storm water drainage system at a suitable location for its final disposal.
- i. Invert of the drainage system shall be decided in such a way that the water can easily be discharged above the High Flood Level (HFL) outside substation boundary at suitable location upto a maximum 50M beyond boundary wall of substation or actual whichever occurs earlier and approved by IA.
- j. All internal site drainage system, including the final connection/disposal to IA acceptance points shall be part of Supplier's scope including all required civil works. The Contractor shall connect his drain(s) at one or more points to outfall points as feasible at site.
- k. The drainage scheme and associated drawings shall be got approved and constructed as per enclosed tender drawing.

7.00 Roads and Culverts inside substation premises

- a. The main approach road including modification of existing road to meet the site conditions, roads for access to equipment and buildings within substations (including bay extension in existing substations) are in the scope of the Contractor. Layout of the roads shall be based on General detail & Arrangement drawing for the substation. If extra road is required for functional point of view, which has not been mentioned in the layout drawing, Contractor should provide the same without extra cost to the IA/IA Representative.
- b. All substation roads shall be constructed so as to permit transportation of all heavy equipment. The roads shall have min. 3.0 m wide RCC road as per enclosed tender drawing.
- c. Road construction shall be as per IRC standards.
- d. Adequate provision shall be made for road drainage. Protection of cut and embankment slopes of roads as per slope stability requirement shall be made.
- e. All the culverts and its allied structure (required for road/rail, drain trench crossings etc.) shall be designed for class A loading as per IRC standard / IS code and should be checked for loading.
- f. All roads shall be designed for class 'D' of traffic as per IRC-37 Guide-lines for the design of rigid pavements.

8.00 Transformer Foundation

The Contractor shall provide a road system integrated with the transformer foundation to enable installation and the replacement of any failed unit by the spare unit located at the site. This system shall enable the removal of any failed unit from its foundation to the nearest road.

If existing/failed transformer is required to be replaced by new one in augmentation/bay extension works of existing substations then the foundation supporting that equipment shall be strengthen by modifying the foundation itself or the foundation shall be dismantle and recast new foundation as per site conditions. However, Contractor must furnish the design calculation incorporating all those changes so that safety of the structure and foundation remain adequate.

Similarly all types of equipment foundations with /without supporting structures shall be treated in similar manner as stated for transformer foundations.

Contractor must access the amount of work involve for augmentation/bay extension of existing substations while quoting.

9.00 Cable & Pipe Trenches

- a. The cable trenches and precast removable RCC cover (with lifting arrangement) shall be constructed using RCC of M20 grade for new substation whereas for bay extension of existing substation size and material of cable trenches shall be same as the existing one and pre-cast removable RCC cover (with lifting arrangement) shall be constructed using RCC of M20 grade. Cable trenches must be designed for the design criteria stated below, whether it is of concrete or brick for both new substations and bay extension works in existing substations.
- b. The cable trench walls shall be designed for the following loads.
 - (i) Dead load of 100 kg/m length of cable support + 75 Kg on one tier at the end.
 - (ii) Triangular earth pressure + uniform surcharge pressure of 1T/m².
- c. Cable trench covers shall be designed for self-weight of top slab + concentrated load of 200 kg at center of span on each panel.
- d. Cable trench crossing the road/rails shall be designed for class A. Loading of IRC/relevant IS Code and should be checked for transformer loading.
- e. Trenches shall be drained. Necessary sumps be constructed and sump pumps if necessary shall be supplied. Cable trenches shall not be used as storm water drains.
- f. The top of trenches shall be kept at least 100 mm above the finished ground level for the new substation. The top of cable trench shall be such that the surface rainwater does not enter the trench.
- g. The top of trench shall be kept same as existing one to maintain uniformity of the cable trenches structure in case of bay extension works of existing substations.
- h. All metal parts inside the trench shall be connected to the earthing system.
- i. Cables from trench to equipment shall run in hard conduit pipes.
- j. Trench wall shall not foul with the foundation. Suitable clear gap shall be provided.
- k. The trench bed shall have a slope of 1/500 along the run & 1/250 perpendicular to the run.

- l. Cable trenches shall be blocked at the ends if required with brick masonry in cement sand mortar 1:6 and plaster with 12mm thick 1:6 cement sand mortar.
- m. Cable trench contains cable tray that shall be supported on ISA. The size and spacing of angle section shall be as per design criteria mentioned above.
- n. Cable trench shall be constructed as per enclosed tender drawing.

10.00 Foundation /RCC Construction

1. Work covered under this Clause of the Specification comprises the design and construction of foundations and other RCC constructions for switchyard structures, equipment supports, trenches, drains, control cubicles, bus supports, transformer, marshalling kiosks, auxiliary equipment & systems, buildings, tanks, boundary wall or for any other equipment or service and any other foundation required to complete the work. This clause is as well applicable to the other RCC constructions.

However, for the augmentation/bay extension works of existing substation, type of RCC structures and foundations etc. shall be similar to one already existing at the existing substation and for which design shall be furnished in support of safety of those RCC structures and foundations etc. Contractor must assess the amount of work involved for the construction of switchyard structures, equipment supports, trenches, drains, control cubicles, bus supports, transformer, marshalling kiosks, auxiliary equipment & systems, buildings, tanks, boundary wall or for any other equipment or service and any other foundation required to complete the work for the existing substations.

2. Concrete shall conform to the requirements mentioned in IS: 456 and all the tests shall be conducted as per relevant Indian Standard Codes as mentioned in Standard field quality plan appended with the specification

A minimum grade for PCC and RCC shall be used for all structural/load-bearing members as per latest IS 456.

3. If the site is sloppy, the foundation height will be adjusted to maintain the exact level of the top of structures to compensate such slopes.

4. The switchyard foundation's plinths and building plinths shall be minimum 300mm and 500 mm above finished ground level respectively.

5. Minimum 75mm thick lean concrete shall be provided below all underground structures, foundations, trenches etc. to provide a base for construction.

6. Concrete made with Portland slag cement shall be carefully cured and special importance shall be given during the placing of concrete and removal of shuttering.

7. The design and detailing of foundations shall be done based on the approved soil data and sub-soil conditions as well as for all possible critical loads and the combinations thereof. The Spread footings foundation or pile foundation as may be required based on soil/sub-soil conditions and superimposed loads shall be provided.

8. If pile foundations are adopted, the same shall be cast-in-situ driven/bored or precast or under reamed type as per relevant parts of IS Code 2911. Only RCC piles shall be provided. Suitability of the adopted pile foundations shall be justified by way of full design calculations. Detailed design calculations shall be submitted by the bidder showing complete details of piles/pile groups proposed to be used. Necessary initial load test shall also be carried out by the bidder at their cost to establish

the piles design capacity. Only after the design capacity of piles has been established, the Contractor shall take up the job of piling. Routine tests for the piles shall also be conducted. All the work (design & testing) shall be planned in such a way that these shall not cause any delay in project completion.

a. Design

1. Foundations shall be of reinforced cement concrete for new substation but for the augmentation / bay extension works of existing substation it could be of RCC/ PCC depending on type of structures and materials used for the similar type of structures in those bay extension works of existing substation. Design requirement shall be fulfilled by the Contractor and furnished for approval for both new substation and existing substation (for bay extension works) as specified in the scope of work. The design and construction of RCC/ PCC / Masonry structures shall be carried out as per IS: 456 and relevant IS code/CBIP manual/NBC etc and minimum grade of concrete shall be as per relevant IS code. Higher grade of concrete than specified above may be used at the discretion of Contractor without any additional financial implication to the IA/IA Representative.
2. Limit state method of design shall be adopted unless specified otherwise in the specification.
3. For detailing of reinforcement IS: 2502 and SP: 34 shall be followed. Cold twisted deformed bars ($F_y=415 \text{ N/mm}^2$) conforming to IS: 1786 shall be used as reinforcement. However, in specific areas, mild steel (Grade I) conforming to IS: 432 can also be used. Two layers of reinforcement (on inner and outer face) shall be provided for wall & slab sections having thickness more than 150 mm. Clear cover to reinforcement towards the earth face shall be minimum 40 mm.
4. RCC water retaining structures like storage tanks, etc. shall be designed as un-cracked section in accordance with IS: 3370 (Part I to IV) by working stress method. However, water channels shall be designed as cracked section with limited steel stresses as per IS: 3370 (Part I to IV) by working stress method.
5. The procedure used for the design of the foundations shall be the most critical loading combination of the steel structure and or equipment and/or superstructure and other conditions, which produces the maximum stresses in the foundation or the foundation component and as per the relevant IS Codes of foundation design. Detailed design calculations shall be submitted by the bidder showing complete details of piles/pile groups or isolated /combined footings proposed to be used.
6. Design shall consider any sub-soil water pressure that may be encountered following relevant standard strictly.
7. Necessary protection to the foundation work, if required shall be provided to take care of any special requirements for aggressive alkaline soil, black cotton soil or any other type of soil which is detrimental/harmful to the concrete/masonry foundations.
8. RCC columns /pedestals shall be provided with rigid connection at the base.
9. All sub-structures shall be checked for sliding and overturning stability during both construction and operating conditions for various combinations of loads. Factors of safety for these cases shall be taken as mentioned in relevant IS Codes or as stipulated elsewhere in the Specifications. For checking against overturning, weight of soil vertically above footing shall be taken and inverted frustum of pyramid of earth on the foundation should not be considered.
10. Earth pressure for all underground structures shall be calculated using co-efficient of earth pressure at rest, co-efficient of active or passive earth pressure (whichever is applicable).

11. In addition to earth pressure and ground water pressure etc., a surcharge load of 1T/Sq.m shall also be considered for the design of all underground structures including channels, sumps, tanks, trenches, substructure of any underground hollow enclosure etc., for the vehicular traffic in the vicinity of the structure.

12. Following conditions shall be considered for the design of water tank in pumps house, channels, sumps, trenches and other underground structures:

i. Full water pressure from inside and no earth pressure & ground water pressure & surcharge pressure from outside (application only to structures, which are liable to be filled up with water or any other liquid).

ii. Full earth pressure, surcharge pressure and ground water pressure from outside and no water pressure from inside.

iii. Design shall also be checked against buoyancy due to the ground water during construction and maintenance stages. Minimum factor of safety of 1.5 against buoyancy shall be ensured ignoring the superimposed loadings.

13. The foundations shall be proportioned so that the estimated total and differential movements of the foundations are not greater than the movements that the structure or equipment is designed to accommodate.

14. The foundations of transformer and circuit breaker shall be of block type foundation. Minimum reinforcement shall be governed by IS: 2974 and IS: 456.

15. The tower and equipment foundations shall be checked for a factor of safety of 2.0 for normal condition and 1.5 for short circuit condition against sliding, overturning and pullout.

b. Admixtures & additives

1. Only approved admixtures shall be used in the concrete for the Works. When more than one admixture is to be used, each admixture shall be batched in its own batch and added to the mixing water separately before discharging into the mixer. Admixtures shall be delivered in suitably labeled containers to enable identification.

2. Admixtures in concrete shall conform to IS: 9103. The water proofing cement additives shall conform to IS: 2645. IA/IA Representative shall approve concrete Admixtures/ Additives.

3. The Contractor may propose and the IA/IA Representative may approve the use of a water-reducing set-retarding admixture in some of the concrete. The use of such an admixture will not be approved to overcome problems associated with inadequate concrete plant capacity or improperly planned placing operations and shall only be approved as an aid to overcoming unusual circumstances and placing conditions.

4. The water-reducing set-retarding admixture shall be an approved brand of Ligno-sulphonate type admixture.

5. The waterproofing cement additives shall be used as required / advised by the IA/IA Representative.

c. Gates and Boundary Wall

1. The Gate frame shall be made of medium duty MS pipe conforming to relevant IS with welded joints.

2. The gates shall be fabricated with welded joints to achieve rigid connections. The gate frames shall be painted with one coat of approved steel primer and two coats of synthetic enamel paint.
3. Gates shall be fitted with approved quality iron hinges, latch and latch catch. Latch and latch catch shall be suitable for attachment and operation of pad lock from either side of gates. Hinges shall permit gates to swing through 180 degree back against fence. Gates shall be earthed by G I wire.
4. Gates shall be fitted with galvanized chain hook or gate hold back to hold gates open. Double gates shall be fitted with centre rest and drop bolt to secure gates in closed position.
5. Gates shall be installed in locations shown on drawings. Next to the main gate, a men gate (1.25 m wide, single leaf) shall also be provided.
6. Bottom of gates shall be set approximately 40mm above ground surface and necessary guiding mechanism shall be fitted.
7. The Contractor shall design and construct boundary wall around substation area as per requirements. The boundary wall shall be of height 2.0M and shall be made of RCC frame construction with RCC column and plinth beam arrangement and panels filled with one brick thick wall in cement sand mortar 1:6. The boundary wall shall be plastered on both external and internal faces with cement and sand plaster 1:6 of thickness 18 mm and 12 mm respectively. An additional barbed Y-shaped arm of MS angle 50x50x6 with 3-rows (6 nos) barbed wire A-4 IS: 278. Expansion joints shall be provided as per codal requirements. MS grating shall be provided at required locations for drainage purposes. The boundary wall shall be painted with minimum two coats of color wash over a base coat of white wash with lime. The front portion of boundary wall shall however be with a RC jail and 12 mm square MS bar top above brick work and pebble dash plaster finish with colour pigment. The steel work shall be given two coats of synthetic enamel paint of approved make over one coat of primer. Boundary wall and gate shall be constructed as per enclosed *tender drawing*.

11.00 Buildings - General Requirements

The scope for new control room building includes the design, engineering and construction including anti-termite treatment, plinth protection, DPC of Building including sanitary, water supply, electrification, false ceiling etc. of control room building. The buildings shall be of RCC framed structure of concrete of M20 grade (Min.). Following design criteria shall be adopted for design purposes for new substation.

If any extension of the Control Room building is required in augmentation / bay extension works of existing substation then extension part shall be compatible to existing one structurally and architecturally but following design criteria shall be adopted for design purposes for R&M of existing substation.

a. Control room Building

Minimum floor area requirements shall be 10000×12000 mm excluding space for wash room which may be increased at the time of detailed engineering to suit project requirements. The layout of the control room shall be finalised as per detailed engineering to suit project requirements. The minimum dimension of different rooms required for C.R. building shall be as per drawing. The CR building shall consist of the following:

- a. Control room
- b. S/s In-charge room
- c. Battery room

- d. Store room
- e. Toilet

An open space of 1 m minimum shall be provided on the periphery of the rows of panel and equipment generally in order to allow easy operator movement and access as well as maintenance.

Any future possibility of annexe building shall be taken care of while finalizing the layout of the control room building.

Minimum headroom of 3 M below soffit of beams/false ceiling shall be considered for rooms. The roof shall have four side sloping roof or flat roof as finalised during detailed engineering.

i. Design

a) The buildings shall be designed:

1. To the requirements of the National Building Code of India, and the standards quoted therein.
2. For the specified climatic & loading conditions.
3. To adequately suit the requirements of the equipment and apparatus contained in the buildings and in all respects to be compatible with the intended use and occupancy.
4. With a functional and economical space arrangement.
5. For a life expectancy of structure, systems and components not less than that of the equipment, which is contained in the building, provided regular maintenance is carried out.
6. Be aesthetically pleasing. Different buildings shall show a uniformity and consistency in architectural design.
7. To allow for easy access to equipment and maintenance of the equipment.
8. With, wherever required, fire retarding materials for walls, ceilings and doors, which would prevent supporting or spreading of fire.
9. Suitable expansion joints shall be provided in the longitudinal direction wherever necessary with provision of twin columns.
10. Individual members of the buildings frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion etc.
11. Permissible stresses for different load combinations shall be taken as per relevant IS Codes.
12. The building lighting shall be designed in accordance with the requirements of relevant section.
13. Seismic considerations as applicable.

ii. Design loads

Building structures shall be designed for the most critical combinations of dead loads, super- imposed loads, equipment loads, wind loads, seismic loads, and temperature loads.

Dead loads shall include the weight of structures complete with finishes, fixtures and partitions and should be taken as per IS: 1911.

Super-imposed loads in different areas shall include live loads, minor equipment loads, cable trays, small pipe racks/hangers and erection, operation and maintenance loads. Equipment loads shall constitute, if applicable, all load of equipments to be supported on the building frame.

The wind loads shall be computed as per IS 875, Seismic Coefficient method shall be used for the seismic analysis as per IS 1893 with importance factor 1.5.

Wind and Seismic forces shall not be considered to act simultaneously.

Floors/slabs shall be designed to carry loads imposed by equipment, cables piping, equipment and other loads associated with building. Floors shall be designed for live loads as per relevant IS. Cable and piping loads shall also be considered additionally for floors where these loads are expected.

For consideration of loads on structures, IS: 875 shall strictly adhere to. Any other load coming in the structure, not mentioned in IS 875 shall be calculated as per relevant IS code and NBC.

iii. Submission

The following information shall be submitted for review and approval to the IA/IA Representative:

1. Design criteria shall comprise the codes and standards used, applicable climatic data including wind loads, earthquake factors maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads, impact factors, safety factors and other relevant information.
2. Structural design calculations and drawing (including construction/fabrication) for all reinforced concrete and structural steel structures.
3. Fully, dimensioned concept plan including floor plans, cross sections, longitudinal sections, elevations and perspective view of each building. These drawings shall be drawn at a scale not smaller than 1:75 and shall identify the major building components.
4. Fully dimensioned drawings showing details and sections drawn to scales of sufficient size to clearly show sizes and configuration of the building components and the relationship between them.
5. Product information of building components and materials, including walls partitions flooring ceiling, roofing, door and windows and building finishes.
6. A detailed schedule of building finishes including colour schemes.
7. A door & window schedule showing door types and locations, door lock sets and latch sets and other door hardware.

Approval of the above information shall be obtained before ordering materials or starting fabrication or construction as applicable.

iv. Finish Schedule

1. The finishing schedule is given in subsequent clauses.
2. M.S. Ladder should be provided to access the control room roof from outside. Ladder shall be made up of ISMC 75x40 which will run as beam one meter apart and intermediate steps will be made up of 45x45x5 angle with rise of 300 mm. Red oxide primer shall be applied initially, then two coats of rich zinc paint shall be applied to avoid corrosion.

v. Flooring

Flooring in various rooms of control room building shall be as for detailed schedules given in Table -1

vi. Walls

Control room buildings shall be of framed superstructure. All walls shall be non-load bearing walls. Min. thickness of external walls shall be 230 mm (one brick) with 1:6 cement sand mortar.

vii. Plastering

All internal walls shall have minimum 12mm and 15 mm thick 1:6 cement sand plaster on either side of wall. The ceiling shall have 6mm thick 1:4 cement sand plaster.

viii. Finishing

All external surfaces shall have 18 mm cement plaster in two coats, under layer 12 mm thick cement plaster 1:5 and finished with a top layer 6 mm thick cement plaster 1:6 (DSR 13.19) with water proofing compound. The paint shall be antifungal quality of reputed brand suitable for masonry surfaces for high rainfall zone. White cement primer shall be used as per manufacturer's recommendation.

Internal finish Schedule is given Table - 1 below:

TABLE-1

S.No.	Location	Flooring & Skirting 150mm high	Wall Internal	Ceiling	Doors, Windows, Ventilators
1.	Control Room, Relay Room	Precast Terrazo tiles (DSR'02, item no. 11.29A.2 & 11.31.2	Oil bound washable distemper on smooth surface applied with 2mm thick Plaster of Paris putty. (DSR'02 – 13.40 A & 13.77.2)	White Wash (DSR'02 – 13.70.1)	1) Standard steel rolled section frames with 5 mm glass. DSR'02 – 10.12, 10.13 & 10.14 2) Flush door shutters -

					DSR'02 – 9.25.2
2.	Sub-station Incharge, Office, corridor, staff room.	Precast Terrazo tiles (DSR'02, item no. 11.29A.2 & 11.31.2	Oil bound washable distemper on smooth surface applied with POP putty. (DSR'02 – 13.40 A & 13.77.2)	White Wash (DSR'02 – 13.70.1)	1) Standard steel rolled section frames with 5 mm glass. DSR'02 – 10.12, 10.13 & 10.14 2) Flush door shutters - DSR'02 – 9.25.2
3.	Battery room	Acid and Alkali Resistant tiles. DSR'02 – 11.36 C. 1 & 11.36 C.1.1	Dado of acid resistant tile 1.2 M high & Paint above 1.2 M to ceiling. DSR'02 – 11.36 C. 2.1, 11.36C.2 & 13.96.1	Acid resistant Paint. DSR'02 –13.96.1	1) Standard steel rolled section frames with 5 mm glass. DSR'02 – 10.12, 10.13 & 10.14 2) Flush door shutters - DSR'02 – 9.25.2 Painted with acid resistant Paint. DSR'02 –13.96.1
4.	Toilet	Ceramic glazed tiles in flooring DSR'02 – 11.74	DADO glazed tile 2.1M high for toilet (DSR 02 - 11.73)	White Wash (DSR'02 – 13.70.1)	1) Standard steel rolled section frames with 5 mm glass. DSR'02 – 10.12, 10.13 & 10.14 2) Flush door shutters - DSR'02 – 9.25.2
5.	Other areas not specified	Terrazo tiles (DSR'02 - 11.29A.2 & 11.31.20	Oil bound distemper, DSR'02 - 13.40A & 13.77	White Wash (DSR'02 – 13.70.1)	

Note: DSR item references (DSR-2002) to be read with CPWD specifications are only for material and workmanship guidance of the Contractors.

ix. Roof

Roof of the C.R. Building shall consist of Cast-in-situ RCC slab treated with a water proofing system which shall be an integral cement based treatment conforming to CPWD specification (item no. 25.8 of DSR 2002). The water proofing treatment shall be of following operations:

- i. Applying and grouting a slurry coat of neat cement using 2.75 kg/m^2 of cement admixed with proprietary water proofing compounds conforming to IS: 2645 over the RCC slab including cleaning the surface before treatment.
- ii. Laying cement concrete using broken bricks/brick bats 25mm to 100mm size with 50% of cement mortar 1:5 (1 cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 over 20mm thick layer of cement

mortar of min 1:5 (Cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 to required slope and treating similarly the adjoining walls upto 300mm height including rounding of junctions of walls and slabs.

- iii. After two days of proper curing applying a second coat of cement slurry admixed with proprietary water proofing compound conforming to IS: 2645.
- iv. Finishing the surface with 20mm thick joint less cement mortar of mix 1:4 (1 cement: 4 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 and finally finishing the surface with trowel with neat cement slurry and making of 300 x 300 mm square.
- v. The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the IA/IA Representative.

With average thickness of 120 mm and minimum thickness at khurra at 65 mm.

x. Glazing

Minimum thickness of glazing shall be 5.0 mm. as per IS: 2835.

xi. Doors and Windows

The details of doors and windows of the control room building shall be as per finish schedule Table-1 and tender drawing with the relevant IS code. Rolling steel shutters and rolling steel grills shall be provided as per layout and requirement of buildings. Paints used in the work shall be of best quality specified in CPWD specification.

xii. Plumbing & Sanitation

1. All plumbing and sanitation shall be executed to comply with the requirements of the appropriate byelaws, rules and regulations of the Local Authority having jurisdiction over such matters. The Contractor shall arrange for all necessary formalities to be met in regard to inspection, testing, obtaining approval and giving notices etc.
2. PVC syntax or equivalent make Roof water tank of adequate capacity depending on the number of users for 24 hours storage shall be provided. Minimum 1 Nos. 500 liters capacity shall be provided.
3. Galvanized MS pipe of medium class conforming to IS: 1239 shall be used for internal & external piping work for potable water supply.
4. Sand CI pipes with lead joints conforming to IS: 1729 shall be used for sanitary works above ground level.
5. Each toilet shall have the following minimum fittings.
 - (a) WC (Western type) 390 mm high with toilet paper roll holder and all fittings
Or
WC (Indian Type) Orissa Pattern (580 x 440 mm) with all fittings (both types of WCs shall be provided at alternate locations).
 - (b) Urinal (430 x 260 x 350 mm size) with all fittings.

- (c) Wash basin (550 x 400 mm) with all fittings.
 - (d) Bathroom mirror (600 x 450 x 6 mm thick) hard board backing
 - (e) CP brass towel rail (600 x 20 mm) with C.P. brass brackets
 - (f) Soap holder and liquid soap dispenser.
6. All fittings, fastener, grating shall be chromium plated.
7. All sanitary fixtures and fittings shall be of approved quality and type manufactured by well known manufacturers. All items brought to site must bear identification marks of the type of the Manufacturer.
8. Soil, waste and drain pipes, for underground works shall be stoneware for areas not subject to traffic load. Heavy-duty cast iron pipes shall be used otherwise.
9. In case of Augmentation/R&M of existing substation, amount of work shall be envisaged by contract for lump sum quotation.

12.00 Miscellaneous General Requirements

1. Dense concrete with controlled water cement ratio as per IS-code shall be used for all underground concrete structures such as pump-house, tanks, water retaining structures, cable and pipe trenches etc. for achieving water-tightness.
2. All joints including construction and expansion joints for the water retaining structures shall be made water tight by using PVC ribbed water stops with central bulb. However, kicker type (externally placed) PVC water stops shall be used for the base slab and in other areas where it is required to facilitate concreting. The minimum thickness of PVC water stops shall be 5 mm and minimum width shall be 230 mm.
3. All steel sections and fabricated structures that are required to be transported on sea shall be provided with anti corrosive paint to take care of sea worthiness.
4. All mild steel parts used in the water retaining structures shall be hot-double dip galvanised. The minimum coating of the zinc shall be 750 gm/sq. m. for galvanised structures and shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. The galvanizing shall be followed by the application of an etching primer and dipping in black bitumen in accordance with BS: 3416.
5. A screed concrete layer not less than 100 mm thick and of grade not weaker than M10 conforming to IS: 456-1978 shall be provided below all water retaining structures. A sliding layer of bitumen paper or craft paper shall be provided over the screed layer to destroy the bond between the screed and the base slab concrete of the water retaining structures.
6. Bricks having minimum 75kg/cm² compressive strength can only be used for masonry work. Contractor shall ascertain himself at site regarding the availability of bricks of minimum 75kg/cm² compressive strength before submitting his offer.

7. Doors and windows on external walls of the buildings (other than areas provided, with insulated metal claddings) shall be provided with RCC sunshade over the openings with 300 mm projection on either side of the openings. Projection of sunshade from the wall shall be minimum 450 mm over window openings and 750 mm over door openings.
8. Service ladder shall be provided for access to all roofs.
9. Angles 45x45x5 mm (minimum) with lugs shall be provided for edge protection all round cut outs/openings in floor slab, edges of drains supporting grating covers, edges of RCC cable/pipe trenches supporting covers, edges of manholes supporting covers, supporting edges of manhole precast cover and any other place where breakage of corners of concrete is expected.
10. Anti termite chemical treatment shall be given to column pits, wall trenches, foundations of buildings, filling below the floors etc. as per IS: 6313 and other relevant Indian Standards.
11. All rungs for ladder shall also be galvanised as per IS: 277 medium classes.
12. For all civil works covered under this specification, nominal mix by volume batching as per CPWD specification is intended. The relationship of grade of concrete and ratio of ingredients shall be as below:

Sl.No.	Mix	Cement	Sand	Coarse aggregate of 20 mm down grade as per IS 383
1.	M 10	1	3	6
2.	M 15	1	2	4
3.	M 20	1	1.5	3

The material specification, workmanship and acceptance criteria shall be as per relevant clauses of CPWD specification and approved standard Field Quality Plan.

13. The details given in tender drawings shall be considered along with details available in this section of the specification while deciding various components of the building.

14. Items/components of buildings not explicitly covered in the specification but required for completion of the project shall be deemed to be included in the scope.

13.00 Interfacing

The proper coordination & execution of all interfacing civil works activities like fixing of conduits in roofs/walls/floors, fixing of foundation bolts, fixing of lighting fixtures, fixing of supports/embedment, provision of cutouts etc. shall be the sole

responsibility of the Contractor. He shall plan all such activities in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling, breakage etc. is reduced to minimum.

14.00 Water Supply

PART 1 - Contractor shall make its own arrangement for construction water.

PART 2 - The Contractor shall carry out all the plumbing/erection works required for supply of water in control room building.

(iii) The details of tanks, pipes, fittings, fixtures etc for water supply are given elsewhere in the specification under respective sections.

(iv) A scheme shall be prepared by the Contractor indicating the layout and details of water supply which shall be got approved by the IA/IA Representative before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works.

(v) Bore wells and pumps for water supply are in the scope of Contractor meeting the day-to-day requirement of the water supply.

(vi) If the water is supplied by Municipal Corporation then bore well for water supply purposes is not required to be carried out by Contractor. Contractor shall also make necessary arrangement /formalities to receive water connection from corporation.

15.00 Sewerage System

(i) Sewerage system shall be provided for control room building.

(ii) The Contractor shall construct septic tank and soak pit suitable for 5 users if outside of Municipal Corporation zone. Otherwise, all necessary arrangement for the disposal of sewerage to the Municipal Corporation's end shall be arranged by the Contractor at his own cost for regularizing the disposal activity.

(iii) The septic tank and soak pit shall be constructed as per enclosed tender drawing.

16.00 Statutory Rules

- a. Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable for the State). Fire Safety Rules of Tariff Advisory Committee, Water Act for pollution control etc.
- b. Provisions for fire proof doors, no. of staircases, fire separation wall, plastering on structural members (in fire prone areas) etc. shall be made according to the recommendations of Tariff Advisory Committee.
- c. Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.
- d. Requirement of sulphate resistant cement (SRC) for sub structural works shall be decided in accordance with the Indian Standards based on the findings of the detailed soil investigation to be carried out by the Bidder.
- e. Foundation system adopted by Bidder shall ensure that relative settlement and other criteria shall be as per provision in IS: 1904 and other Indian Standards

- f. All water retaining structures designed as un-cracked section shall also be tested for water tightness at full water level in accordance with clause no. 10 of IS: 3370 (Part-I).
- g. Construction joints shall be as per IS: 456.
- h. All underground concrete structures like water retaining structures etc. shall have plasticizer cum water proofing cement additive conforming to IS: 9103. In addition, limit on permeability as given in IS: 2645 shall also be met with. The concrete surface of these structures in contact with earth shall also be provided with two coat of bituminous painting for water/damp proofing. In case of water leakage in the above structures, Injection Method shall be applied for repairing the leakage.
- i. All building/construction materials shall conform to the best quality specified in CPWD specifications if not otherwise mentioned in this specification.
- j. All tests as required in the standard field quality plans have to be carried out.

17.00 Fencing

a. Product materials for fencing

The minimum requirements are as follows:

i. Chain Link fence fabric in accordance to IS-2721

1.	Size of mesh	:	75 mm
2.	Nominal wire size	:	4.0 mm dia
3.	Width of chain link	:	2000 mm
4.	Class of zinc coating	:	medium
5.	Zinc coated after weaving.		

ii. Posts

Angle Section

Intermediate : L 65 x 65 x 6

Straining posts : L 65 x 65 x 6

Stay post : L 65 x 65 x 6

1. All structural steel shall conform to IS: 2062 and shall be painted with a coat of approved steel primer and two coats of synthetic enamel paint.

2. The Chain Link fabric shall be fixed to the post at the top and bottom of the fence by welding/fixing 50 mm MS flat all through its length.
3. Fencing top shall be either of galvanised barbed wire or tape. Barbed wire shall conform to IS: 278.
4. The barbed wire may consist of not more than two splices per reel. The barbed wire shall be formed by twisting two line wires, one containing the barbs. The barbed wire shall be designated as A-4 IS: 278 and shall be galvanized.
5. Above chain link, 3-rows (6 nos) of barbed tape/wire shall be provided in each arm of the Y shaped barbed arm at top.
6. With barbed tape/wire above the chain link fence, the total fence height shall be minimum 2500 mm above finished gravel level.
7. Barbed tape/wire arms shall be same as intermediate and straining post.
8. Tension wire: single strand, high tensile, galvanised steel wire, 4 mm diameter.
9. Fittings and hardware: cast aluminum alloy or galvanized steel, malleable or ductile cast iron turnbuckles to be drop forged.
10. GI chain link mesh shall be as per IS: 2721. Mesh size 75 mm and nominal wire size shall be 4.0 mm diameter.

On the results of these additional tests, the whole or portion of the barbed wire/tape shall be accepted or discarded by the Purchaser, as the case may be.

b. Installation

1. Contractor shall submit the fencing drawing Fence shall be installed along lines shown on approved drawings.
2. Post holes shall be excavated by approved methods.
3. Intermediate posts shall be spaced 2.5 m apart measured parallel to ground surface.
4. Straining posts shall be installed at equal intervals not exceeding 25.0 m.
5. Straining posts shall be installed at sharp changes in grade, at corners, at change of direction and where directed.
6. All corner post will have two-stay post and every tenth post will have a transverse stay post.
7. Posts shall be set in 1:2:4 plain cement concrete Blocks of minimum dimension 400 mm x 400 mm x 1000 mm deep Concrete work shall conform to relevant clause. Post shall be braced and held in plumb position and true alignment and elevation until concrete has set.
8. Fence fabric shall not be installed until concrete has cured a minimum of 7 days.
9. Bottom and top of the fence fabric shall be fixed with MS flats of 50 mm x 6mm (min).

10. Fence fabric shall be laid out with barbed edge on top, stretched tightly and shall be fastened to intermediate, post gate and straining post with 50 x 6 flats.
11. Fabric shall be secured to tension wires with tie wires at 400 mm intervals. Tie wires shall be given not less than two twists.
12. Barbed tape shall be spliced with standard wire splices.
13. Barbed tape shall be stretched to have uniform tension.
14. Barbed tape shall be attached to barbed wire arms with approved metal clips.
15. Toe wall of one Brick/Random Rubble masonry, with notches over 75 mm thick PCC (1:4:8) shall be provided below all fencing and shall be minimum 200 mm above and 200 mm below finished ground level. All exposed surfaces of brick toe wall shall be provided with 1:6 cement sand plaster and coated with two coats of colour wash with a base coat of white wash with lime. Rubble masonry toe wall shall be with raised & cut pointing and 50 mm PCC (1:2:4) band coping.
16. Proper earthing shall be done for fencing also.

13.10. LT AB Cable Reconductoring Work

1. Survey

1.1. Survey

The Contractor shall carry out a GPS based survey of existing bare conductor LT distribution lines in the habitation. The Survey should cover Pole by pole survey of all the bare conductor lines to identify the location of poles and phase configuration, pole condition, Existing stays / struts, Existing street lamp connections, Location and capacity of the connected distribution transformer (DTR) to each LT line, Connection points of any existing ABC lines connected to the bare conductor lines should be identified. The length of such ABC lines and total service connections provided through this line should be indicated on the map at this point, Load readings for each LT feeder. Upon completion of the survey the Contractor is required to develop the Single Line Diagram (SLD-A) indicating the survey Information and Schedule of network survey information (Schedule – A).

1.2. Load Readings

Load readings of each LT feeder shall be taken before and after proposed ABC conversions. This is required to monitor actual demand reductions achieved following ABC conversions.

Load currents on each phase and the neutral in respective LT feeder shall be taken on four different occasions per day before and after completion of ABC conversion work. The load current measurements shall be decided by Engineer in Charge. Load reading before ABC conversions shall be taken when carrying out the survey and recorded in Schedule-A. Load readings after ABC conversions shall be provided to the IA/Engineer in charge within one week from completion of works.

1.3. Network Design for ABC Conversions

Contractor should prepare details of proposed ABC conversions for respective habitation in accordance with these guidelines and prepare Single line diagram indicating proposed ABC conversions (SLD-B) and Schedule of proposed ABC conversions (Schedule -B). while preparing SLD, loading in distribution transformer must be examined. On completion of work, average day-loading in distribution transformer should limit 80-85% only. Contractor

1.4. Load Balancing

When preparing ABC conversion schedule (Schedule-B), phase connections for single phase Distribution Box/SMC Distribution Boxes shall be determined so that total number of single phase consumers are balanced across the three phases of a given feeder.

2. Conversion of bare conductor lines to ABC

2.1. AB Cable types and Sizes

1,1 kV voltage grade XLPE insulated aluminum conductor and aluminum alloy bare neutral messenger type cables shall be used for proposed ABC conversions. The AB cables provided shall fully comply with technical specifications provided in this tender document.

The following **standard sizes** of AB cables shall be used:

- ABC16-SP : 1X16 mm² (ph)+1X25 mm² (bare messenger cum neutral) +1x16 mm² (insulated street lighting cable)
- ABC50 : 3X50 mm² (ph)+1x35 mm² (bare messenger cum neutral) +1x16 mm² (insulated street lighting)
- ABC95 : 3X95 mm² (ph)+1x70 mm² (bare messenger cum neutral) +1x16 mm² (insulated street lighting)

2.2. Vertical and Horizontal Clearances

all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

As per ISS 162-1961 minimum electrical clearance from live part to earth and safety clearance in case of different voltage must be kept as follows:

Voltage	Electrical Clearance (mm)		Safety Clearance in SIS (mm)
	Phase - Earth	Phase - Phase	
33kV	381	432	2740
66kV	658	786	3050

Minimum Clearance Between Power Lines (mtr.) :			
kV	11	33	66
11	2.44	2.44	2.44
33		2.44	2.44
66			2.44

2.3. Installation of AB Cables

- Prior to installation of AB cables, all pole works including stay/struts works should be completed as per scope of works provided in proceeding sections. (i.e installation of new poles, pole replacements, pole re-alignment, installation of pole supports).

All ABC accessories used for installation works shall conform to technical specification provided in this document.

3.1. Installation of clamp assemblies

AB cable should be installed on poles using anchoring and suspension clamps according to the approved drawings by the IA/IA Representative. Samples of complete clamp assemblies shall be approved by the Project Manger prior to use.

Anchoring clamps shall be used at the beginning and end of each cable run, at a major change in direction, terminal poles and at T-off points. Suspension clams shall be used at other intermediate points.

It should be noted that different clamps are specified for cable ranges 25-50 sqmm and 70-95 sqmm. These have different dimensional and maximum load specifications. If ABC manufacturer recommends any alternate clamps it should be approved by the Project Manger prior to use.

Stainless steel straps and buckles shall be used for fixing pole brackets to the pole as shown in drawings. Strap binding tool shall be used for tensioning and cutting the straps.

Separation of neutral messenger for tensioning and fixing to the clamp should be done using plastic phase separators. Weather resistant black nylon ties should be used for typing insulated conductors to the neutral messenger at either side of suspension clamps, to prevent the phase conductors from chatting against suspension clamp.

3.2. Stringing of AB cable

Stringing of AB cables shall be done in a proper manner ensuring insulated conductors do not get damaged during installation. Dragging the ABC on the ground is not permitted. Pulleys installed on poles shall be used to pull AB cables.

Minimum clearance above ground to line shall be maintained. Sag tension charts for installing AB cables shall be developed by the Contractor taking into consideration of cable characteristics, maximum / minimum temperatures and maximum wind pressure as per service conditions provided by MSEDCL. Based on this clear guidelines shall be provided to linesmen to ensure bare neutral messenger is pulled at appropriate tension so that;

- Required ground clearances are maintained, and
- Messenger conductor tension is maintained well below its breaking load at all temperatures.

Dynamometer method or sag method may be used to ensure appropriate tension of neutral messenger during installation. Over tensioning of neutral messenger should be avoided to ensure its tension does not exceed permissible loading limits at low temperatures. Loose spans of AB cable should be avoided to maintain permissible maximum sag at high temperatures. Loose spans may only be allowed for short spans in special cases. This applies when there are practical difficulties to install necessary stays or struts as required at a t-off point. A short loose span of AB cable may be used in this case to transfer the stay / strut support point upstream or downstream of the line.

Stringing of AB cable shall be done using proper equipment such as stringing blocks with plastic coated pulleys, pulling (come along) clamp, cable hoist and pulling tool, dynamometer etc. Proper equipment recommended by the ABC manufacturer shall be used to avoid any damage to the cable during installation. Temporary stays or strut poles shall be employed as necessary during stringing operation to ensure safety of personnel and equipment. Phasing of insulated conductors shall be identified by one, two and three ridges on the XLPE insulation. Same phasing shall be maintained accordingly through the line. Interchanging of phasing at any connection point is not permitted.

In order to ensure durability of AB cables and to prevent possibility of failures due to effects of water treeing, any exposed parts of phase conductors or open cuts of insulation are strictly not permitted. Hence all connectors to be used in ABC line shall be pre-insulated type or bare connectors covered by heat shrinkable tubing or GelWrap sleeves. For installing connectors proper equipment such as insulation stripping tool, ratchet cable cutter, hydraulic compression tool with compression dies shall be used.

All cable ends shall be properly sealed by pre-moulded or heat-shrinkable type end caps.

Samples of all ABC accessories including connectors shall be approved by the IA/IA Representative prior to use.

Mid-span joints shall be generally avoided by properly planning stringing work. In exceptional cases where mid span joint is required, pre-insulated compression connectors shall be used. The joints for each phase shall be staggered along the cable. No mid-span joints are allowed for AB cable sections running across a street.

Insulated piercing connectors or non-tension mechanical connectors with heat shrinkable tubing shall be used for non-tension inline connections at anchoring points where necessary.

3.3. AB cable connections to Distribution Transformers

AB cables shall be connected to bus-bars or protection equipment terminals of the LT feeder Distribution Boards by means of pre-insulated compression lugs and aluminium / bi-metallic strips.

Where no Distribution Board is available AB cable shall be directly connected to the distribution transformer bushing terminals using insulated compression lugs. In this case additional length of AB cable shall be provided by means of a loop to facilitate future connection to the Distribution Board or fuses.

3.4. Earthing of Poles / ABC neutral messenger conductor

Earthing shall generally be carried out in accordance with the requirements of latest CEA regulations (as amended from time to time) and the relevant regulations of the Electricity Supply Authority

The Contractor shall ensure every 6th pole of ABC line including neutral messenger and any metallic hardware is earthed with spike earth (20x2500 mm) as per existing practice of MSEDCL. (for normal soil).

Poles shall be earthed using 8 SWG (7/4.0 mm) GI wire with 1 No. Coil/Spike/Pipe earth.

3.5. Pole Numbering

Each pole of the existing line shall be uniquely numbered as per pole numbering scheme followed by the IA. Pole number and other information as required by the IA should be painted on the pole.

3.6. Dismantling existing bare conductors and line hardware

Dismantling existing bare conductors and line hardware. Conductors and other line hardware including insulators, brackets, cross arms and bolts and nuts shall be carefully removed without causing damage to the existing poles. Bare conductors shall be removed in the longest length practicable for future re-use with a metal tag of description/ tag # of conductor, the said conductor shall be wound on empty conductor reels or made up in rolls.

Following dismantling works affected areas shall be cleaned and reinstated. All dismantled items shall remain the property of MSEDCL and Contractor shall deliver all salvaged materials to the designated MSEDCL warehouse as directed by the IA/IA Representative.

3.7. Parallel AB Cable lines

Parallel AB cable lines refers to installation of second ABC cable line on the existing poles as per design requirements approved by IA/IA Representative.

The scope of work for this item shall exclude (a) existing bare conductor line dismantling and (b) pole numbering requirements applicable for the scope of works specified above for 'conversion of bare conductor lines to ABC'.

3.8. Rates for Conversion of bare conductor lines to ABC

It should be noted that scope of work for this item relates to AB cable installation on existing poles. It excludes any additional works required on the existing poles or installation of new poles, installation of Distribution Box/SMC Distribution Boxes, stays etc. Separate BOQ items are provided for work associated with installation of new poles and replacement, re-alignment or relocation of existing poles, installation of stays and struts and installation of Distribution Box/SMC Distribution Boxes for AB cables.

4. Installation of LT Distribution Box/SMC Distribution Boxes for ABC**4.1. Types of LT Distribution Box/SMC Distribution Boxes**

The following types of LT Distribution Box/SMC Distribution Boxes (according to number of consumers to be connected) shall be selected:

- Type A : Single Phase, 1 Incoming (25 mm²)/ 6 outgoing (upto 10 mm²)
- Type B : Three Phase, 1 Incoming (35 mm²)/ 4 outgoing (upto 16 mm²)

4.2. Mounting Arrangement

Distribution Box/SMC Distribution Box (DB) shall be mounted on LT pole with galvanized MS clamp of 40x3 mm size.

4.3. Connection to AB Cable

2Cx25 sqmm or 4Cx35 sqmm Stranded cables shall be used to connect AB cable with single phase and three phase Distribution Box/SMC Distribution Box respectively. For connection to ABC, insulation piercing connectors (IPC) and PG clamps of appropriate size shall be used.

Single phase Distribution Box/SMC Distribution Boxes shall be connected to specified phase as per Schedule-B in order to ensure load balancing in ABC line.

4.4. Connection of Consumer Service Cables

All existing consumer service cables shall be re-connected to the Distribution Box/SMC Distribution Box by the Contractor. In case existing consumer service connections are to be replaced with armoured service cables in a given habitation as determined by the IA/IA Representative, new armoured cable shall be connected to the Distribution Box/SMC Distribution Box.

5. Replacement of Existing Consumer Service Connections

5.1. Service Connection Types

The applicable service connection types are as follows;

SC Type	Connected Load No of Phases / Contract Dmd	Service Cable Size (cores / sqmm)
SP-1	Single Phase / upto 4 kW	2 x 4 mm ²
TP-1	Three Phase / upto 4 kW	4 x 4 mm ²
TP-2	Three Phase / above 4 kW	4 x 4 mm ²

5.2. Service Cable Types

The service cable shall be 1.1 KV grade PVC insulated, PVC sheathed, armoured multicore **stranded** aluminium cable as per sizes indicated in above table

5.3. Service Cable Span

Permissible maximum span for service cable shall be 30 m. In isolated cases this limit may be extended with the approval of IA/IA Representative provided that required ground clearance is maintained with additional supports where necessary.

Existing service cables shall be replaced with armored service cables only in certain specified areas which are high theft prone areas. This will be specified by the IA/IA Representative during execution. No service cable replacements shall be carried out without the approval of IA/MSEDCL.

In this case existing service cables shall be replaced with new armoured cables. Existing un-armoured service cables shall be removed and returned to MSEDCL warehouse. Any non-standard supports used as supports for existing service cables shall also be removed.

New armoured service cables shall be drawn from the LT Distribution Box/SMC Distribution Box upto the meter board as shown in drawings. The service wire is to be hanged on supportive GI wire between pole support and the house. 7/3.15 mm (10 SWG) & 7/4.00 mm (8 SWG) GI wires shall be used for single phase and three phase services respectively.

Before installing service wires and GI wire, GI pipe / MS Angle on the consumer premises is to be erected using clamps/nails/proper binding etc. In case of hut or poor structure at consumer premises, GI pipe is to clamp on wooden planks/wooden structure existing in the house. The GI pipe should be supported for neutralizing tension by means of GI tie wire support. In pukka/brickwork/cement concrete foundations, house, GI support pipe is to be clamped by means of MS clips.

New service cable shall be connected to existing consumer meter terminals or incoming fuse / MCB / MCCB terminals. Care should be taken not to damage the existing meters in the process.

20mm dia PVC conduit pipes shall be used to take down service cable from the roof to the meter box along the walls. The service cable shall be drawn inside PVC pipes from roof upto the meter board.

Terminal cover of the meter or fuses shall be sealed upon connection of new service cable as arranged with the IA.

Earth terminal point shall be provided at meter board via bearer GI wire. This point shall be connected with the proper earthing system through GI wire. 10mm diameter earth knob in form of bolt and nut is to be installed on energy meter board.

All work required to install service cable from LT Distribution Box/SMC Distribution Box upto the meter board shall be carried out as per drawings. This includes GI wire for supporting service cables from LT Distribution Box/SMC Distribution Box upto the consumer premises, MS angle fixed at roof, clamp with bolts nuts and flat iron for fixing GI wire on pole, clamps for fixing cable to GI wire, PVC conduit pipes and accessories to draw the service cable from roof upto the meter board.

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6. Installation of Poles

6.1. Types of pole installation works for ABC conversions

The following types of pole installation works applicable for ABC conversions as per site requirements specified in the table below;

#	Type	Site Requirements
1	Installation of new poles	<ul style="list-style-type: none"> New pole to be used as an intermediate pole in the existing line to address excessive spans or other requirements. When there is a need to do minor extensions to the existing line in order to minimize excessive service cable lengths to existing consumers. To shift existing lines due to safety/clearance issues.
2	Replacement of existing (unusable) poles	<ul style="list-style-type: none"> To replace existing poles which are damaged / corroded and cannot be re-used. To replace of existing non-standard line supports such as temporary structures including supports embedded in buildings.
3	Re-location of existing poles	<ul style="list-style-type: none"> To shift existing poles To shift existing lines due to safety/clearance issues
4	Re-alignment of existing poles	<ul style="list-style-type: none"> To straighten the poles that are inclined in a particular direction but in re-usable condition

6.2. Types of poles

For works relating to new poles and replacement of poles, poles according to specification shall be used.

For works relating to re-location or realignment of existing poles the available existing pole (any type) may be re-used provided that it is in re-usable condition.

7. Erection of Poles

7.1. Removal of existing poles for re-use or disposal

All unusable poles or non-standard line supports in the existing LT lines shall be removed and disposed. If the existing pole is removed for re-use adequate measures should be taken not to damage the pole during removal.

Existing poles shall be removed by pulling the complete pole from the ground; poles shall not be cut off at the ground line. Pole shall be cleaned and any material attached with the pole (including concrete) shall be removed. The RCC base plate may be removed and re-used if it is in re-usable condition.

Pits shall be backfilled and compacted completely with sufficient added backfill piled above grade to prevent depressions being created by natural compaction.

Contractor shall be responsible for disposal of unusable poles or non-standard line support structures after taking approval of the IA/ Engineer In- Charge.

7.2. Erection of new or existing poles

For 8/8.5 m PCC poles pole pit shall be excavated as per details provided in drawing # <REC/DDUGJY/GEN/02 (for reference). Pole shall be placed on the RCC base pad made as per drawing # REC/DDUGJY/GEN/05A (for reference). PCC pole pit shall be refilled with 200 mm average size of boulder mixed with excavated earth. Proper ramming shall be performed for better compaction. Pole shall be erected fully vertical and firmly fixed to ground and shall not wobble.

7.3. Erection of poles with concrete foundation

Concrete foundations shall be used to erect terminal / tension poles and poles in water logged areas or for all locations as instructed by the IA/IA Representative. Details of concrete foundation for PCC poles (for reference) are provided in drawing # REC/DDUGJY/GEN/01.

7.4. Re-alignment of existing pole

Existing poles that are inclined in a particular direction shall be re-aligned / straightened by pulling, providing additional bouldering, concreting and re-compacting as necessary. Upon re-alignment pole shall be erected fully vertical and firmly fixed to ground and shall not wobble. If necessary pole may be completely removed and re-installed.

7.5. Earthing of poles

Earthing of poles shall be carried out as per CEA regulations and existing practice of MS&EDCL.

7.6. Pole Numbering

Requirements specified in section 3.9 with respect pole numbering shall also be applicable for new poles or pole replacements indicated in this section.

8. Installation of Stays and Struts

8.1. Installation of Stays (Guys)

Stays shall be installed to nullify tension on poles due to tension of AB cable at terminal, angle, cut-point and T-off positions. Stays may also be installed at steep gradient locations as required. Along the straight run stays shall be installed at minimum two locations in 1 km.

If there are no existing stays installed at such locations in the existing line, such poles shall be identified and included in Schedule-B for installation of new stays. In addition required stays for proposed new and relocated poles shall also be included.

10 SWG stay wire (7/ 3.15 mm) with 16 mm stay rod shall be used for 11 kV / LT lines. Stay shall be installed in the opposite direction of resultant force due to AB cable tension in order to nullify the same.

If the stay 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.

8.2. Installation of Struts

The struts may be used only in case where stays cannot be installed due to physical obstacles or limitations. Strut shall be applied in the same direction of resultant force due to AB cable tension in order to nullify the same.

8.3. Installation of Stays

Stay assembly comprising of turn buckle assembly, anchor rod and plate, stay insulator, thimble and GI stay wire shall be supplied and installed as indicated in drawing # EC/DDUGJY/GEN/09B (reference).

In general, the stay should be applied on the pole as close as possible to the load center. The angle between stay wire and pole shall be between 45° – 60° . Where there are issues obtaining specified angle due to physical obstacles, bow (outrigger) stay arrangement may be considered with the approval of the IA/IA Representative. In case of critical space issues, fly stays may also be considered subject to approval of the IA/IA Representative. (Reference : REC Drawing # G4).

Concreting of stay pit shall be done as shown in drawings except for firm soil where compacting with necessary aggregates shall be done.

Stay wire shall be properly tightened after installation and allowing sufficient time for setting concrete. Contractor shall ensure all stays in the existing line are properly tightened including new and existing stays.

8.4. Installation of Strut pole

Installation of strut pole shall be carried out using 8 m PCC pole and pole brackets as shown in drawing # REC/DDUGJY/GEN/10. Strut pole shall be installed with the RCC base plate. Angle between the line and strut pole shall be 45° .

9. Re-Connecting Existing Street Lamps to ABC

If there are existing street lamps connected to the bare conductor line, these street lamps shall be re-connected to ABC line through the street lighting conductor using IPC (for insulated conductor) and PG clamps (for bare neutral messenger). This work scope is limited to providing connection to existing street lamps only.

10. Shutdown during execution of works :

The Contractor is required to take shutdown to execute reconductering and all other works wherever needed. During shut down, safety of system and operating manpower shall be ensured by Contractor.

Shut down shall be planned with concerned substation incharge well in advance. This may subject to exigencies leading to cancellation of requisition if situation so desire. Contractor shall be responsible to take advance action on resource mobilization (men, materials and machine) well in advance to perform shut down works. Adequate manpower shall be mobilise so as to take-up the works in parallel at ll supports on given shut-down area. Contractor shall deply well educated and experience engineer to take care of shut down, eand earthing of lines, check clearances on completion of works, return shut down and ensure re-energisation of section/part of line. He shall be available at site for taking shut-down, during execution of works, return of shut down and re-energisation of line. Safety of working crew shall be looked after by him. He must be a trained person having requisite experience of shut-down works. He must be well aware of LT/HT networks and their supply sources.

On completion of work, Contractor shall provide as built GA drawings GPS making of connected consumers and their type of connection (single/three phase), domestic/commercial/agriculture etc. and connected loads.

13.11. Construction of New 11 kV Feeders and Associated Works**1. Construction of new 11 kV lines****1.1. Survey**

Mapping of routes of proposed 11 KV lines shall be done by GPS survey. While surveying, existing electrical infrastructure, existing agriculture private tube well (PTW) locations, capacity and load details shall be mapped during survey.

Upon completion of the survey the Contractor shall provide a survey report with the following information;

- Single line diagram of the route survey and proposed line alignment details mapped and provided in a standard mapping software. This should also include information such as existing electrical infrastructure and PTW information.
- Road and railway crossing points of the proposed 11 kV line shall be marked on the single line diagram.
- Line sections proposed for 11 kV AB (Aerial Bundled) cables due to vegetation, safety and forest clearance issues (if applicable) shall be marked on the single line diagram. Lengths of proposed AB cable line sections shall be indicated.
- Schedule of location wise pumps to be fed through new feeder or alternatively general consumer distribution transformers to be transferred to new feeder for making dedicated feeder for agricultural consumers. This schedule should include location / capacity of the existing distribution transformers to be transferred and location /capacity and load of agriculture PTWs with reference to the locations of the single line diagram.
- Estimated peak demand on each feeder/s upon implementation and percentage voltage regulation at farthest point on various spur sections.
- Single line diagram of the 33/11 kV substation indicating of 11 kV outgoing feeder to connect the new feeder. If existing spare feeder is unavailable list of works to be performed at the substation to install additional new feeder. The survey report shall be submitted in a suitable format for uploading to the web portal and for printing. The survey report will be used as the basic document for execution of work upon approval by the IA/IA Representative. Upon completion of work, as built single line diagram shall be provided with relevant information of the works carried out.
- On the survey drawings Line to line crossing (HT/LT, LT/LT, HT/HT/Railways Crossing) details to be marked with available clearances.
- Efforts shall be taken to avoid long zig-zag lines and too many line-to-line crossing while surveying and finalizing route maps/SLD.

1.2. Statutory Clearances

For execution of new 11 KV UG Cable construction work, all statutory clearances shall be obtained by the Contractor coordinating through the IA. These include road crossing clearances, railway crossing approvals, way leave clearance and any approvals needed from local authorities, road authorities and other regulatory authorities. All statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

1.3. Construction of new 11 kV lines

Upon approval from the IA/IA Representative the Contractor shall carry out construction work in full compliance with the technical instructions, specifications and drawings provided in this Volume.

1.4. Stringing of conductors / AB cables

Minimum safety clearances shall be maintained in the 11 kV line. Sag tension charts for installing ACSR conductors or AB cables shall be developed by the Contractor taking into consideration of conductor / cable characteristics, maximum / minimum temperatures and design wind pressure as per service conditions.

Based on this, clear guidelines shall be provided to linesmen to ensure ACSR conductors or bare neutral messenger (for AB cables) are pulled at appropriate tension so that;

- (a) Required ground clearances are maintained and
- (b) Conductor tension is maintained well below its breaking load at all temperatures.

Dynamometer method or sag method may be used to ensure appropriate tensioning of conductors / cables during installation. Over tensioning of conductors should be avoided to ensure its tension does not exceed permissible loading limits at low temperatures. Loose spans of conductors should be avoided to maintain permissible maximum sag at high temperatures. Loose spans may only be allowed for short spans in special cases. This applies when there are practical difficulties to install necessary stays or struts as required at a t-off point. A short loose span may be used in this case to transfer the stay / strut support point upstream or downstream of the line.

Stringing of conductors / AB cable shall be done using proper equipment as recommended by the manufacturer to avoid any damage to the conductor / cable during installation. Temporary stays or strut poles shall be employed as necessary during stringing operation to ensure safety of personnel and equipment.

1.5. 11 kV line for underground railway crossing

Detail survey of location of railway crossing shall be carried out by the Contractor to avoid multi-crossing at nearby location. Prior approval from railway authorities for execution of this work shall be obtained by the Contractor through the IA/IA Representative. Contractor should ensure timely completion of work during block period allocated by the railway authority by mobilizing adequate resources.

2 Nos. separate cables shall be laid in separate HDPE pipe enclosures per crossing. One cable to be kept as a spare. Horizontal Direct Drilling (HDD) shall be used for installation of cables below the railway tracks.

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1.6. Tree Cutting and Trimming

The Contractor shall count, mark with suitable quality of paint all the trees that are required to be cut/trimmed to obtain required wayleave clearance. Contractor shall pay compensation for any loss or damage for tree cutting due to Contractor's work. If forest clearance is envisaged for execution of work, clearance of forest department shall be arranged by the Contractor through the IA/IA Representative.

1.7. Installation of Distribution Box/SMC Distribution Boxes for LT lines

3 phase and single phase Distribution Box/SMC Distribution Boxes shall be supplied as per specifications and installed on poles according to number service connections for LT AB cable lines. When installing single phase Distribution Box/SMC Distribution Boxes they shall be connected to alternate phases of the AB cable in order to obtain adequate level of load balancing.

2. Extension of Substation Control Room Building

Extension of substation control room building shall be carried out as per instructions of the Project Manger to provide additional space for new outgoing feeder panels if required.

This work shall be carried out as instructed by the IA/IA Representative under the supervision of civil engineer / technical officer appointed by him. The Contractor shall be responsible to ensure building is extended in the same manner as existing building. The Contractor shall be responsible to provide necessary measures to ensure substation control operations are carried out without disruption during the construction period.

13.12. Underground Cabling**1. Survey**

The detailed survey shall be carried out for the approved feeders/spur lines by the Contractor and submitted for IA's approval. The Successful Tenderer shall carry out radar survey of the route using Ground penetrating Radar and determine route profile of any other utility cables, pipes etc along the route. The route survey and drilling profile shall be got approved and finalized by the Engineer-in-Charge prior to commencement of the drilling, HDPE pipe insertion and cable insertion.

2. The scope includes :

- Laying of underground 33 KV, XLPE HT Cable (3Cx300 sqmm)
- Laying of underground 11KV, XLPE HT Cable (3Cx185 sqmm)
- Laying of underground 1.1 KV, XLPE, LT Power Cable (3.5Cx240-204.79KM, 3.5Cx 150-227.39KM, 3.5Cx25 sqmm-44.74KM, 1Cx630 Sqmm -1.8KM and 1Cx400 sqmm-2.4KM)
- Laying of underground 1.1 KV, PVC, LT armoured Power Cable (4Cx25 sqmm)
- Laying of underground 1.1 KV,PVC, LT armoured Service Power Cable (4Cx10 sqmm - 56KM, 2Cx10 sqmm - 247KM)

3. Horizontal Direction Drilling

- 3.1. HDD or Horizontal Directional Drilling is a trenchless boring method for installing underground cables, pipes and conduits in a shallow curve along a prescribed bore path with the use of a surface-launched rig / machine, which minimises the disruption of the surrounding area, for example, roads and driveways. The laying of U/G cables shall normally be done direct in ground through trenchless boring by using HDPE pipes. However in exceptional circumstances the cables may have to be laid in covered trenches or in racks fixed to the walls or supported from the ceilings. The scope shall cover supply of all the material as per the BOQ, erection equipments, labour and all the other items required for the laying of the power cables. The cable route markers, at a maximum distance of 200 mtrs, and danger boards shall be provided for the information of all concerned and for their safety. Any additional requirement in terms of safety perspective shall be provided by the Contractor without any extra cost. It is the responsibility of the Contractor to maintain the required statutory clearances from other utility services. Any damage caused to any utility services/ human life / public property etc shall be the sole responsibility of the Contractor. The Contractor will lay the underground power cable in such a fashion that no straight through joints are required and only end terminations joints are required, however wherever the joints are required in HT cable then the same shall be carried out overhead on PCC poles structure. In exceptional circumstances such as where length of line is more than the standard cable length in drum and overhead jointing is not possible then straight through joints will be allowed. The Contractor shall have ISO 9001-2008/18001-2007
- 3.2. The Horizontal drilling shall be for a distance of not less than 90 mts at each stretch and subsequently thereafter. The reinstatement of road dug up for drilling at every 90 mts shall be incorporated in the price for Horizontal Directional Drilling.
- 3.3. Disposal of extra excavated material such as mud, slurry, stones etc shall be also included in the rate per meter of horizontal drilling and shall not be charged extra.
- 3.4. The trenchless technology shall be used with HDPE casing for the portion of the cable route such as road, railway, nullah crossing and without HDPE casing for major portion of the cable route. The outer diameter of the HDPE pipe shall be suitable for insertion in an 8" diameter horizontally drilled bore. The HDPE pipe shall be of PE 80 grade with pressure rating PN4 conforming to IS 4984/1995 and shall have wall thickness of 6.20 to 7.10 mm. The HDPE pipes shall be joined by using Butt welding and a 7/20 G.I wire shall be provided along the entire length of each pipe duct.
- 3.5. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe/cable, a drilling fluid mixing, delivery, and recovery system of sufficient capacity to successfully

complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a magnetic guidance system or walk over system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, and trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

- 3.6. The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the bulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pullback pressure during pullback operations.
- 3.7. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.
- 3.8. The drill head shall be steerable by changing its rotation and shall provide necessary cutting surfaces and drilling fluid jets.
- 3.9. Mud motors shall be of adequate power to turn the required drilling tools.
- 3.10. Drill Pipe shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

4. Accessories

- 4.1. This being a Turnkey contract, successful installation, commissioning & integration with existing system, of those equipment/accessories/material not specifically mentioned in the specifications, shall be the responsibility of Contractor. No extra payment shall be made for these inherent works.
- 4.2. He shall also supply all other associated equipment/ material/accessories not specifically mentioned in this tender specification but are required for successful and trouble free operation of the executed work as a whole. For that no extra payment shall be made to the Contractor.

5. Technical Standards

- 5.1. The electrical equipments and materials required during erection should be of high standard. Technical features of these equipments and materials must conform to the technical specification given in this bidding document. Wherever the same is not specified, it must conform to the relevant I.S for that material.
- 5.2. Materials conforming to other international standards, which ensure equal or higher quality than the standards mentioned above, shall also be acceptable. In case the bidders who wish to offer materials conforming to other standards, salient points of difference between standards adopted and specific standards shall be clearly brought out in the respective schedule. Four copies of such standards with authentic English version shall be furnished along with the offer.
- 5.3. Whenever a material or an article is specified or described by the name of a particular brand, manufacturer or trade mark, the specific item shall be understood as establishing type, function and quality desired. Products of other manufacturers may also be considered, provided sufficient information is furnished, so as to enable the IA to determine that the products are equivalent to those mentioned.
- 5.4. Materials supplied/used shall conform in all respects to the relevant Indian Standard Specification with latest amendments there to.

	Title	IS No.
1.	Cement	IS 269
2.	Steel	IS 6003/1970
3.	Fasteners	IS 6639/1972
4.	Concrete mix	IS 1343

5. RCC IS 456
6. Cable laying and jointing IS 1255

Installation work pertaining to equipment, cable laying etc should be in accordance with the applicable standards, safety codes etc.

6. Site Storage/ Transportation

- 6.1. It shall be the responsibility of the Contractor to store, move/transport from stores/storage yard etc., relevant items and accessories to the place of installation wherever necessary he will assemble all parts of equipment. In accordance with the specific installation instructions as directed by Site Engineer.
- 6.2. The stores should be dismantled and site cleared after the work is completed

7. Erection, Testing and Commissioning

- 7.1. All the works covered under the scope of the tender shall be done in accordance with the norms defined by the IA, unless the same is not specifically defined in the specification or with the provisions of Indian Electricity Rules/Acts/Other Government Rules/Regulations as prevalent at the time of execution of the job/work.
- 7.2. Installation shall be carried out strictly in accordance with the approved drawings Modifications, if any, required to suit site conditions, shall be carried out only with the prior approval of the Site Engineer. All such changes shall be incorporated in "As built" drawings to be furnished by the Contractor.
- 7.3. Responsibility for successful installation of other equipment accessories, purchased but not mentioned specifically above, and their commissioning shall be on Contractor. For all such items the Contractor shall be supplying all material and equipment required to accomplish the job complete in all respect.
- 7.4. Installation work pertaining to equipment, cable laying etc should be in accordance with the applicable standards, safety codes etc.
- 7.5. The Contractors shall themselves be responsible for timely arrangement/ procurement of all the raw materials required for the manufacture of all tendered items by them/ their and / or by their vendors.
- 7.6. While Repairing & Replacing the equipment, if any other equipment gets damaged due to negligent handling of the Contractor the same shall be replaced by the Contractor at his cost to the IA satisfaction.
- 7.7. He shall be responsible for dismantling of defective equipments, there proper handling and shifting.
- 7.8. Also he shall hand over the old & dismantled equipments/ material to the purchaser's local stores or other sites as per instructions of the purchaser for which no extra payment shall be made.
- 7.9. All charges on account of damages/losses/claims/thefts etc. involved under the conditions laid down above shall be borne by the Contractor. It's cost shall be recovered from his bills /security deposits /other assets.
- 7.10. In order to avoid hazards to personnel moving around, the equipment such as Transformer, Capacitor Banks, Switchgears etc. if required to be kept charged after installation till their commissioning, shall be cordoned off by suitable barriers to prevent accidental injury to personnel moving around.
- 7.11. Where the equipments/ assemblies are supplied in more than one part, the Contractor shall make all necessary mechanical and electrical connections between the sections. The Contractor shall also do necessary adjustment in the alignments required for its proper operation.
- 7.12. Care shall be taken in handling instruments relays and other delicate devices where instruments and relays are supplied separately they shall be mounted only after the associated switch gear/control panels are erected and aligned.
- 7.13. Precaution: The Contractor shall exercise all possible care to avoid damage to public utilities e.g. water/ sewage pipes telephone and power lines/cable already existing. In case of any accidental damage during the work, the Contractor shall be responsible to repair/replace the same at his own cost, and shall ensure that the purchaser is not put to any loss.
- 7.14. The Contractor shall have to provide proper lighting, barricading, signboards etc. at the work site as a necessary precautionary arrangement to avoid accident/ damage/ losses to the public /utilities/properties.
- 7.15. Site Solution: It may be possible due to some reasons or others that it would not be possible to work as per the procedure. In such case/cases, the solution to the problem shall be achieved by the purchaser with the consultation of Contractor, and the

Contractor shall work as per procedure proposed by the purchaser. Such cases shall in variably be informed to the engineer of the contract for which no extra payments shall be made.

- 7.16. Space Constraints: While executing the job it is quite possible that some of the specified work may not be carried out due to space/land/ other technical constraints etc. In such case the concerned IA, if required, may divert this work at some other site or cancel the left over portions of work.
- 7.17. The Contractor shall ensure that the equipment under erection as well as the work area and the site are kept clean to the satisfaction of the Engineer. In case, the Engineer is not satisfied about the cleanliness he will have the right to carry out the cleaning operations and expenditure incurred in this regard will be to Contractor's account. Packing cases and packing materials shall be promptly cleared from sites.

13.13. Specification for erection of 66 kV M/C, D/C tower / H-frame line :**1.1. General technical particulars for erection of 66 kv lines.****1.1.1. Scope :**

The erection work covered under these sections consists mainly of

- Distribution of all materials to erection site.
- Stub setting.
- Tower Erection.
- Cold line Stringing.
- Testing and commissioning and Guarantee of Line.

1.1.2. The Contractor shall be fully responsible for completing all the above works and till them are taken over by the MSEDCL.

1.1.3. The methods of erection are dealt within details, but are left to the Contractor who shall exercise his own judgment with regards to actual handling of materials and in deciding upon the best methods to be adopted in the erection of the towers, conductors and other materials.

1.2. Way leave/tree cutting and other construction :

1.2.1. The IA will arrange for write off way and for tree cutting clearance, the Contractor will instruct his laborers & staff to use minimum area while doing the work where there are standing crops. No person of the Contractor should pick in items from standing crops of fruits. The Contractor should take all possible steps to avoid or minimize damage to standing crops etc.

1.2.2. The Contractor should immediately notify and obstruction or hindrance from local community or the local authorities in the prosecution of the work to the concerned Engineer-in-charge, but should not deal directly in the matter. The Engineer-in-charge will arrange to remove the obstacles as soon as possible.

1.3. Access to locations :

1.3.1. It will be the Contractor's sole responsibility to take the materials up to the locations required. Any path way, temporary road or temporary bridge required will have to be provided by the Contractor at his cost. If for any reasons the above is not feasible the Contractor at his own cost shall have to arrange transportation by Head roads.

1.4. Distribution of materials :

1.4.1. The Contractor has to take delivery of tower materials/lines materials from the IA's stores and transport it to the respective tower erection sites and will be responsible for any damages to or loss of all materials at any stage during the Transportation or erection. The materials that will be issued by the IA will be in 'AS IS WHERE IS' conditions at the store centre of the IA in the area during working hours days. All the materials received by the Contractor shall be got insured for storages and erection risk by the

Contractor at his own cost. An indemnity Bond/Bonds have to be issued by the Contractor for the materials take over by him for erection.

1.4.2. On completion of the work all surplus tower and line materials including the excess Bolts & Nuts and stub materials shall be returned by the Contractor to the nearest respective stores of the IA as per the instructions of the Engineer-in-charge of the works at no extra cost to the IA.

1.4.3. The Contractor shall submit the complete material account immediately after the works is completed and in case not late than one month of completion and Handing over of the line.

1.5. Stub setting and foundations :-

1.5.1. The Contractor shall be fully responsible for correct setting of stubs in accordance with approved methods at the exact locations and alignments and in precisely correct level; stub setting templates to the supplied by the IA should be used for proper setting of stubs. The Contractor will be responsible for constructing the foundations in accordance with the design of each type of foundations supplied to him by the IA and as per approved final schedules.

1.5.2. The foundation work includes stone revetment, concrete or earth filling above ground level where necessary and stacking and tamping on the site of all surplus excavated soil. Surplus stone should be stacked within the tower base.

1.5.3. Classification of Soil :

1. Normal soil : Which can be readily removed ordinary spades, shovels viz Normal Soil, Black cotton soil, Hard & Soft Morrum and Yellow clay.
2. Soft Rock : Litterate, line stone or rock which break away chips or slabs.
3. Hard-Rock : Rock which may need chiseling or blasting.
4. wet Soil : Soil encounters in wet location.

1.5.4. Excavation for foundation :

1.5.4.1. The tenderer should quote different rates for different types of soil. The Contractor will be intimated the alternative that will be operated, the payment for excavation will be limited to guaranteed volume as per approved excavation drawings that will be furnished by the IA to the Contractor even though the Contractor may excavates more the sake or his own convenience. If the excavated depth is more than the depth shown in approved drawings, the additional depth should be filled in with lean concrete (1:4:8) at Contractor's cost.

1.5.5. Concrete :

1.5.5.1. The cement required shall be supplied by the Contractor approved by the IA/MSEDCL

1.5.5.2. All cement is used shall be accountable. If the quantity of cement utilized in the work is observed to be more than the permissible quantities worked out bases on the finally approved foundation drawings and subject to the maximum as per the guaranteed volumes, irrespective of the fact that the cost of cement is recovered from the Contractor's Bills.

The cement consumption for difference types of concrete shall be considered as follows:-

1. M-20 Mix (1:1.5:3) 8.2 bags.

2. M-15 Mix (1:2:4) 6.5 bags.

1.5.5.3. The sand shall be of best quality containing hard siliceous materials, clean and of snap angular grit type and free from earth or organics matter of salts and to the satisfaction of the Engineer-in-charge. The sand shall be washed before use. No. salty or Darkish water shall be used for concreting.

1.5.5.4. The aggregate shall be of the best quality to the satisfaction of the Engineer-in-charge and brakes to maximum size of 40mm for thick concrete and 20mm thin concrete section. It should also be free from grit and dirt.

1.5.5.5. The mixture of concrete to be used shall be such as to produce a sound : compact and water proof concrete and shall not be weaker than 1:2:4 ratio with 20mm stone metal for chimney portion and 40mm stone metal for mass concreting pyramid portion or slab portion, unit rates may be quoted for concrete of M-15 Mix ratio. The concrete shall be mixed as stiff as the requirements of placing the concrete in the form of moulds with case and degree to which concrete resists segregations will permit. Hence the quantity of water used should not be too much.

1.5.5.6. Proper forms or moulds adequately braced to retain proper shape while concreting should be used for chimney or pyramid and slab portions. Form boxes should be water tight so as not to allow cement cream to come out leaving only sand and jelly to form money coml. in concrete. Form excess boxes should be cleaned and oiled before using for concreting.

1.5.5.7. All wet locations must be kept completely dewatered both during the placing of concrete and for 24 hours after completion. There should be no disturbance of concrete by water during this period.

1.5.5.8. Form boxes should not be removed before 24 hours after concreting. Concrete surface where required should be set right with tick cement and mortar immediately after removal of the forms.

1.5.5.9. After 24 hours of pouring, the concrete should be cured by keeping it continuously wet for 14 days. The pit may be back filled with selected earth sprinkled with necessary amount of water and well consolidated layers not exceeding 150mm after 48 hours and thereafter both the exposed top and the fill shall be kept wet for the remainder of the prescribed time.

1.5.5.10. Payment for the quantity of excavation and concreting for each type of tower shall be made on prorated basis of actual work done subject to the maximum of guaranteed volumes as per the approved drawings to be furnished by the purchaser.

1.5.5.11. The supply of steel for reinforcement, if required is to be supplied by the Contractor

1.5.6. EXCAVATION IN ROCK :

1.5.6.1. Where towers are to be planted in rock, suitable holes should be drilled, but if drilling is difficult, blasting may be resorted to, but sufficient care should be taken to eliminate the possibility of serious cracking of the rock.

1.5.6.2. Care should also be taken to minimize the concreting for filling blasted areas. Stubs may be shortened suitably in case of drilled holes as per design drawings.

1.6. Erection of Towers :

1.6.1. The superstructure of towers should be erected on foundations after 14 days of concreting. However, the method adopted for erection of towers is left to the decision of the Contractor subject to the condition that he takes responsibility for any damages to materials. No. tower member should get strained or bent during erection. The tower must be truly vertical after erection and no straining would be allowed to bring it in alignment. Maximum tolerance in verticality that will be permitted is one mm per 360mm of tower height. All bolts and nuts shall be made fully tight and finally the bolt threads shall be centred purchased to avoid nuts becoming loose, punching of bolts shall be made by chamfering the threads with centre punch at least at three places equally spaced on contact surface of bolts and nuts.

1.6.2. Tower erection shall include erection of all accessories and fittings including attachment for step bolts, ladders, platform, 'U' Bolts shackles, Hangers, strain plates etc. and punching of bolts and nuts so that towers are completed in all respect.

1.6.3. Suitable tower extension shall be erected to get desired ground clearance whenever required. Which have been determined at the time of final survey.

1.7. Grounding :

1.7.1. It is necessary that in no case tower footing resistance should be more than 10 ohms. During dry weather.

1.7.2. Pipe type earthing :

1.7.2.1. At location where footing resistance does not exceed 10 ohms the pipe type earthing as per method specified by MSEDCL would be followed. The Contractor will have to supply all materials required for grounding including salt, finely broken coke/charcoal, G.I. Pipe G.I. Wire clamp & Nuts-Bolts etc.

1.7.3. Counterpoise earthing :

1.7.3.1. In place of high resistivity soil conditions, counterpoise earthing shall be adopted as per MSEDCL specifications to bring down the tower footing resistance below 10 ohms. The counterpoise earthing shall be buried 600mm below ground level and for this purpose some space should be left out in chimney coping portion at the time of stub setting. Coping should be complete after installation of counterpoise earthing. All materials are to be supplied by the Contractor.

1.8. Insulator hoistings:

1.8.1. Suspension Insulator strings shall be used on all tangent type towers with deviation up to 2 and tension insulator string on all shall medium, large angle and dead end type towers on all lines.

1.8.2. Insulators string shall be assembled on ground. These shall be cleaned and examined for their cracks chips or defective glazing (not exceeding half centimeter square) and then hoisted by careful handling, the work will include fitting of all hardware and fitting in their proper places and order.

1.9. Stringing of conductor and ground work:

- 1.9.1. Before commencing of stringing work, tower healthiness certificate of each & every tower location must be submitted to Engineer in charge in writing.
- 1.9.2. Before commencing of stringing work, Contractor must obtain approval of sag tension charts showing initial and final sags and tensions for various temperature and spans.
- 1.9.3. The Contractor shall be responsible and will take care of proper handling of drums from stores to site, sufficient numbers of aluminum sketch blocks shall be used for laying out the A.C.S.R. Conductors. Necessary precautions shall be taken to avoid conductor rubbing on the ground by providing adequate ground rollers on supports. Additional rollers shall also be provided to cross thorny hedges, forcing and other obstructions to avoid scratching of conductors. The conductor and ground wire shall be made to sag correctly as per stringing charts before they are finally transferred to the hard wares for conductors and to clamps for ground wire, No joints should be made at less than 30 meters from the tower and that no joint shall be permitted in Railway, River & Road crossing spans. There shall not be more than one joint in a span of each conductor. All conductors shall be stressed to their maximum working load at the time of stringing.
- 1.9.4. The minimum clearance between the lowest point of conductor and ground shall not be less than required those. All compression joints should be carefully made and a record of initial and final length of the joints, jointly signed by Contractor's and IA's representatives should be maintained. Dynamometer shall be used in tensioning the conductors, check for sag should also be made at intervals when conductors are drawn up. Over stressing, causing damage to towers, should be avoided care should be exercised not to over tension the conductor. An extra sag of 150mm should be allowed at all important tension points like Railway and River crossing. After being pulled the conductor/ground wire shall not be allowed to hang in the stringing sheaves for more than 72 hours before being pulled to the specified sag. During the time the conductor/ground wire is on the stringing sheaves before sagging in, it shall be ensured that the conductors/ground wire is not damaged to wind, vibration vehicles or other causes.
- 1.9.5. The conductor shall be pulled up to desired sag, and left in Arial stringing sheaves for at least one hour after which the sag shall be rechecked and adjusted, if necessary, before clipping in and transferring the conductors from the Arial stringing sheaves to the suspension clamps.
- 1.9.6. Conductor shall be clamped within 24 hours of sagging in. The sag will be checked the first and last span of the section in case of sections up to eight spans and in one intermediate open also for section with more than eight spans.
- 1.9.7. The stringing sheaves, when suspended on the transmission structure for sagging, shall be so adjusted that the conductor will be on the sheaves at the same height as the suspension clamp to which it is secured.
- 1.9.8. All the line conductors shall be terminated at sub-station structures whose details shall be furnished by the IA, at the appropriate times, The Contractor shall fix strain insulators on the sub-station structures.
- 1.9.9. P.A Rods and Vibration Dampers shall be fitted at each suspension towers before final clamping of conductor with insulator string. Vibration damper are to be fixed using aluminum tape with each clamping bolt and in correct vertical position in relation to conductor. Compression type joints are to be used for jointing of conductors. Each part connected with joints shall be perfectly cleaned by wire brush and

properly greased before final compression. All the joints of conductors and earth wire shall be made in the best workmanship manner and shall be perfectly straight and having maximum possible strength.

1.9.10. Stringing work includes the hoisting insulators, fixing hardware, lifting amour rods, and vibration dampers, making joints, repair sleeve etc. All stringing tools and hydraulic compressor machine should be arranged by the Contractor.

1.10. Supply of materials by Contractor :-

1. G.I. Tower Material & Nut-Bolts & ACD excluding barbed wire.
2. Conductors, Earth Wire, Disc Insulators, Hardware for conductor and Earth Wire as the case may be.
3. All jointing materials and accessories for ACSR conductor.
4. Any other items required to complete the work.

1.11. Materials to be supplied by the contractor:-

1. Cement, Sand, Stone, and Crusher, metal, gravels and morrum.
2. DP/NP/PP/CIP Including supply of G.I. Nut Bolts and Barbered wire for fixing of anti-climbing devices complete.
3. Coke, Salt and G.I. wire and all earthing requirements.
4. Heavy duty G.I. Earthing pipe 32 mm dia, 3 mtr. Long and 50x6 mm. G.I. Flat with nut-bolt for pipe type earthing and G.S.S. Wire, Lugs, Bolts, Nuts etc for CP type earthing as per specification.
5. Any other materials which shall be required to complete the work satisfactorily in all respects and not specified in above for supply of materials by the IA.
6. Steel bars required for reinforcement.

13.14. Plinth Mounted Distribution Substations

1.0 Scope

The specification covers the design, engineering, manufacture, stage inspection, testing, pre-delivery inspection, supply, delivery, loading, unloading and performance requirements of 11/0.433 KV non-sealed type aluminum and copper wound distribution transformers for outdoor use. The transformers shall be double wound, three phase, oil immersed with ONAN cooling. The rating required under this specification is 500 KVA with copper windings.

The equipment offered should have been successfully type tested within five years from date of tender and the designs should have been in satisfactory operation for a period not less than three years as 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, specifically from Central Govt./ State Govt. or their undertakings.

The scope of supply should also include the provision of type tests on random samples if desired by the purchaser. In this case the bidder has to bear the charges for conducting such type tests at CPRI or National Govt. approved Laboratory.

The transformer 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.

2.0 Codes & Standards

Except where modified by this specification, the transformers shall be designed, manufactured and tested in accordance with the latest editions of the following standards. 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. Whether to accept or reject any alternative standard shall be adjudged by the Purchaser. The Bidder shall furnish a copy of the alternative standard proposed along with the bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard. In the case of conflict the order of precedence shall be 1) IEC or ISO Standards, 2) Indian Standards, 3) other alternative standards.

IEC/ISO	Indian Standard	Subject
IEC 71		Insulation Coordination
IEC 76	IS 2026	Power Transformers
	IS 1180	Outdoor Three Phase Distribution Transformers up to 500 KVA, 11/0.433 KV, Non- Sealed Type
IEC 137	IS 2099	Bushing for Alternating Voltages above 1000V
IEC 156		Method of determining Electric Strength of Insulating Oils.
IEC 296	IS 335	Specification for Unused Mineral Insulating Oils for Transformers and Switchgear
	IS 6792	Method of determination of electric strength of insulating oils.
IEC 354	IS 6600	Loading Guide for oil immersed Transformers
IEC 437		Radio Influence Voltage Measurement
IEC 551		Determination of Transformer and Reactor Sound Levels.
IEC 616		Terminal and Tapping markings for power transformers.
IEC 722		Guide to the Lightning and Switching impulse testing of Power Transformers and Reactors
ISO 1460/BS 729		Galvanizing

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Supplier of the necessity of providing the goods complying with other relevant standards or recommendations.

3.0 Service Conditions

The service conditions shall be as follows:

- maximum altitude above sea level - 1,000m
- maximum ambient air temperature - 50° C
- maximum daily average ambient air temperature - 35° C
- minimum ambient air temperature - 5° C
- maximum temperature attainable by an object exposed to the sun - 60 ° C
- maximum yearly weighted average ambient temperature - 32° C
- maximum relative humidity - 100%
- average number of thunderstorm days per annum (isokeraunic level) - 70
- average number of rainy days per annum - 120
- average annual rainfall - 1500 mm
- maximum wind pressure - 260Kg / m2

Environmentally, the region where the equipment will be installed includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators.

Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive, tropical and humid coastal atmosphere.

4.0 SYSTEM CONDITIONS:

The equipment shall be suitable for installation in supply systems of the following characteristics.

Frequency - 50 Hz \pm 5%

Nominal system voltages	11 KV System	- 11 KV
	LV System	- 433/250 V
Maximum system voltages	11 KV System	- 12 KV
	LV System	- 476 V
Minimum LV voltage	(NEC)	- 392 V
Nominal short circuit apparent power of 11 KV System - 500 MVA (IS: 2026)		
Insulation levels		
1.2/50 μ sec impulse withstand	11 KV System	- 75KV peak (IS:2026)
Power frequency one minute withstand 11 KV System - 28 KV (rms)		
(wet and dry)	LV System	- 3 KV (rms)
Neutral earthing arrangements:	LV System	- Solidly earthed

PART 2: Technical

SPECIFIC TECHNICAL REQUIREMENTS			
1		Rated KVA (ONAN rating)	500 KVA, 11/ 0.433 KV
2		No. of phases	3
3		Type of installation	Outdoor
4		Frequency	50 Hz (\pm 5%)
5		Cooling medium	Insulating Oil (ONAN)
6		Type of mounting	for 500 KVA on Wheels, Mounted on rails.
7		Rated voltage	
	a)	High voltage winding	11 KV
	b)	Low voltage winding	0.433 KV
8		Highest continuous system voltage	
	a)	Maximum system voltage ratio (HV/ LV)	12 KV / 0.476 KV
	b)	Rated voltage ratio (HV / LV)	11 KV / 0.433 KV
9		No. of windings	Two winding Transformers
10		Type of cooling	ONAN (Oil natural / Air natural)
11		KVA Rating corresponding to ONAN cooling system	100%
12		Method of connection:	
		HV:	Delta
		LV:	Star
13		Connection symbol	DYN 11

14		System earthing	Neutral of LV side to be solidly earthed.
15		Percentage impedance voltage on normal tap and KVA base at 750 C corresponding to HV/ LV rating and applicable tolerances (Negative tolerance will not be allowed):	% Impedance + Tolerance %
			5.0 + 10% (No Negative Tolerance)
16		Intended regular cyclic overloading of windings	As per IEC -76-1, Clause 4.2
17	a)	Anticipated unbalanced loading	Around 10%
	b)	Anticipated continuous loading of windings (HV / LV)	110 % of rated current
18	a)	Type of tap changer	Off-load tap changer
	b)	Range of taping	+ 2.5% to – 7.5% in 5 equal steps of 2.5% each on HV winding
19		Neutral terminal to be brought out	On LV side only
20		Over Voltage operating capability and duration	112.5 % of rated voltage (continuous)
21		Maximum Flux Density in any part of the core and yoke at rated KVA, rated voltage i.e. 11 KV / 0.433 KV and system frequency of 50 HZ	1.5 Tesla
22		Insulation levels for windings :-	
	a)	1.2 / 50 microsecond wave shape Impulse withstand (KVP)	HV: 28 LV: N.A.
	b)	Power frequency voltage withstand (KV- rms)	HV: 28 LV: 03
23		Type of winding insulation	
	a)	HV winding	Uniform
	b)	LV winding	Uniform
24		Withstand time for three phase short circuit	2 Seconds
25		Noise level at rated voltage and frequency	As per NEMA Publication No. TR-1

26		Permissible Temperature Rise over ambient temperature of 50°C		
	a)	Of top oil measured by thermometer.		35°C
	b)	Of winding measured by resistance.		40°C
27		Minimum HV clearances in air (mm) :-		
	a)	Phase to Phase		280
	b)	Phase to ground		140
28		Terminals		
	a)	HV winding line end		12 KV oil filled porcelain communicating type of bushings (Antifog type)
	b)	LV winding		0.433 KV porcelain type of bushings (Antifog type)
29		Insulation level of bushing		HV LV
	a)	Lightning Impulse withstand (KVP)		75 Not applicable
	b)	1 Minute Power Frequency withstand voltage (KV –rms)		28 3
	c)	Creepage distance (mm) (minimum)		25 mm/ KV
30		Material of HV & LV Conductor		Electrolytic Copper for 500 KVA
31		Maximum current density for HV and LV winding for rated current		1.4 Amp/ mm ² for Aluminum windings and 2.4 Amp/ mm ² for Copper windings.
32		Polarisation index i.e ratio of megger values at 600 sec. to 60 sec for HV to earth, L.V to earth and HV to LV.		Shall be greater than or equal to 1.5, but less than or equal to '5'.
33		Core Assembly		Boltless type
34		Maximum permissible No Load and Load Losses (Watts)		500 KVA
	a)	No Load Losses at rated voltage and rated frequency	-	950
	b)	Load Losses at rated current and at 750 C	-	6500

5.0 Type of Transformer

The transformers shall be of core type construction, double wound, three phase, oil immersed, 11/0.433KV, 50 Hz with natural oil and air cooling (ONAN) to be used as step down transformers for outdoor use. The design of the tank, fittings, bushings, etc shall be such that it will not be necessary to keep the transformer energized to prevent deterioration as the transformers may be held in reserve, outdoors, for many years.

6.0 Performance , Capacity and short circuit ratings

The following ratings are covered under this specification

- 500 KVA, 11/0.433 KV, Copper wound

The transformer shall be capable of supplying a continuous load equal to its KVA rating, under the following conditions:

- continuous steady load;
- design at maximum ambient air temperature of 50°C;
- 40°C average winding temperature rise and 35°C top oil temperature rise for conventional breathing transformers.

The transformer may be overloaded during emergency up to 150% of its continuous rating in accordance with IEC Publication 354 or IS: 6600. Bushings and other current-carrying parts shall also be designed for this condition.

The transformer shall be capable of withstanding for two seconds without damage to any external short circuit, with the short circuit MVA available at the terminals of either winding with rated voltage on the other winding. If short circuit tests have been carried out on the particular design of transformer offered, the test results shall be supplied with the bid.

The thermal ability to withstand short circuit shall be demonstrated by calculation.

The transformer shall be capable of withstanding the thermal and dynamic effects of short circuits, as specified in IEC 76-5 or IS: 2026: Ability to withstand short circuits.

The maximum flux density in any part of the core and yoke at rated KVA, Voltage and frequency shall not exceed 1.5 Tesla.

7.0 Voltage ratio & tapping range

The transformers shall have the following ratio:-

- the nominal voltage ratio shall be 11,000/ 433 V for 500 KVA transformers;
- Tolerance on the voltage ratio shall be $\pm 0.5\%$.
- For transformers of ratings 500 KVA, 11/0.433 KV, Taps shall be provided on the H.V. Windings for voltage variation from tap-1 (+2.5%) to tap-5 (- 7.5%) in equal steps of 2.5 %. Tap No-2 shall be the principal (normal) tap.

The bidder shall state in the technical schedule, the percentage regulation at full load, power factor 1.0 and at full load, power factor 0.8 lagging.

Transformers shall be suitable for parallel operation with each other.

8.0 Percentage impedance

The Percentage of Impedance at 75°C shall be 5% for 500 KVA transformer with positive tolerance of 10%. No negative tolerance on percentage Impedance is allowed.

9.0 Losses

The No Load and Load Losses shall not exceed the values given below:-

KVA Rating	Maximum No Load loss in Watts	Maximum Full Load loss in Watts at 75°C.
500 KVA	950	6500

The above losses are maximum allowable and there should not be any positive tolerance.

The offered transformer(s) should have been type-tested at CPRI/ National Govt. approved laboratory. The bid shall be accompanied with type-test reports (short circuit test and Impulse test) conducted at Central Power Research Institute / National Govt. approved laboratory for the offered transformers within five years from date of tender. The short circuit test report(s) must contain the measured no load loss and load loss, determined by CPRI/ National Govt. approved laboratory.

In case of any doubts, <IA> reserves the right to verify the original type test reports of CPRI/ National Govt. approved Laboratory or ask the supplier to conduct the type tests at CPRI/ National Govt. approved Laboratory at his (supplier's) cost for re-confirmation of the test results particularly no load losses, load losses and percentage impedance. Bids without type test reports shall not be considered for evaluation.

If the bidder quotes lower values of losses than the CPRI's measured losses, he has to prove the same by conducting the Impulse & short Circuit tests at CPRI/ National Govt. approved laboratory along with measurement of no load losses and load losses at his own cost in presence of IA' s authorized representative without any financial liability to IA.

However, if the loss figures will exceed the stipulated values as per specification, the transformer(s) shall be out rightly rejected.

10.0 Vector group

The transformers shall be connected delta-star, in accordance with vector group reference Dyn11 of IEC - 76/ IS - 2026. The LV neutral shall be brought out to a terminal bushing, which shall be identical to the phase bushings in all respects.

11.0 Losses and capitalisation

Transformers would be out rightly rejected if losses exceed the values indicated at clause-10 above.

12.0 Flux density

The flux density at rated voltage & rated frequency shall not exceed. 1.50 Tesla. The transformer must be capable of operating at 10% over voltage and at frequency of 48.5 Hz without saturation.

13.0 INSULATION LEVELS

The insulation levels as defined in IEC 76-C/ IS: 2026 Insulation levels and dielectric test shall apply as per Table.

	HV Winding	LV Winding
Basic Impulse voltage Level (KVp) (1.2/50 micro. sec. Wave)	75	Not Applicable
Power Frequency voltage withstand level, Wet and Dry (KV)	28	3

14.0 NOISE LEVEL

The average noise level of the transformers shall not exceed 51db. The measurement shall be carried out in accordance with IEC 551 at a distance of 300mm from the envelope of the transformer.

15.0 RADIO INFLUENCE VOLTAGE

The maximum radio influence voltage shall be 250μ V, measured as specified in IEC 437.

16.0 CORE AND WINDINGS

Core

- Stage level inspection for core construction shall be carried out by the IA.
- Each lamination shall be insulated such that it will not deteriorate due to mechanical pressure and the action of hot transformer oil.

- The core shall be constructed from high grade, non-ageing, Cold Rolled Grain Oriented silicon steel laminations (CRGO or M3 or better) only. No other core materials shall be entertained. Bidders are requested to note that only PRIME CORE materials are to be used. In no case, second grade core material is to be used. The bids should contain copies of invoices towards purchase of core laminations along with test certificates and curves of specific core loss of the laminations proposed to be used.

The purchaser at his discretion, may select samples from the core laminations and get the same tested in CPRI/ Approved National Govt. Laboratory to prove the quality of the core material.

- For the above purpose, the supplier shall have to offer every batch of core laminations received from his Sub-Vendor along with Invoice of the sub-vendor, Mills test certificate, packing list, Bill of lading, Bill of entry certificate to customs etc. towards proof of prime core materials for verification by the Purchaser's representative without any cost to the Purchaser. Besides, the Contractor must mention in his bid about the type of CRGO lamination to be utilized for the offered transformers along with a copy of the specific core loss curve at different flux densities.
- Core materials should be directly procured either from the manufacturer or through their accredited marketing organization of repute, but not through any agent. The core and winding shall be capable of withstanding shocks during transport, installation and service. Provision shall be made to prevent movement of the core and windings relative to the tank during these conditions and also during short circuits.
- The design shall avoid the presence of pockets which would prevent the complete emptying of the tank through the drain valve. The core material offered in the tender to be checked for its correctness before core coil assembly. For this, the tenderer must ask for core and coil inspection before its tanking.
- The laminations shall be free of all burrs and sharp projections. Each sheet shall have an insulting coating resistant to the action of hot oil.
- The insulation structure for the core to bolts and core to clamp plates, shall be such as to withstand 2000 V DC voltage for one minute.
- The completed core and coil shall be so assembled that the axis and the plane of the outer surface of the core assemble shall not deviate from the vertical plane by more than 25mm.
- All steel sections used for supporting the core shall be thoroughly shot or sand blasted, after cutting, drilling and welding.
- The finally assembled core with all the clamping structures shall be free from deformation and shall not vibrate during operation.
- The core clamping structure shall be designed to minimize eddy current loss.
- The framework and clamping arrangements shall be securely earthed.
- The core shall be carefully assembled and rigidly clamped to ensure adequate mechanical strength.
- Oil ducts shall be provided, where necessary, to ensure adequate cooling inside the core. The welding structure and major insulation shall not obstruct the free flow of oil through such ducts.
- The design of magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earth clamping structure and production of flux component at right angle to the plane of the lamination, which may cause local heating. The supporting framework of the cores shall be so designed as to avoid the presence of pockets, which would prevent complete emptying of the tank through the drain valve or cause trapping of air during filling.
- The construction is to be of boltless core type. The core shall be provided with lugs suitable for lifting the complete core and coil assembly. The core and coil assembly shall be so fixed in the tank that shifting will not occur during transport or short circuits.

INTERNAL EARTHING

- All internal metal parts of the transformer, with the exception of individual laminations and their individual clamping plates shall be earthed.
- The top clamping structure shall be connected to the tank by a copper strap. The bottom clamping structure shall be earthed by one or more the following methods:
 - a) By connection through vertical tie-rods to the top structure.
 - b) By direct metal to metal contact with the tank base.
 - c) By a connection to the structure on the same side of the core as the main earth connection to the tank.
- The magnetic circuit shall be connected to the clamping structure at one point only and this shall be brought out of the top cover of the transformer tank through a suitably rated insulator. A disconnecting link shall be provided on transformer tank to facilitate disconnections from ground for IR measurement purpose.
- Coil clamping rings of metal at earth potential shall be connected to the adjacent core clamping structure on the same side as the main earth connections.

Windings

- Winding shall be subjected to a shrinking and seasoning process, so that no further shrinkage occurs during service. Adjustable devices shall be provided for taking up possible shrinkage in service.
- All low voltage windings for use in the circular coil concentric winding shall be wound on a performed insulating cylinder for mechanical protection of the winding in handling and placing around the core.
- Winding shall not contain sharp bends which might damage the insulation or produce high dielectric stresses. No strip conductor wound on edge shall have width exceeding six times the thickness.
- The winding insulation shall be free from insulating compounds which are liable to soften, ooze out, shrink or collapse. It shall be non catalytic and chemically inert in hot transformer oil during normal service.
- The stacks of windings are to receive adequate shrinkage treatment.
- The windings and connections are to be braced to withstand shocks during transport, switching, short circuit or other transient conditions.
- Permanent current carrying joints in the windings and leads shall be welded or brazed. Clamping bolts for current carrying parts inside oil shall be made of oil resistant material which shall not be affected by acidity in the oil steel bolts, if used, shall be suitably treated.
- Terminals of all windings shall be brought out of the tank through bushings for external connections.
- The windings shall be uniformly insulated and the L.V neutral points shall be insulated for full voltage.
- The completed core and coil assemble shall be dried in vacuum at not more than 0.5mm of mercury absolute pressure and shall be immediately impregnated with oil after the drying process to ensure the elimination of air and moisture within the insulation. Vacuum may be applied in either vacuum over or in the transformer tank.
- The winding shall be so designed that all coil assemblies of identical voltage ratings shall be interchangeable and field repairs to the winding can be made readily without special equipment. The coils shall have high dielectric strength.
- Coils shall be made of continuous smooth high grade electrolytic copper or aluminium conductor shaped and braced to provide for expansion and contraction due to temperature changes.
- Adequate barriers shall be provided between coils and core and between high and low voltage coil. End turn shall have additional protection against abnormal line disturbances
- The insulation of winding shall be designed to withstand voltage stress arising from surge in transmission lines due to atmospheric or transient conditions caused by switching etc
- Tapping shall not be brought out from inside the coil or from intermediate turns and shall be so arranged as to preserve as far as possible magnetic balance of transformer at all voltage ratios.

- Magnitude of impulse surges transferred from HV to LV windings by electromagnetic induction and capacitance coupling shall be limited to BIL of LV winding.
- The winding conductor shall be of Al. up to 250 KVA transformers and copper for 500 KVA Transformers. The current density shall not exceed 1.4 Amp/ mm² for aluminium and 2.4 Amp/ mm² for copper at normal full load current.

17.0 BUSHINGS AND TERMINATIONS

Bushings

- Bushings shall be of the outdoor type and easily replaceable. Cemented in types will not be accepted. They shall be sufficiently robust to withstand normal transport and erection hazards and shall conform to IEC 137 /IS 3347 and 2099.
- All bushings shall have a minimum creepage distance of 25 mm /KV and shall have a continuous rating of 200% of the transformer rating. The protected creepage distance shall not be less than 50% of the total.

The following minimum 11 KV clearance shall be provided:

	External (Air) for 11 KV
Phase to phase	280 mm
Phase to earth	140 mm

- The 11 KV bushings of transformers shall be provided with a bi-metallic terminal connector or suitable device to receive 55 –100 mm² AAAC or ACSR conductor directly without any bimetallic action.
- The secondary bushings of transformers shall be fitted with non ferrous threaded terminals. With the exception of brass the terminals shall be protected from atmospheric deterioration by suitable tinning or by some other approved coating.
- The terminals are to be supplied with one 16mm bolt, one conic spring washer, one matching flat washer, one nut and one lock nut for each hole in the terminal plate.
- HV Bushing stud shall be not less than 12 mm dia for 250KVA & 500KVA with HV side terminal connectors & LV Bushing stud shall be not less than 32 mm dia for 500KVA & 20 mm dia for 250KVA with Palm terminal connectors (For LV studs)

Bushing Labels

- The HV bushings shall be labeled U, V and W and the LV bushing u, v, w and n. Marking letters shall be at least 12 mm high. The means of marking shall be either,
 - ❖ engraved metal plate; or
 - ❖ etched anodized aluminum.

Phase identification by adhesive stickers shall not be acceptable.

- If labeling is to be carried out on the tank, it is preferred that one plate be used rather than individual markings for each phase, in order to prevent incorrect phase markings. Labels shall conform to the requirements of the section on labels in this specification.

Earthing Terminals

All transformers shall be provided with two earthing terminals conforming to relevant Standards and M12 ISO metric bolt and nut which shall be non ferrous. It shall include a spring washer and lock washer.

18.0 LIGHTNING ARRESTORS

9 KV, 5KA metal oxide lightning arresters of reputed make conforming to IS-3070 Part- III, one number per phase shall be provided.(Under the HV bushing with GI earth strip 25x4 mm connected to the body of the transformer with robust clamping arrangement). Lightning arrestors with polymer insulators in conformance with relevant IEC can also be used.

19.0 TANK FABRICATION

All transformer sizes, the tank shall be of bolted type construction in accordance with IS 1180 (Part 2).

- The tank shall be at atmospheric pressure at an internal temperature of 100 C;
- The tank shall be designed for an internal pressure of 100 Kg/ m² at 50⁰ C ambient conditions. It shall be capable of withstanding an unlimited number of 24 hours cyclic variations of internal pressure from atmospheric to this value.
- The tenderer shall state the top oil temperature at which the tank internal pressure shall reach the value of 100 kN/ m² and the value of steady load which will result in this top oil temperature with an ambient temperature of 45⁰ C.
- Adequate space shall be provided at the bottom of the tank for collection of sediments.

Transformer tanks of all types shall be designed so that the completed transformer can be lifted and transported without permanent deformation or oil leakage. Stiffeners provided on all the four side walls for rigidity should be so designed that there is no accumulation of water.

The Tank shall be of rectangular shape with round edges fabricated from tested quality mild steel plates with minimum thickness of 3.15 mm. for the side walls while top cover and the bottom plate of the tank shall have a minimum thickness of 5 mm. The transformer tank and the top cover shall be designed in such a manner as to leave no external pockets in which water can log, or any internal pocket where air/ gas can accumulate.

All sealing washers / gaskets shall be made of oil and heat resistant neoprene rubber or neoprene bonded cork seals suitable for temperature as stipulated in this specification. Surfaces at gasketed joints shall be such that an even face is presented to gasket, thereby eliminating the necessity for the gasket to take up surface irregularities.

All pipes, radiators, stiffeners or corrugations which are welded to the tank wall shall be welded externally and shall be double welded wherever possible. All welds shall be stress relieved.

The transformer tank shall be complete with all accessories, lifting lugs etc. and shall be designed to allow the complete transformer filled with oil to be lifted by crane or jacks without risk of any damage and can be transported by Rail/ Road without straining any joints and without causing any leakage of oil.

20.0 PRESSURE RELIEF DEVICE

Transformers shall be fitted with a pressure relief device in the form of explosion vent. The tenderer shall state the pressure at which it is designed to operate.

21.0 OIL LEVEL GAUGE

A suitable oil level gauge (Magnetic type) shall be fitted on the transformers and so located that it can be easily read from ground level. The gauge fitted with the conservator shall be graduated for temperatures of 5⁰ C, 30⁰ C and +98⁰ C.

22.0 CONSERVATORS AND BREATHERS

All the transformers shall be provided with a conservator tank.

The conservator tank shall be so designed and located as to eliminate any trapping of air in the transformer or pipe work. It shall be inclined at an angle of about 5 degrees to the horizontal towards the drain plug and the pipe connecting the main tank to the conservator should project about 20 mm above the bottom of the conservator so as to create a sump for the collection of impurities. Minimum oil level corresponding to 50 C shall be well above the sump level.

All transformers shall be fitted with a silica gel breather of weatherproof design at a convenient height with oil seal at the bottom, draw in plug and filling holes with covers to isolate the silica gel from the atmosphere. The breather pipe should be connected at top of the conservator tank with two bends at right angles. The cover of the main tank and bushings turrets shall be provided with air release plug to enable the trapped air to be released.

23.0 FITTINGS AND ACCESSORIES

The following standard fittings and accessories shall be provided:

- rating, diagram and terminal marking plate.
- two earthing terminals .
- lifting lugs/ platform lugs.
- pressure relief device in form of explosion vent.
- silica gel breather. (1 Kg for 500KVA)
- filling and drain / sampling plugs (A single drain / filling plug shall consist of a 20 mm pipe inside the transformer tank, starting from the bottom and projecting to the top cover with a hermetically sealed / welded plug).
- a magnetic or prismatic oil level gauge for all transformers indicating three position of oil i.e. minimum. 5 ⁰C, 30 ⁰C and 98 ⁰C.
- A thermometer pocket with thermometer with screwed top to prevent ingress of water or leakage oil.
- Inlet valve having p-30 mm thread (with cover) on the transformers body/ conservator.
- Drain valve 12 mm size for draining the conservator oil with locking arrangement.
- Top filter valve (25 mm with adopter for 16 mm hole) with plug.
- Bottom filter valve with drain Plug.
- Air release plugs at transformer top cover, bushing turrets etc.
- Lightning Arresters (LA) for HT bushing.
- Set of Radiators.
- Conservator Tank.

Bi-metallic terminals on the bushings for connection with over head ACSR/ AAAC conductor (For HV & LV).
The Specification and brief details of the salient features of these terminals should be stated.

The fittings, tap-changer for 250 KVA and 500 KVA Transformers, accessories and sizes listed are indicative only and any other fittings and accessories which are generally required for satisfactory operation of the transformer are to be provided without any extra cost.

24.0 TAP CHANGING ARRANGEMENTS

Off - load tap changing mechanism for 250 KVA & 500 KVA, 11/0.433 KV Transformers shall have the following characteristics:-

- Tap changing shall be carried out with the transformers in off circuit.
- Tap positions shall be numbered as follows:

Tap No. - 1	Tap No. - 2	Tap No. - 3	Tap No. - 4	Tap No. - 5
+ 2.5 %	Principal/ Normal tap	- 2.5 %	- 5 %	- 7.5 %

- Provision shall be made for locking of the tap switch handled by using a pad-lock with 6 mm diameter hasp.
- Tap-changing handles shall be fitted with gasketed covers, so that sealing of the transformers under normal condition is independent of the switch shaft gland.

25.0 TRANSFORMER OIL

The transformers shall be supplied complete with first filling of transformer oil and 10% extra. The quantity of oil required for the first filling of the transformer and its full specification shall be stated in the bid. The complete first filling shall be of new oil free from inhibitors and additives. The bidder shall quote the price of transformer complete with first filling of oil plus 10% extra. However, the rate of transformer oil in Rupees per litre shall be quoted separately also. The transformer oil shall be supplied in non-returnable drums.

The insulating oil for the transformer shall be of EHV grade, generally conforming to IEC: 296/ BS: 148/ REC: 39/ 1993 or latest version of IS: 335/ 1983 whichever is more stringent. No inhibitors shall be used in the oil. The dielectric strength of the oil shall not be less than 60 KV at 2.5 mm. gap when tested in accordance with IS: 6792/ 1972. If an anti-oxidant inhibitor is recommended, its use shall be subject to the purchaser's approval.

The design and materials used in the construction of the transformer shall be such as to reduce the risk of the development of acidity in the oil.

The Contractor shall warrant that oil furnished is in accordance with the following specifications.

S. No	Characteristic	Requirement	Method of Test
1	Appearance	The oil shall be clear & transparent & free from suspended matter or sediment	A representative sample of oil shall be examined in a 100 mm thick layer at ambient temp.
2	Density at 200C	0.89 g/cm ³ Max.	IS:1448
3	Kinematic Viscosity at 27 deg. C Max	27 CST	IS:1448
4	Interfacial tension at 27deg.C Min.	0.03 N/m	IS:6104
5	Flash Point	136 0C	IS:1448

6	Pour Point Max.	-6 0C	IS:1448
7	Nautralisation Value (Total Acidity) Max.	0.03 mg KOH/gm	IS:335
8	Electric strength Breakdown (voltage) Min.	72.5 KV	IS:6792
9	Dielectric dissipation factor tan delta at 900 C	0.03 Max	IS:6262
10	Min specific resistance(resistively) at 90 deg.C	35X10 ¹² ohm cm (min.)	IS:6103
11	Oxidation stability		
12	Neutralization value after oxidation	0.40mg KOH/g	
13	Total sludge after oxidation	0.10% by weight max.	
14	Presence of oxidation Inhibitor	The oil shall not contain anti-oxidant Additives.	IS:335
15	Water content Max:	Less than 25ppm	IS:2362

26.0 RATING AND CONNECTION PLATE

Each transformer shall be provided with a rating plate of weatherproof material showing the following items indelibly marked:

- type of transformer
- standard to which it is manufactured (preferably IEC 76)
- manufacturer's name
- transformer serial number
- year of manufacture
- rated frequency in Hz (50)
- rated voltages in KV (11/0.433)
- number of phases (3)
- rated power in KVA
- type of cooling (ONAN)
- rated currents in A
- vector group symbol (Dyn11)
- 1.2/50µs wave impulse voltage withstand level in KVp
- power frequency withstand voltage in KV
- impedance voltage at rated current and frequency in percentage at 75°C at normal tap
- Measured load loss in KW at rated current and at 75°C at normal tap
- Measured no-load loss in KW at rated voltage and rated frequency
- continuous ambient temperature at which ratings apply in 0C
- top oil and winding temperature rise at rated load in 0C
- winding connection diagram
- total weight in kg with complete oil filled.
- total weight of the transformer without oil

- volume of oil in litres.
- weight of core and windings in kg; and
- name of the purchaser (<.....>) to be intimated during approval

The rating plate shall conform to the requirements of the section of Labels in this specification.

27.0 BASE MOUNTING ARRANGEMENT

The under base of all transformers of 460 mm long with holes of 14 mm dia at a centre to centre distance of 415 mm to make them suitable for fixing on a platform or plinth. 500 KVA transformers shall be provided with bi-directional flat rollers, suitable for use on a 1000 mm gauge track.

28.0 PAINTING

All paints shall be applied in accordance with the paint manufacturer's recommendations.

Particular attention shall be paid to the following:

- a) Proper storage to avoid exposure as well as extremes of temperature.
- b) Surface preparation prior to painting.
- c) Mixing and thinning
- d) Application of paints and the recommended limit on time intervals between coats.
- e) Shelf life for storage.

All paints, when applied in normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

All primers shall be well marked into the surface, particularly in areas where painting is evident, and the first priming coat shall be applied as soon as possible after cleaning. The paint shall be applied by airless spray according to the manufacturer's recommendations. However, wherever airless spray is not possible, conventional spray be used with prior approval of purchaser.

The supplier shall, prior to painting protect nameplates, lettering gauges, sight glasses, light fittings and similar such items.

Cleaning and Surface Preparation

- After all machining, forming and welding has been completed, all steel work surfaces shall be thoroughly cleaned of rust, scale, welding slag or spatter and other contamination prior to any painting.
- Steel surfaces shall be prepared by Sand/Shot blast cleaning or chemical cleaning by seven tank process including Phosphating to the appropriate quality.
- The pressure and Volume of the compressed air supply for the blast cleaning shall meet the work requirements and shall be sufficiently free from all water contamination prior to any painting.
- Chipping, scraping and steel wire brushing using manual or power driven tools cannot remove firmly adherent mill-scale and shall only be used where blast cleaning is impractical

Protective Coating

- As soon as all items have been cleaned and within four hours of the subsequent drying, they shall be given suitable anticorrosion protection.

Paint Material

Followings are the type of paints that may be suitably used for the items to be painted at shop and supply of matching paint to site:

- i) Heat resistant paint (Hot oil proof) for inside surface.
- ii) For external surfaces one coat of Thermo Setting Paint or 2 coats of Zinc chromate followed by 2 coats of Synthetic Enamel paint. The color of the finishing coats shall be dark admiral grey conforming to No.632 or IS 5:1961.

Painting Procedure

- All painting shall be carried out in conformity with both specifications and with the paint manufacture's recommendations. All paints in any one particular system. Whether shop or site applied, shall originate from one paint manufacturer.
- Particular attention shall be paid to the manufacturer's instructions on storage, mixing, thinning and pot life. The paint shall only be applied in the manner detailed by the manufacturer e.g. brush, roller, conventional or airless spray and shall be applied under the manufacturer's recommended conditions. Minimum and maximum time intervals between coats shall be closely followed.
- All prepared steel surfaces should be primed before visible re-rusting occurs or within 4 hours whichever is sooner. Chemical treated steel surfaces shall be primed as soon as the surface is dry and while the surface is warm.
- Where the quality of film is impaired by excess film thickness,(wrinkling, mud cracking or general softness) the supplier shall remove the unsatisfactory paint coatings and apply another. As a general rule, dry film thickness should not exceed the specified minimum dry film thickness by more than 25%. In all instances, where two or more coats of the same paints are specified, such coatings may or may not be of contrasting colors.
- Paint applied to items that are not be painted, shall be removed at supplier's expense, leaving the surface clean, un-stained and undamaged.

Damages to Paints Work

Any damage occurring to any part of the painting scheme shall be made good to the same standard of corrosion protection and appearance as that originally employed. Any damaged paint work shall be made as follows:

- a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.
- b) A priming coat shall immediately applied, followed by a full paint finish equal to that originally applied and extending 50mm around the perimeter of the originally damaged.

The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before & after priming.

Dry Film Thickness

To the maximum extent practicable, the coats shall be applied as a continuous film of uniform thickness and free of pores. Over-spray, skips, runs, sags and drips should be avoided. The different coats may or may not be same color.

Each coat of paint shall be allowed to harden before the next is applied as per manufacture's recommendations. Particular attention must be paid to full film thickness at edges.

The requirement for the dry film thickness (DFT) of paint and the material to be used shall be as given below:

Sl. No	Paint Type	Area to be painted	No of Coats	Total Dry film thickness(Min)
1	Powder Paint (2) Thermo setting powder	Inside outside	01 01	20 Micron 60 Micron
2	Liquid paint a) Zinc Chromate(Primer) b) Syenthetic Enamel(Finish Coat) c) Hot Oil paint	Outside Outside inside	02 02 01	45 micron 35 micron 35 micron

29.0 SEALING GASKETS

All sealing washers / gaskets shall be made of oil and heat-resistant Nitrile/ Neoprene rubber/ synthetic rubber bonded cork type RC-70C gaskets. Gaskets made of natural rubber or cork sheet are not permissible.

30.0 SUPPRESSION OF HARMONICS

The transformer shall be designed with attention to the suppression of harmonic voltage, especially the third and fifth.

31.0 GUARANTEE:

The manufacturers of the transformer shall provide a guarantee of 60 months from the date of date of commissioning. In case the Distribution transformer fails within the guarantee period the purchaser will immediately inform the supplier who shall take back the failed DT within 15 days from the date of the intimation at his own cost and replace/repair the transformer within forty five days of date of intimation with a roll over guarantee.

The outage period i.e. period from the date of failure till unit is repaired/ replaced shall not be counted for arriving at the guarantee period.

In the event of the supplier's inability to adhere to the aforesaid provisions, suitable penal action will be taken against the supplier which may inter alia include blacklisting of the firm for future business with the purchaser for a certain period.

32.0 TESTS

Routine Tests

Routine tests shall be carried out on all transformers and the tests shall be conducted in accordance with relevant National/ International Standards. No sampling is allowed. In addition, tank tests in accordance with IS:1180 shall be carried out.

The following routine measurements and tests shall be carried out in presence of Purchaser's authorized representative(s):

- Measurement of winding resistance. (For 500 KVA at all tap positions)
- Voltage ratio measurement and check of polarity and vector group. Bushing positions shall have permanent markings at this stage of production;

- c) Measurement of impedance voltages/ short circuit impedance at rated current and frequency (for 500 KVA transformers at normal, highest and lowest tap positions)
- d) Measurement of load loss at half load & full load at 75°C; (for 500 KVA transformers at normal, highest and lowest tap positions)
- e) Measurement of neutral unbalance current;
- f) Temperature rise test on one transformer of each rating and measurement of hot resistance.
- g) Measurement of no-load loss and no-load currents at 50%, 75%, 90%, 100%, 110%, 115%, and 120% of rated voltages on one transformer of each rating; (For unit transformer of each Lot)
- h) Induced over voltage withstand test at 22KV for 60 sec on the HV windings;
- i) Power frequency voltage withstand tests on HV and LV windings;
- j) Magnetic balance test
- k) Polarization Index test P.I. value shall be not less than 1.5. P.I. = IR at 600 sec / IR at 60 sec.
- l) Oil leakage test : The criterion of leakage shall be discoloration by oil of whitewash applied externally to suspected parts at an oil temperature of 90°C or other method, as approved by the Purchaser;
- m) Pressure test on transformer tank on one unit for each rating. Bushings and oil shall be subject to the following routine tests.
- n) Bushing routine test: in accordance with IEC 137/IS 3347;
- o) Oil dielectric and moisture content test: conforming to IEC 156 or IS 335. Routine test certificates shall include in addition to the test results, the purchaser's order number, the transformer serial number, outline drawing number and transformer KVA rating.

Any other applicable tests shall be conducted at the discretion of the Purchaser without any extra cost to purchaser.

Type Tests

- The measurements and tests should be carried out in accordance with the standard specified in each case as indicated in the following table if the same tests were not conducted earlier at CPRI or any Govt. approved Laboratory on the transformers of the offered design.

Type Test	Standard
Temperature Rise Test	IEC 76/IS 2026
Impulse Voltage Withstand Test, including Full Waves and Chopped Waves as listed below	IEC 76/IS 2026
Noise Level Measurement	IEC 551
Short Circuit Test	IEC 76 / IS 2026

In accordance with IEC 76-3 the following sequence of impulses should have been/ should be applied;

- one full wave at 50% BIL;
- one full wave at 100% BIL;
- one chopped wave at 50% BIL;
- two chopped waves at 100% BIL and
- two full waves at 100% BIL.
- If the type test report(s) submitted by the bidder do not fulfil the criteria, as stipulated in this technical specification/ Bidder's offer, the relevant type test(s) has/ have to be conducted by the Bidder at his own cost in CPRI/ National Govt. approved laboratory in the presence of IA/IA's representative(s) without any financial liability to IA, in the event of order placed on him.
- Even if the Type test report(s) confirm(s) the Purchaser's specification, the Purchaser at his discretion may ask the Supplier to repeat any or all specified type tests at CPRI/ National Govt. approved laboratory on sample(s), selected at random by the

purchaser's representative(s) out of the offered quantity (first lot i.e. minimum one third of the total ordered quantity). The type test(s) are to be test-witnessed by the Purchaser's representative(s). For such type of repetition of type tests, the Bidder may quote Type Test Charges in the enclosed Price Schedule or conduct the tests free of cost.

- The supplier shall furnish calculations in accordance with IS: 2026 to demonstrate the Thermal ability of the transformers to withstand Short Circuit forces.

TEST VOLTAGE

Transformers shall be capable of withstanding the Power frequency and Impulse test voltage as described below:

Nominal system voltage	Highest voltage	System	Impulse voltage	Test	Power frequency test voltage
433 V (rms)					3 KV (rms)
11 KV (rms)	12 KV (rms)		75 KV (Peak)		29 V (rms)

13.15. Installation, Testing & Commissioning of 3-phase outdoor Switched Capacitor Bank

Scope:

1.1 This specification covers design & supply of **1.98 & 3.96 MVAR (IA may include the requirements as per its need)** capacitor bank along with all required equipments to be installed in 33kV sub stations. The capacitor bank shall consist of capacitor bank, circuit breaker, Series Reactor, control & relay panel, isolators, LAs, CTs and NCT, conductor, all type of necessary connectors along with suitable mounting structure. All these equipment shall have suitable terminal/equipment connectors as detailed in Technical specification.

1.2 The equipments to be supplied against this specification are required for vital installations where continuity of service is very important. The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years

1.3 The equipment offered shall be complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.

1.4 Configuration: The major equipments involved for each mechanically switched shunt capacitor bank are as follows:

1. 12.65 kV, 1980 kVAr (or any other rating as defined by MSEDCL), 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor bank having two variable step of 792 Kvar & one Variable steps of 396 kVAr. Bank shall be complete with Capacitor units of 264/132 kVAr, Aluminium busbars, Pin & Post insulators, HRC fuses, Surge arrestor etc. with details as follows-(1) 11 kV, Aluminium Wound, Dry type Series reactors a) 0.52 kVAr for 792 kVAr step - 6 Nos. , b) 0.25 kVAr for 396 kVAr step - 3 Nos. (2) 11 kV, 3-Phase Dry Type RVT - 1 No. (3) 12 kV 3 Phase Indoor type metal enclosed Vacuum Capacitor switches. - 3 Nos. (4) Indoor Type Automatic Control Unit - 1 No.(5) IP 55 , Outdoor CRCA cubicle Panel for accommodating capacitors, Series Reactor, Vacuum contactor, Surge arrestor & Fuses

2. 12.65 kV, 3960 kVAr, 3-Phase, 50 C/s housed in Outdoor Type CRCA Panel, Capacitor bank having two variable step of 792 Kvar & two Variable steps of 1188 kVAr. Bank shall be complete with Capacitor units of 396/264 kVAr, Aluminium busbars, Pin & Post insulators, HRC fuses, Surge arrestor etc.with details as follows-

(1) 11 kV, Aluminium Wound, Dry type Series reactors

a) 0.52 kVAr for 792 kVAr step - 6 Nos. ,

b) 0.8 kVAr for 1188 kVAr step - 6 Nos.

(2) 11 kV, 3-Phase Dry Type RVT - 1 No.

(3) 12 kV 3 Phase Indoor type metal enclosed Vacuum Capacitor switches. - 4 Nos.

(4) Indoor Type Automatic Control Unit - 1 No.(5) IP 55 , Outdoor CRCA cubicle Panel for accommodating capacitors, Series Reactor, Vacuum contactor, Surge arrestor & Fuses etc

3. 11 kV Circuit Breaker

4. 11 kV Isolator with earth blade

5 11 kV lightning Arrestors

6. 11 kV Current Transformer

7. 11 kV Neutral current transformer

8. 11 kV Single phase Current Limiting Reactors

9. Control & Protection Equipment.

1.5. It is not the intent to specify herein complete details of design and construction. The equipment offered shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements. The dimensional drawings attached with this specification and the notes thereto are generally of illustrative nature. In actual practice, notwithstanding any anomalies, discrepancies, omissions, in-completeness, etc. in these specifications and attached drawings, the design and constructional aspects, including materials and dimensions, will be subject to good engineering practice in conformity with the required quality of the product, and to such tolerances, allowances and requirements for clearances etc. as are necessary by virtue of various stipulations in that respect in the relevant Indian Standards, IEC standards, I.E. Rules, I.E. Act and other statutory provisions.

1.6 The Tenderer/supplier shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.

1.7 The tenderer shall furnish in his offer a list of recommended spares with unit rates for each set of equipment that may be necessary for satisfactory operation and maintenance of circuit breaker and Isolators for a period of 10 years. The purchaser reserves right of selection of items and quantities of these spares to be ordered. The cost of such spares shall not be considered for tender evaluation.

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

1.9 11 KV Multiple switched Automatic Capacitor bank(CRCA Cubicle panel) shall be manufactured by principle manufacturer of capacitor banks..

2.0

STANDARDS

The equipment shall conform (for performance and testing thereof) in all respects to the relevant Indian/International Standards specifications with latest amendments thereto.

2.1 INDIAN STANDARDS

IS NO.	Title
13925:1998	Specification for H.T. shunt Capacitor
IS 9920-2002	Vacuum Contactors/ Capacitor Switch
IS 9921 -1985	Isolator
IS 2705	Current Transformer
IS 3070	Lighting Arrestor
IS 3156	Residual Voltage Transformer.
IS 5553	Series Reactor
IEC 61000	Automatic Power Factor Controller

The other components such as VCB panel & other auxiliary equipments shall comply with the latest version of latest Indian/International standards.

2.3 Equipment conforming to other internationally accepted standards which ensure equal or higher quality than the above mentioned standards would also be acceptable. In such

case bidders, who wish to offer material conforming to standards other than listed above, shall clearly bring the salient points of difference between the standards forward/adopted and specified hereinabove. Four copies of such standards with authentic English Translation shall be furnished along with the offer. In case of conflict order of preference shall be (1) ISS (2) IEC (3) other standards. In case of any difference between provisions of these standards and provision of this specification the provision contained in this specification shall prevail.

3 0 SERVICE CONDITIONS

The capacitor Bank to be supplied against this specification shall be required to operate satisfactorily and continually under the following moderately hot and humid tropical climate conducive to rust and fungus growth . As per parameters mention in tender documents. Following to be submitted by contractor , during engineering.

- Location: - To be defined by the
- Maximum ambient air temperature (deg. C) To be defined by the
- Minimum ambient temperature (deg. C) To be defined by the
- Average daily ambient air temperature (deg/C) To be defined by the
- Maximum relative Humidity (%) To be defined by
- Maximum altitude above sea level (M) To be defined by the
- Average annual rainfall (MM) To be defined by the
- Isoceraunic level (days per year) To be defined by the
- Sciemic level (Horigental accn.) To be defined by the
- Maximum wind pressure (kg/sqm) To be defined by the

4 0 PRINCIPAL PARAMETER

The equipment covered under this specification shall conform to specific parameters given below:

4.1 CAPCITOR BANKS

Sl. No.	Item	Specification
1.	Nominal system voltage	11 KV
2.	Rated voltage of capacitor bank	12.65 KV
	Output of capacitor bank at 12.65 KV	1980 & 3960 KVAR (To be given by)
4.	Rated line current	To be filled by
5.	Connection of capacitor bank	Single star

6.	No. of phases	3
7.	Rated voltage of individual capacitor unit	To be filled by
8.	Capacity of individual capacitor unit	To be filled by
9.	Insulation level	RMS-28 KV
		Peak -75 KV
10.	Maximum temp. rise over ambient	10 C
	measured on container	
11.	Type of discharge	Internally though resistor provided
		within the Unit
12.	Type of fuse	External fuse
13.	Type of installation	Outdoors
14.	Power loss (Tan delta)	Not to exceed 0.2 watt/KVAR
		subject to tolerance as per standard.

Capacitor Bank Rating:

Sl.No.	Transformer Capacity (MVA)	Rating of Capacitor Bank (MVar)	Steps configuration kVar X No. of Steps (Switched)
1	5	1.98	396+792+792
2	8 & 10	3.96	792+792+1188+1188
3	Any other capacity as defined by IA approval.	Any other rating as defined by IA approval	To be specified by the MSEDCL website

Note: The stages may be changed during detailed engineering Residual Voltage Transformer

5.0 TECHNICAL REQUIREMENT

5.1 CAPACITOR UNIT

The capacitor shall be of unit type construction suitable for indoor installation having high dielectric strength. No sun protection will be provided. The capacitor bank shall be complete with mounting frames, insulators and all other components for formation of capacitor bank. The bank shall be open type complete with inter connecting aluminum bus bars and adequate clearance shall be provided between phases and phase to earth..

The capacitor should be able to withstand 10% overvoltage and 30% over current (r.m.s. value) arising due to over voltage and harmonics

5.2 ASSEMBLY

Capacitor units of 132, 264 & 396 KVAR, 7.3 single phase shall be connected in parallel in each phase to form a three phase star connected capacitor bank. The bank shall be mounted on a steel frame work in suitable one/two tier formation and shall be so arranged that an individual unit of 132, 264 & 396 KVAR can be removed easily without disturbing the complete assembly/ other units.

5.3 CONSTRUCTION OF CAPACITOR UNIT

A. CONTAINER

The container shall be built from CRCA of sufficient thickness (not less than 1.6 mm) to avoid damages to the tank in case of internal fault. It shall be of fabricated construction with all joints properly welded and designed to withstand

rough handling and should be hydraulically tested before assembling the internal elements. It shall be adequately epoxy pointed. The lid of container shall be properly welded to the container.

The capacitor unit shall be hermetically sealed after the entire assembly has been dried and impregnated with suitable liquid (Dielectric.) The capacitor elements shall be thoroughly dried and impregnated with an **impregnate** which has been completely refined and degasified so as not to have any impurities or gas which may cause deterioration of the dielectric. The **impregnate** used shall have low viscosity and high chemical stability and should be non-PCB. The container shall be adequately insulated from capacitor elements. Sufficient 'Wall' insulation shall be provided so that the capacitor units meant for use of 11 KV nominal system can be placed directly on grounded steel structures. The metallic surface of capacitor units shall be epoxy painted making capacitor units suitable for installing outdoor under moist tropical climatic conditions. **Capacitor panel shall be bolted type design. Capacitor Panel shall have IP-55 Degree of protection. Capacitor Panel shall be Powder coated**

B. **CAPACITOR UNIT**

The capacitor unit shall have **aluminium** foil as conducting layer. The dielectric used shall be polypropylene film by using layers of polypropylene film shall have the following compatibility criterion: -

(i) Polypropylene film shall conform to standard specification with latest amendments, for plastic film for new generation.

(ii) Compatibility between oil film (after thermal aging at 115 C for 96 Hrs.)

The **impregnate** used shall be non PCB liquid with **low be accumulating**, rapid bio degradation and low toxicity. Adequate number of such elements shall be assembled and enclosed in the enclosure to form a single phase unit with terminal bushings. The air in the enclosure and moisture absorbed by the paper shall be removed under high vacuum at elevated temperature and replaced by suitable impregnating medium having high permeability, high dielectric strength and non-inflammable properties.

C. **DISCHARGE DEVICE:**

Suitable discharge device shall be connected across the capacitor unit in accordance with IS: 13925. The discharge device shall reduce the residual voltage from the crest value of the rated voltage to 50 V or less within 10 Minutes after the capacitor is disconnected from the source supply.

D. **EARTHING CONNECTIONS:**

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

E. **MARKING:**

The capacitor unit shall be provided with a rating plate and terminal markings as stipulated in IS: 13925. The bidder shall submit the type test report along with the bid.

F. **FUSES**

Each capacitor element shall be protected by External HRC fuse of suitable rating and interruption capacity so that a faulty capacitor element shall be disconnected by fuse. The fuse shall satisfactorily operate under ambient conditions. The following requirements shall be considered while selecting the right size of fuse.

- a. Ability to withstand the maximum discharge current from healthy capacitor element.
- b. Capability of handling fault current so as to Blow off before the in case rupture takes place thereby avoiding damage to adjoining capacitor elements/capacitor units.

G. **BUSHINGS**

Bushing shall be of porcelain or polycrystalline and shall be jointed to the case by welding method (Weldable type bushing) to ensure adequate and permanent seal. Leads shall be brought out through one-piece bushing and welded to the terminal stud to make a strong and positive electrical contact. Bushing terminal shall be of stainless steel.

Capacitors to be tested for cyclic Over voltage and 3 G test for mechanical shock & vibration, bidder has to clarify / confirm these points in GTP

5.4 **PHYSICAL ARRANGEMENT OF BANK**

Star point of the capacitor bank shall be ungrounded. The mounting rack arrangement shall be such that one no. additional unit in each phase can be installed in future for increasing capacity.

5.5 AUTOMATIC CONTROL UNIT

(a) **Switching Arrangement:**

The Automatic control unit shall be provided inside the control; room to continuously monitor total load KVAR on secondary side of the transformer and shall automatically switch ON or switch OFF the capacitor banks through the operation of 12 KV Capacitor Switch in accordance with the parameter given in table no. 4.2 Overriding provision shall also be made for electrical switching ON or OFF of the capacitor switch by the operator from the ACU control box.

(b) **Time Delay:**

The switching ON operation will take place after period of 10 minutes. The switching OFF operation of relevant steps will be instantaneous.

(c) **Controls:**

The Automatic control unit shall instantly switch OFF the capacitor bank in the following contingencies occurring in any of the phases.

i) Voltage increased by 10% above the rated voltage of 11 KV.

ii) Power transformer current impedance (due to single phasing and for any other reasons) between any of the two phases exceeding 20% of the lowest, iii) Current increases in any capacitor unit by 30% above the rated current (only the relevant capacitor switch will open). Current between any of the two phases of the capacitor bank differs more than 15% of the lowest current of the 3 phases (only the relevant capacitor switch will open).

(d) **Monitoring Facility:**

A suitable display should be provided to indicate the capacitor current in each phases of the complete capacitor bank on the ACU panel inside the control room. Indications shall also be provided to indicate ON & OFF status of each capacitor bank. Along with audio alarm indicating tripping of capacitor bank and ON /OFF, visual display window be provided on control panel. Automatic Control unit shall have GSM(4G/3G/2G/GPRS)/CDMA connectivity; suitable modem shall be connected along with control unit to transfer the data to remote locations. Provision of SIM will be under the scope of bidder. Bidder has to provide online Dashboard to the IA users as per their requirements, Capable to show real time data and capable to generate MIS as per requirement .Bidder has to establish secure head end system on cloud which will be under the scope of bidder. Data transferred from Modem to Head end system through secure APN SIM, for the entire agreed period.

GSM / GPRS MODEM Specifications:

• Quad-band 850/900/1800/1900MHz

• GPRS multi-slot class 12/10

• GPRS mobile station class B

• Compliant to GSM phase 2/2+

– Class 4 (2 W @ 850/900MHz)

– Class 1 (1 W @ 1800/1900MHz)

• Control via AT Commands (3GPP TS 27.007, 27.005 and enhanced AT Commands)

(e) **Control Power:**

The AC control voltage for operation of the ACU shall be taken from substation battery. The required control voltage shall be 230 VAC supply.

(f) **Temperature Variation:**

The control equipment and associate circuitry shall be suitable for operation at an ambient temperature in the range of + 5 deg C to (+) 50 deg C.

(g) **Protection of ACU:**

Besides in-built protection against lines surges and transient over voltages, suitable fuses/MCB shall be provided for protection against over current. The ACU shall remain fully functional during and after line surges and transient over voltages.

(h) **Control Unit Casing:**

Except for the terminals, the ACU shall be enclosed in a suitable casing so as to avoid ingress of dust. ACU should be installed at inside of substation on Floor mounting arrangement.

5 6 **VACUUM CONTACTOR SWITCHES**

This specification covers 11 KV, 50 Hz, Indoor type automatic Vacuum Contactor Switch suitable for switching capacitor in steps.

(a) **Applicable Standards:**

Unless otherwise stipulated in this specification the Vacuum Contactor Switch shall comply with the latest version of IS:9920 (AC Switches for voltages above 1000 V). Capacitor should be tested by International Labs as per IEC 60265-1 (1998)

(b) **Rated Voltage:**

The rated voltage for the Vacuum Contactor Switch shall be 12 KV. This represents the highest system voltage corresponding to the nominal system voltage of 11 KV.

(c) **Rated Current:**

The standard rated normal current shall be 200A

(d) **Rated Capacitive Switching Current:**

The rated capacitive switching current shall not be less than 100 A Note: The capability of the Vacuum Contactor Switch shall also take into account the parallel switching of capacitor bank steps.

(e) **Rated Short Time Current:**

The rated short time symmetrical current for 1 second shall be 10KA (rms AC. component).

(f) **Rated Short Circuit Making Current:** The rated making current shall be 25 KA Peak .

(g) **Basic Impulse Level (BIL):**

The rated basic impulse level of Vacuum Contactor Switch to earth as also across the open terminals shall be 75 KV.

(h) **Control Supply:**

The control power for closing the Vacuum Contactor Switch shall be 230 V single phase AC supply. The closing mechanism shall be suitable for a voltage variation of (+) 10% to (-) 20%.

(i) **Design & Construction Requirement:**

Type:

- a. The Capacitor Switch shall be of vacuum type.
- b. The Vacuum Contactor Switch shall be of three phase construction and shall be suitable for remote operation.
- c. The Vacuum Contactor Switch shall be suitable for indoor installation and shall have sealed weather proof type construction.
- d. The enclosure of the Vacuum Contactor Switch shall be provided with two earthing terminals marked with the

earth symbol.

- e. The bushings provided on the switch shall have clamp type of terminals to directly receive aluminium conductors up to 10mm dia in both horizontal and vertical directions. The terminal arrangement shall be such as to avoid bimetallic corrosion.

(j) **Operating Mechanism:**

The operating mechanism shall be either solenoid or motor charged spring for which the control supply shall be as per clause 31.

(k) **Mechanical and Electrical Endurance:**

The Vacuum Contactor Switch shall be capable of performing not less than 10,000 mechanical operations and 10,000 electrical operations at 100A capacitive current without getting damaged.

(l) **Marking:**

The Vacuum Contactor Switch shall be provided with a legible and indelibly marked name plate with the following:

- a) Name of the manufacturer.
- b) Type, designation and serial number.
- c) Rated voltage and current.
- d) Rated frequency.
- e) Number of poles.
- f) Rated short time current (symmetrical).
- g) Rated making current.
- h) Rated capacitive switching current.
- i) Date of manufacturing.
- j) Property of respective MSEDCL

- (m) **Testes:** The Vacuum Contactor Switch shall be subjected to the following tests in accordance with the IS:9920 (Part-IV), & Should also be tested by international labs as per IEC 60265-1(1998)

(i) **Type Tests**

- a) Tests to verify the insulation level, including withstand tests at power frequency voltages on auxiliary equipment.
- b) Tests to prove that the temperature rise of any part does not exceed the specified values.
- c) Making and breaking tests including tests for the rated capacitive current.
- d) Tests to prove the capability of the switch to carry the rated short time current.
- e) Tests to prove satisfactory operation and mechanical/electrical endurance.

(ii) **Routine Tests**

- a) Power frequency voltage dry tests.
- b) Voltage tests for auxiliary circuits.
- c) Measurement of the resistance of the main circuits.
- d) Tests to prove satisfactory operation.

5.7 **AUXILIARY EQUIPMENTS**

Isolator:

- (i) The Isolator shall be Outdoor type, 11 KV, 400Amp, Single throw, Double break, off load type, triple pole, Horizontal gang operated with earth switch.
- (ii) Tests: The Isolator shall be type tested and shall be subjected to routine and acceptance test in accordance with IS: 1818-1972.
- (iii) The bidder shall submit guaranteed technical particulars along with their bid.

5.8 **LIGHTNING ARRESTOR**

- (i) The specification covers the supply, delivery, erection, testing & commissioning of 9 KV, 10 KA,

Station class heavy duty, gapless, metal (zinc) oxide surge arrestors complete along with clamps, complete fitting and accessories for installation on outdoor type 11 KV switchgear, transmission lines, transformers etc.

- (ii) Tests: The Lightning Arrestors shall be type tested and shall be subjected to routine and acceptance test in accordance with IS: 3070.
- (iii) The bidder shall submit guaranteed technical particulars along with their bid.

5.8 B) Suitable one number RC surge suppressor shall be provide per bank inside of cubicle panel.

LA and Isolator shall be mounted on same structure and outgoing of Isolator shall be connected with CRCA capacitor panel through suitable power cable .

5.9 RESIDUAL VOLTAGE TRANSFORMERS

The residual voltage transformers shall be in door type, dry with primary in star and secondary in star & tertiary in open delta formation. The neutral of the primary winding shall kept fully insulated and would be isolated from ground. The tertiary winding in open delta shall be used to energise the neutral unbalanced voltage withstand relay. The RVT should be suitable to discharge the capacitor bank to voltage not exceeding as per standards with latest amendments thereof. The RVT should be designed to with stand the temperature rise due to energy discharge in to it capacitors in case of tripping. All the type test as per IS including temperature rise test should be furnished. RVT shall be mounted inside a cubicle.

5.10 HRC FUSES

Suitable indoor type 11 KV HRC fuses along with the mounting insulators etc. to provide proper protection for the capacitor unit shall form part of the equipment to be supplied.

5.11 SERIES REACTORS

0.2 % Series reactor per phase per step of capacitor rating for inrush current restriction to be connected on neutral end as per IS: 5553. The rated voltage shall be 12 KV. The reactor shall be dry type single phase reactors mounted on post insulators and designed to carry 130 % of rated current continuously without exceeding the temperature rise & shall be applicable for thermal class of insulation used. The reactor shall be mounted on structure.

- i. Tests: The series reactor shall be type tested and shall be subjected to routine and acceptance test in accordance with IS: 5553.
- ii. The bidder shall submit guaranteed technical particulars along with their bid.

5.12 CAPACITOR CUBICLE:

It shall be free standing outdoor type sheet steel enclosure fabricated from 2 mm. thick CRCA sheets. Capacitor cubical shall be mounted on mild steel channel frame and base frame shall be provided with mounting holes for fixing on concrete foundation. All doors and covers shall be designed to avoid ingress of water, moisture, dust etc. and shall be provided with suitable gaskets to achieve IP-55 degree of protection. Covers and doors shall be provided with electrical interlocks to avoid access to live parts. Viewing glasses shall be provided to view inside parts like fuses, contactors. CFL type internal panel lighting shall also be provided to have proper view in the night. Capacitor enclosure shall be duly powder coated. FRP canopy shall be provided at the top and which projects about 200 mm beyond cubicle on all sides. All LT internal wiring shall be fire retardant cable of 2.5sq.mm. All cable entries shall be from bottom through cable glands of suitable size. HT XLPE cable entry shall be through a cable entry box mounted on cubicle or fixed separately on foundation and coupled to the cubicle. Necessary Danger plate & Name plate etc shall be provided at prominent places. All other necessary fittings and accessories should be provided by manufacturer to ensure safe and smooth operation of the equipment.

Cubicle panel shall have provision of Internal Arc prevention as per IEC 62271-200

Cubicle panel shall be bolted type design.

Cubicle panel shall be IP 55 degree of protection.

Cubicle panel shall be powder coated.

5.13 BUS BARS AND INTERCONNECTION MATERIALS

Suitable bus bar arrangement shall be provided by the supplier and requisite quantity of bus bar material shall be provided for the Bank. All bus bars shall be aluminum flats with suitable cross section . Bus bar connections between Bank and RVT. Shall also be provided.

5.14 ACCESSORIES

Each capacitor bank cubicle panel shall be provided with the following accessories:-

1. 2 Nos. earthing terminals
2. Clamps and connectors
3. Aluminum bus bar
4. RC Surge Suppressor one no per bank
5. RVT
6. Capacitors
7. Series reactor
8. Vacuum Contactor
9. Rating plate

All other accessories required for erection, assembly and commissioning of the capacitor bank

ACU shall be floor mounted and kept inside of substation building near to VCB panel.

LA and Isolator shall be mounted on external structure and to be kept outside.

5.15 RATING PLATE

Each unit shall be fitted with a rating plate giving clearly the particulars specified of marking as per standards:

5.16 CLEARNCES INSTALLATION AND MAINTENANCE INSTRUCTIONS:

The supplier shall provide 3 sets of detailed instruction manuals and drawings covering all aspects of installation and maintenance of the capacitor bank and the associated equipments.

5.17 OPERATION OF CAPACITOR BANK

- a. The capacitors are proposed to be connected in 3 phase, 11 KV, 50 Hz system. The maximum symmetrical short circuit level on 11 KV systems is **26.2 kA for 1seconds**.
- b. It is to be specifically noted that 1.5 & 3 MVAR capacitors banks are intended for use at our 33/11 KV receiving substations within our distribution network.
- c. Maximum permissible over voltage shall be as per standards and latest amendments thereof.
- d. Permissible increase in current loading due to any or all of the following shall not exceed 30% of the rated current.
 1. Increased voltage
 2. Increased frequency
 3. Non sinusoidal voltage
- e. The capacitors shall be suitable for operating in temperature category 50° C as per standards.

Note:- All the parameters which are not covered under the above mentioned specification will be considered according to IS.

6.0 TESTS

6.1 TYPES TESTS

All the offered equipment shall be fully type tested by the bidder as per relevant standards including the type tests mentioned below. Type test should have been conducted on the similar or higher capacity of equipments for 11 KV or 33 KV class of capacitor bank from recognized test laboratory preferably CPRI or other Govt. test labs within 5 years prior to date of opening of bid. The bidder shall furnish four sets of test reports as per relevant standards for each type

of equipment offered. along with the bid. The offers received without type tests shall be tested as non responsive and rejected.

- a. Thermal stability
- b. Capacitor less tangent measurement at elevated temperature.
- c. A.C. voltage test between terminal & container.
- d. Lightening impulse voltage test between terminal and container.
- e. Short circuit discharge test.

6.2 ACCEPTING TEST

All acceptance tests stipulated in relevant standards and including those as mentioned below shall be carried out by the Supplier in presence of Purchaser's representative.

- a. Capacitance measurement test
- b. Capacitor loss tangent measurement test.
- c. Voltage test between terminals.
- d. A.C. voltage test between terminal and container.
- e. Tests of internal discharges device.
- f. Sealing test

The method shall be subject to agreement between the Supplier and Purchaser where it is not specified in the relevant standards. The Purchaser reserves the right to carry out any other test (s) of reasonable nature, in addition to above mentioned tests, at works/test house of the Supplier or any other recognized laboratory/Research Institute to satisfy that the material compiles with the intent of this specification

7.0 INSPECTION

The inspection shall be carried out by the Purchaser at two stages of manufacture i.e. inspection during manufacturing and final inspection and testing. The Supplier shall keep the Purchaser informed in advance of the manufacturing programmer so that the arrangement can be made for inspection. The Manufacturer shall grant free access to works, for Purchaser's representative at a reasonable time. Inspection and acceptance of any equipment under this specification by the Purchaser shall not relieve the Supplier of his obligation of furnishing the equipment in accordance with this specification and shall not prevent subsequent rejection if the equipment is found to be defeat/not as per this specification.

All acceptance tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the contractor and Purchase. The contractor shall offer to the inspecting official (s) representing the Purchase, all reasonable facilities without charge, to satisfy that the material is being furnished in accordance with this specification. The Purchase has the rights to have the tests carried out at his own cost by an independent agency wherever there is a dispute regarding the quality of the supply.

The contractor shall give not less than 15 days advance intimation to enable the purchase to depute his representative for witnessing the state/acceptance tests.

8.0 QUALITY ASSURANCE PLAN

8.1 The bidder shall have ISO-9001/9002 or any latest, certification'. The bidder shall invariably furnish the following information along with his bid part-I falling which his bid shall be liable for rejection. Separate information should be given be individual type of material offered.

- (I) Statement giving list of important raw materials, name of Suppliers for raw material, list of standards according to which the raw materials are tested and list of tests normally carried out on raw materials in presence of bidder's representative, copies of tests certificates
- (II) Information and copies of test certificates as in (1) above in respect of bought out items,

(III) List of manufacturing facilities available

- (IV) Level of automation and list 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 test.
- (VI) List of testing equipment available with the bidder for stage and final testing of equipment offered and test plant limitations if any, vis-a-vis the type test, special acceptance and routine test specified in the relevant standards. These limitations shall be very clearly brought out in the relevant schedule of deviations as deviations from specified tests requirements.
- 8.2 The successful bidder(s) shall within 30 days of placement of order submit the following Information: -
- List of raw material and bought out items and names of the Suppliers selected from those furnished along with the bid.
 - Type test certificates or the raw material and bought out items.
 - Quality assurance plan (QAP) with hold points for purchase's inspection (to be finalized after mutual discussions between the bidder and the purchaser, at latter's office.)

HOLD POINT

A stage in the material procurement of manufacturing process beyond which work shall not proceed without the documental approval of the purchase.

NOTIFICATION POINT:

A stage in the material procurements, or manufacturing process for which advance notice of the activity is required to facilitate witness by the purchasers representatives.

- 8.3 The QAP of the contractor shall consist of the following details.
- ♦ An outline of the proposed work and program sequence.
 - ♦ The structure of contractor organisation for the contract.
 - ♦ The duties and responsibilities assigned to the staff ensuring quality of work
 - ♦ Hold and Notifications points.
 - ♦ Submission of engineering documents required by this specification.
 - ♦ The inspection of material and components on receipt
 - ♦ Stage Inspection.
 - ♦ Final Inspection.

9.0 DOCUMENTATION

All drawing shall conform to International standards organisation (ISO), 'A' series of drawing sheets/Indian standards specification IS: 656. All dimensions shall be in SI units.

9.1 LIST OF DRAWINGS

The bidder shall furnish the following alongwith the bid: -

- Two sets of drawing showing clearly the general arrangement, fitting details, electrical connections etc. required for erection & commissioning
 - Technical leaflets (users manual) giving operating instructions.
 - Three copies of dimensional drawings.
- 9.2 The manufacturing of the equipment shall be strictly in accordance with drawings approved by purchaser and no deviation shall be permitted without the written approval of the purchase. Any manufacturing and fabrication prior to approval of the purchaser shall be at supplier risks.
- 9.3 Approval of drawing/work by the purchase shall not relieve at supplier of his responsibility and liability for ensuring the correctness and correct
- 9.4 Interpretation of the drawing for meeting the requirements of latest revisions of applicable standards, rules and code of practices. The purchase shall have power to reject any work or material which in his judgment is not in all

accordance therewith.

- 9.5 Three sets of drawings for purchaser's approval shall be furnished within two weeks of placement of order. The purchaser shall communicate his comments/ approval within reasonable. The supplier, shall, if necessary modify the drawings and resubmit three copies of modified drawings for a approval.
- 9.6 Three sets of separating manual, drawing, technical leaflets, inspection manual etc shall be supplied to each consignee in the first instance.
- 9.7 One set of routine test certificate shall accompany such dispatch consignment.

10.0 **PACKING & FORWARDING**

The equipment shall be packed in creates suitable for vertical, horizontal transport as the case may be and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully-packed and marked with the appropriate caution symbol. Wherever necessary proper arrangement for lifting such as fitting hooks shall be provided. Any material found short within the packing case(s) shall be supplied immediately by the supplier without any extra cost to purchaser.

Each consignment shall be accompanied with a detailed packing list containing the following information and shall be marked "PROPERTY OF respective <DISCOM>".

- a) Name of the consignee
- b) Details of consignment
- c) Destination
- d) Total weight
- e) Handling and packing instructions
- f) Bill of material indicating contents of each package.

In addition to the above the marking on each package shall per relevant standards.

- 10.1 The packing shall be done an per manufacture's standards practice ensuring that no material is damaged during transit by Rail/Road.

11.0 **SUPERVISION SERVICES:**

The bidders shall provide free of services of their engineers, If required during erection & commissioning of capacitor bank at various places.

Advance notice of 15 days shall be given to the contractor to depute his engineer to various substation in state of Uttar Pradesh.

12. **MANDOTRY SPARES AND TOOLS**

The bidder shall have suitable stock to carry out O&M as and when required.

13. TRAINING:-

- 13.1. Bidder has to organise training sessions for operations of RMUs for Engineers and field staff after commissioning.
- 13.2 Bidder has to organise training sessions for operations of Breakdown fault attending van for Engineers and field staff at regular intervals after supply.
- 13.3. Bidder shall provide posters in Hindi regarding DOs and DON'Ts regarding operation of RMUs properly displayed inside Door of RMUs along with contact details of person to approach in case of problem/ fault.

14.FACILITY MANAGEMENT SERVICES

Bidder shall provide service for monitoring of working of capacitor bank by visiting every installed capacitor bank location once in three months and submit report as per attached sheet.

Indicative Scope of Work for Facility Management Services to be carried out for Keeping 12.65 kV, HT Capacitor bank System at 33/11kV Sub-Stations Healthy and Operational														
1	Visiting each substation on quarterly basis , and log the measurement of 11 KV Incomer breaker data in following format.													
	Sl No	Name of S/s	Rating of bank	Incomers Energy meter serial no	Date of Current Recording	KWH	KVAH	PF1	Date of Last Recording	KWH	KVAH	PF2	Total Hrs between two recordings	Total operation R/Hrs Capacitor Banks between two recordings
	1													
	2													
	3													
	.													
	.													
	n													
2	These readings shall be <u>MRI based</u> and submitted to concerned Executive Engineer office for applying payment of FMS charges , which shall be paid on quarterly basis .													
3	During quarterly visit , bidder shall check the complete capacitor bank for any deficiency , if any deficiency is noticed same shall be rectified within fortnight . <u>In addition to this the healthiness of relay/trip circuit and proper operation in undervoltage/overvoltage conditions should be ensured by the bidder.</u>													
4	At the event of any fault occurred ,shall be duly communicated to bidder by substation in charge or concerned SDO offices - which has to be attended within 7 working days time , and resolution of such complaints specific to capacitor bank shall be done within fortnight of complaint attend date.													
5	To establish one office in each zone - with provision of e-mail and mobile communication connectivity and shall have minimum 4 well qualified technicians to attend faults and provide services .													
6	All required spares shall be kept at FMS Zonal Centres for prompt service .													
7	Any other activity required to ensure the contracted Capacitor bank System is operational for maximum time.													

Annexure-B

General Technical Instructions

(This document is meant for the exclusive purpose of bidding against this Package and shall not be transferred, reproduced or otherwise used for purposes other than that for which it is specifically issued.)

Technical Instructions of 'KONKAN DISASTER MITIGATION PROJECT'

1.1.	33 V Line support	3992
1.2.	11 KV line Support and DTR Substation support	3993
1.3.	Route And Terrain	4003
1.4.	Detailed Survey	4004
1.5.	Profile Plotting	4004
1.6.	Road Crossing	4014
1.7.	Railways Crossings	4015
1.8.	Telecommunication, LT or HT Line Crossing	4015
1.9.	Details En-route	4015
1.10.	Clearances - General	4015
1.11.	Electrical System Data	4037
1.12.	Pole Location	4038
1.13.	Construction	40338
1.14.	Erection of DP Structure for Angle Locations	40438
1.15.	Concreting	40438
1.16.	Providing Of Guys To Supports	40438
1.17.	Guy Strain Insulators	40539
1.18.	Fixing Of Cross-Arms	40540
1.19.	Insulators And Bindings	4050
1.20.	Conductor Erection	4061
1.21.	Tensioning and Sagging Operations	4072
1.22.	Clipping In	4073
1.23.	Fixing of Conductors and Earthwire Accessories	4073
1.24.	Replacement	4073
1.25.	Tying Of Conductor On Pin Insulators	4084
1.26.	Kind And Size Of Tie Wire To Be Used	4084
1.27.	Rules Of Good Tying Practice	4084
1.28.	Conductors At Different Voltages On Same Supports	4094
1.29.	Earthing	4096
1.30.	Anti-Climbing Devices	4106

- 1.31. Testing And Commissioning 4106
- 1.32. River Crossing 4117
- 1.33. Guarding 4118
- 1.34. Repair to conductors 41148
- 1.35. LT Lines and Service connection 41148

General Technical Instructions

Following CEA regulations shall be applicable during execution of work:

- a. Construction Regulation – Central Electricity Authority (Technical Standards for construction of electrical plants and electric lines) Regulation, 2010 (as amended time to time)
- b. Safety Regulation for construction and O&M - Central Electricity Authority (Safety requirements for construction, Operation and Maintenance of electrical plants and electric lines) Regulation, 2011 (as amended time to time)
- c. Connectivity Regulation – Technical Standard for connectivity to the grid (Amendment) Regulation 2013; Technical Standards for connectivity of the Distributed Generation resources, 2013; Central Electricity Authority (Grid Standard) Regulation, 2010 (as amended time to time)
- d. Metering Regulations – Central Electricity Authority (Installation and Operation of meters) Regulations, 2006; Central Electricity Authority (Installation and Operation of meters) (Amendment) Regulations, 2010 and 2015 (as amended time to time)
- e. Central Electricity Authority (Measures relating to safety and Electric supply regulations), 2010 and amendment regulation 2015 (as amended time to time)

1.1. 33 V Line support

9.1m meter long PCC Pole (or PCC Pole as per state practice shall be used for 33 KV line support). 152x152mm H-Beam (37.1kg/m) / Wide parallel Beams 160x30.44 kg/m can also be used as support in urban/forest area and or Steel Tubular Poles/ Wide parallel Beams 160x30.44 kg/m (Expandable through jointing plates) may be used in hilly area where head load shifting is the only option. Cement concreting shall be used for 33 KV support foundations in mixture 1:3:6 (1: cement, 3: coarse sand and 6 Stone ballast 40mm sizes). Each support shall be concrete (0.5mx0.5mx2m) = 0.5 cmt. 0.014 cmt shall also be used in muffing of the support. PCC pole shall not be provided with muffing.

1.1.1. Pole base plates as per specifications shall be used.

1.1.2. Pole earthing shall be performed through earthing coil duly connected with 8 SWG wire. The GI wires between pole structure and the earthing coil should not be used in cut length. Wherever, cut is evitable, proper nut bolt, washer and binding should be made as per REC specifications. The GI wire between support and earth coil should be placed 1 meter below the ground level.

1.1.3. Earth coil should be inserted 1200 mm away from pole.

1.2. 11 KV line Support and DTR Substation support

1.2.1. 8.0 meters or equivalent PCC Poles as per prevailing practices of the state shall be used for 11 KV line and substation support. 152x152mm H-Beam (37.1kg/m) or Wide Parallel Beam 160x30.44 kg/m can also be used as support in urban/forest area and or Steel Tubular Poles/Wide parallel Beam (with expandable lengths through jointing plates) may be used in hilly area where head load shifting is the only option.

The single PCC pole supports shall be erected with Stone bolder/stone ballast mixed with excavated earth in normal soil. PCC poles in Double Pole structures, turning point structure, Distribution Transformer Substation structure shall be grouted in cement concrete mixture of 1:3:6 (1: cement, 3: coarse sand and 6 Stone ballast 40mm sizes). Single pole supports in water logging area shall also be grouted in cement concrete mixture of 1:3:6 (1: cement, 3: coarse sand and 6 Stone ballast 40mm sizes). PCC pole shall be grouted with concrete $(0.6\text{m} \times 0.6\text{m} \times 1.35\text{m}) = 0.486 \text{ cmt.}$. In special location, wherever, IA/IA Representative specifically decides, to enhance additional strength, concreting may be used as support foundation.

In forest, wherever special care is to be made for elephant corridors, 13m long, 152x152mm RS Joist (37.1kg/m) / **Wide Parallel Beams 160x 30.44 kg/m** may be used for 11 KV line support.

152x152mm H-Beam (37.1kg/m)/ Steel Tubular Poles/ Wide Parallel Beams 160 x 30.44 kg/m shall be grouted in cement concrete mixture of 1:3:6 (1: cement, 3: coarse sand and 6 Stone ballast 40mm sizes) in all the formation.

1.2.2. Pole base plates as per specifications shall be used.

1.2.3. Pole earthing shall be performed through earthing coil duly connected with 8 SWG wire. The GI wires between pole structure and the earthing coil should not be used in cut length. Wherever, cut is evitable, proper nut bolt, washer and binding should be made as per REC specifications. The GI wire between support and earth coil should be placed 1 meter below the ground level.

1.2.4. Earth coil should be inserted 1200 mm away from pole.

1.3. Route And Terrain

1.3.1. The scope of HT/LT length of feeder are enclosed with the tender documents. On award of the contract, Contractor shall perform foot survey to access the route, pole location and thus Single Line Diagram of the line works. The survey shall be approved by IA/IA Representative. Accordingly requirements of materials shall be finalized by the turnkey contactor in association with IA/IA Representative.

1.4. Detailed Survey

1.4.1. The detailed survey shall be carried out for the approved feeders/spur lines by the Contractor and submitted for IA approval.

1.5. Profile Plotting

1.5.1. Span: The number of consecutive spans between the section points shall not exceed design length considering wind pressure, type of poles and size of conductor.

1.5.2. Extension: An individual span shall be as near to the normal design span as possible. In case an individual span becomes too short with normal supports on account of undulation in ground profile, one or both the supports of the span may be extended by inserting standard body extension designed for the purpose according to technical specification.

1.5.3. Loading: There shall not be any upward force on poles under normal working conditions and the suspension poles shall support at least the minimum weight span as provided in the design. In case uplift is unavoidable, it shall be examined if the

same can be overcome by adding standard body extensions to the poles failing which tension poles designed for the purpose shall be employed at such positions.

- 1.5.4. Horizontal Tensions on pin insulators are to be avoided by proper alignment of the line. In case where installation of DP structure is not possible to erect for turning the line, "two pins" arrangement with suitable jumpering shall be provided at all those locations where pins are subjected to horizontal tension. Bridling type V Cross arms for such installations shall be used by the agency accordingly.

1.6. Road Crossing

At all road crossings, the poles shall be fitted with horizontally aligned disc type tension insulator string(s) or bridling V-cross arm supports using double pin insulator per phase depending on the type of poles and line but the ground clearance at the roads under maximum temperature and in still air shall be such that it should not fall below 6.1m in case of 33 KV and 11 KV lines. Also, cradle guarding is to be used at all the road crossing locations as per drawings / specifications enclosed.

1.7. Railways Crossings

Railway Crossings at pre-planned locality shall be selected in such a way that minimum feeder length shall be re-routed. The line crossing should be executed as per prevailing practices and approved drawings of railways. Railways crossing shall preferably be executed through underground cabling. Horizontal drill machine shall be used for this purpose. Required permission to block the Railways traffic and approval for railway crossing shall be arranged by the contractor at his own cost. All liaison works shall be performed by turnkey Contractor.

1.8. Telecommunication, LT or HT Line Crossing

The angle of crossing shall be as near 90 degrees as possible. However, deviation to the extent of 30 degree may be permitted under exceptionally difficult situations. Cradle guarding is to be used at all such crossing locations as per drawings / specifications enclosed.

1.9. Details En-route

All topographical details, permanent features, such as well, trees, building etc. 75 m on either side of the alignment shall be detailed on the profile plan.

1.10. Clearances - General

For the purpose of computing the vertical clearance of an over-head line, the maximum sag of any conductor shall be calculated on the basis of the maximum sag in still air and the maximum design temperature. Similarly, for the purpose of computing any horizontal clearance of an over-head line, the maximum deflection of any conductor shall be calculated on the basis of the wind pressure specified by the State Government under rule 76 (2) (a) [or may be taken as 35°, whichever is greater]. Following clearances shall be maintained by the Contractor while executing the work:

1.6.1. CLEARANCE ABOVE GROUND OF THE LOWEST CONDUCTOR: No conductor of an over-head line, including service lines, erected across a street shall at any part thereof be at a height less than

- | | |
|--------------------------------------|------------|
| (a) For low and medium voltage lines | 5.8 metres |
| (b) For high voltage lines | 6.1 metres |

1.6.2. No conductor of an over-head line, including service, lines, erected along any street shall at any part thereof be at a height less than

a. For low, medium and high voltage lines upto and including 11,000 volts, if bare -	4.6 metres
b. For low, medium and high voltage lines Upto and including 11,000 volts, if insulated -	4.0 metres
c. For high voltage lines above 11,000 volts -	5.2 metres

For extra-high voltage lines the clearance above ground shall not be less than 5.2 meters plus 0.3 meter for every 33,000 volts or part thereof by which the voltage of the line exceeds 33,000 volts:

Provided that the minimum clearance along or across any street shall not be less than 6.1 meters.

1.6.3. CLEARANCE FROM BUILDINGS OF LOW AND MEDIUM VOLTAGE LINES AND SERVICE LINES:

Where line is to cross over another line of the same voltage or lower voltage, pole with suitable extensions shall be used. Provisions to prevent the possibility of its coming into contact with other overhead lines shall be made in accordance with the latest CEA regulations (as amended from time to time). The Contractor will required to under cross higher voltage lines by erecting gantries/suitable Rail Pole structures.

Where a low or medium voltage over-head line passes above or adjacent to or terminates on any building, the following minimum clearances from any accessible point, on the basis of maximum sag, shall be observed:-

- | | |
|-----|---|
| a) | For any flat roof, open balcony, verandah roof and lean-to-roof |
| i. | When the line passes above the building a vertical clearance of 2.5 meters from the highest point; and |
| ii. | When he line passes adjacent to the building a horizontal clearance of 1.2 meters from the nearest point, and |
| b) | For pitched roof |
| i. | When the line passes above the building a vertical clearance of 2.5 meters immediately under the lines, and |
| ii. | When the line passes adjacent to the building a horizontal clearance of 1.2 meters. |

The horizontal clearance shall be measured when the line is at a maximum deflection from the vertical due to wind pressure.

1.6.4. CLEARANCE FROM BUILDINGS OF HIGH AND EXTRA-HIGH VOLTAGE LINES:

Where a high or extra-high voltage over-head line passes above or adjacent to any building or part of building it shall have on the basis of maximum sag a vertical clearance above the highest part of a building immediately under such line, of not less than

(a)	For High Voltage Lines up to and including 33,000 volts	3.7 m
(b)	For Extra High Voltage Lines	3.7 m plus 0.3 m for every additional 33 KV or part thereof.

1.11. Electrical System Data

	33 KV	11KV
Nominal voltage	33 kV	11KV
Maximum system voltage	36 kV	12KV
BIL (Impulse)	170 kVp	75KV
Power frequency withstand voltage (wet)	75 kV (rms)	28KV
Minimum corona extinction voltage for	Not less than 27 kV, 50 Hz ac system under Dry condition (rms) phase to earth	
Radio interference voltage at one MHz for	Not exceeding 1000 micro-volts	
27 kV (dry condition)		

1.12. Pole Location

In locating poles on lines, the following general principles should be kept in mind:-

1. Keep spans uniform in length as far as possible.
2. Locate to give horizontal grade.
3. By locating the poles on high places short poles can be used and will maintain proper ground clearance at the middle of the span. In extremely hilly or mountainous country, poles are located on ridges there by greatly increasing the spans without greatly increasing the pull on the conductor. This is possible because the sag can be made very large and will maintain the required ground clearance. Special attention should be given to the locations of poles, where the ground washes badly. Poles should not be placed along the edges of cuts at or embankment or along the banks of creeks of streams.

1.13. Construction

The construction of overhead-lines may be divided into the following parts:-

- (1) Pit marking, pit digging.
- (2) Erection of supports and concreting.
- (3) Providing of guys to supports.
- (4) Mounting cross-arms, pin and insulators, and pin binding.
- (5) Paying and stringing of the conductor.
- (6) Sagging and Tensioning of Conductors.
- (7) Crossings.
- (8) Guarding.

- (9) Earthing.
- (10) Testing and Commissioning.

1.14. Erection of DP Structure for Angle Locations

For angles of deviations more than 10 degree, DP structure may be erected. The pit digging should be done along the bisection of angle of deviation.

After the poles are erected, the horizontal/cross bracings should be fitted and the supports held in a vertical position with the help of temporary guys of Manila rope 20/25 mm dia.

Wherever space is not found sufficient to install double Pole structure, single pole cut point may be installed. The support so erected must be grouted.

1.15. Concreting

The concreting mixture of one cum 1:3:6 ratios would mean 1 part cement, 3 parts coarse sand and 6 part 40 mm aggregate size stones. It may be noted that while preparing the concrete mixture, large quantities of water should not be used as this would wash away cement and sand.

1.16. Providing Of Guys To Supports

Guys are installed at locations where terminal poles are erected at sectional cut points. These cut points may be in same alignment or at turn points. Guys are installed to nullify tension on supports resulted due to conductors tension. In spite of careful planning and alignment of line route, certain situations arise where the conductor tries to tilt the pole from its normal position due to abnormal wind pressure and deviation of alignment, etc. When these cases of strain arise, the pole is strengthened and kept in position by guys. One or more guys will have to be provided for all supports where there is unbalanced strain acting on the support, which may result in tilting/uprooting or breaking of the support.

Guys are braces fastened to the pole. In this work anchor type guy sets are to be used. These guys are provided at (i) angle locations (ii) dead end locations (iii) T - off points (iv) Steep gradient locations and (v) where the wind pressure is more than 50 kg / Sq.m.

The fixing of guys stays will involve (i) pit digging and fixing stay rod (ii) fastening guy wire to the support (iii) Tightening guy wire and fastening to the anchor. The marking of guy pit, digging and setting of anchor rod must be carefully carried out. The stay rod should be placed in a position so that the angle of rod with the vertical face of the pit is 30°/45° as the case may be.

Before start of erection of Stay sets, required concreting materials like Cement, Sand, Stone Chips and Construction water need to be made available near the pit.

G.I. stay wires of size 7/3.15 mm (10 SWG) & 7/4.00 mm (8 SWG), for 16 mm/20 mm stay rods respectively, are to be provided. 8.5 Kg. Stay Wire (7/4.00 mm) per Stay with 20 mm Stay rod for 33 KV line and 5.5 Kg. Stay Wire (7/ 3.15 mm) per Stay with 16 mm Stay rod for 11 KV lines are to be used. For double pole structure (DP), four stays along the line, two in

each direction and two stays along the bisection of the angle of deviation (or more) as required depending on the angle of deviation are to be provided. Hot dip galvanized stay sets are to be used. One stay to counter the angular deformation force shall be used.

After concreting, back filling and ramming must be done well and allowed 7 days to set. The free end of the guy wire/stay wire is passed through the eye of the anchor rod, bent back parallel to the main portion of the stay/guy and bound after inserting the G.I. thimble, where it bears on the anchor rod. 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. The turn buckle shall be mounted at the pole end of the stay and guy wire so fixed that the turn buckle is half way in the working position, thus giving the maximum movement for tightening or loosening.

1.17. Guy Strain Insulators

Guy insulators are placed to prevent the lower part of the Guy from becoming electrically energized by a contact of the upper part of the guy when the conductor snaps and falls on them or due to leakage. No guy insulator shall be located less than 2.6 m from the ground. Guy insulators are to be used in stay wires only. All stay conductors are to be provided with guy insulators as per following specifications.

11 KV line stay	Type C guy insulator (1 No)
33 KV line stay	Type C guy insulators (2Nos)

1.18. 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 is also there. In case, the cross-arm is to be mounted after the pole is erected, the lineman should climb the pole with necessary tools. The cross-arm is then tied to a hand line and pulled up by the ground man through a pulley, till the cross-arm reaches the line man. The ground man should station himself on one side, so that if any material drops from the top of the pole, it may not strike him. All the materials should be lifted or lowered through the hand line, and should not be dropped.

1.19. Insulators And Bindings

Line conductors are electrically insulated from each other as well as from the pole by 'Insulators'. Following two type of insulators shall be used for the line insulation:

- (1) Pin type
- (2) Strain type

The pin type insulators will be used for straight stretch of line. 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 strain insulators are intended for use at terminal locations or dead end locations and where the angle of deviation of line is more than 10°. Strain insulators are also intending to use at major road crossing locations.

The pins for insulators are fixed in the holes provided in the cross-arms and the pole top brackets. The insulators are 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 is so tightened that the strap can move freely in horizontal direction.

All HT/LT insulators shall be tested for insulation tests before installation on line. They shall be dipped into water for 24 hrs and then tested for insulation resistance tests at the stores. The insulators found fit in IR testing shall be sent to site for erection. 11KV na d33 KV insulators shall be tested by at-least 1 KV megger whereas LT insulators shall be tested by 500 Volts megger.

1.20. Conductor Erection

The main operations are:-

- (a) Transportation of Conductor to works site.
- (b) Paying and Stringing of Conductor
- (c) Jointing of Conductor
- (d) Tensioning and Sagging of Conductor

While transporting conductors drums to site, precautions are to be taken so that the conductor does not get damaged/injured. The drum could be mounted on cable drum support, which generally is made from crow-bar and wooden slippers for small size conductor drums. The direction of rotation of the drum has to be according to the mark in the drum so that the conductor could be drawn. While drawing the conductor, it should not rub causing damage. The conductor could be passed over poles on wooden or aluminum snatch block (pulley) mounted on the poles for this purpose.

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.

The mid span jointing is done through compressions or if helical fittings are used the jointing could be done manually. After completing the jointing, tensioning operation could be commenced. The conductor is pulled through come-along clamps to stringing the conductor between the tension locations.

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

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

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 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 aluminum sleeve shall have all corners rounded; burrs and sharp edges removed and smoothened.

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

1.21. Tensioning and Sagging Operations

The tensioning and sagging shall be done in accordance with the approved stringing charts or sag tables. The “initial” stringing chart shall be used for the conductor and “final” stringing chart for the earth-wire. The conductors shall be pulled up to the desired sag and left in running blocks for at least one hour after which the sag shall be rechecked and adjusted, if necessary, before transferring the conductors from the running blocks to the suspension clamps. The conductor shall be clamped within 36 hours of sagging in.

The sag will 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. The sag shall also be checked when the conductors have been drawn up and transferred from running blocks to the insulator clamps.

At sharp vertical angles, conductor and earth-wire sags and tensions shall be checked for equality on both sides of the angle and running block. The suspension insulator assemblies will normally assume verticality when the conductor is clamped.

Tensioning and sagging operations shall be carried out in calm weather when rapid changes in temperature are not likely to occur.

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

1.23. Fixing of Conductors and Earthwire Accessories

Conductor and earth-wire accessories supplied by the Contractor shall be installed by the Contractor as per the design requirements and manufacturer’s instruction within 24hours of the conductor / earth-wire clamping. 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.

1.24. 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.

Sagging of conductor has to be in accordance to the Sag Tension chart. In order to achieve it, it is preferred to pull the conductor to a tension a little above the theoretical value so that while transferring it from the snatch blocks to the pit insulators and to take care of temperature variation. Proper sag could achieve. Sagging for 33/11 KV line is mostly done by “Sighting”. A horizontal strip of wood is fixed below the cross-arm on the pole at the required sag. The lineman sees from other end and the sag is adjusted by increasing or decreasing the tension. The tension clamps could then be finally fixed and conductor be fixed on pin-insulators. All fittings, accessories like guys, cross-arms, etc., could be checked as they should not have de-formalities.

The maximum permissible spans for all the lines of 33/11/0.4 KV are prescribed according to the design of the supports. Sag-tension charts for these conductors are to be followed.

1.25. Tying Of Conductor On Pin Insulators

Conductors should occupy such a position on the insulator as will produce minimum strain on the tie wire. The function of the wire is only to hold the conductor, in place on the insulator, leaving the insulator and pin to take the strain of the conductor.

In straight line, the best practice is to use a top groove insulator. These insulators will carry grooves on the side as well. When the conductor is placed on the top groove, the tie wire serves only to keep the conductor from slipping out.

On corners and angles (below 5 degree deviations) the conductors should be placed on the outside of the insulators. On the far side of the pole, this pulls the conductor against the insulator instead of away from the insulator.

1.26. Kind And Size Of Tie Wire To Be Used

Helically formed fittings are to be used for tying the insulators, end terminal connectors etc.. The tie should always be made of soft annealed wire so that it may not be brittle and injure the line conductor. A tie wire should never be used for second time. Specifications of helically formed fittings are given in this section.

1.27. Rules Of Good Tying Practice

- a. Use only helically formed fittings.
- b. Use of size of tie wire which can be readily handled yet one which will provide adequate strength.
- c. Use length of tie wire sufficient for making the complete tie, including an allowance for gripping with the hands. The extra length should be cut from each end if the tie is completed.
- d. A good tie should
 - (a) Provide a secure binding between line wire insulator and tie wire.
 - (b) Have positive contacts between the line wire and the tie wire so as to avoid any chattering of the contacts.
 - (c) Re-enforce line wire in the vicinity of insulator.
- e. Apply without use of pliers.
- f. Do not use the wire which has been previously used.
- g. Do not use hard drawn wires for typing.

1.28. Conductors At Different Voltages On Same Supports

In urban area, lines are to be erected with provision for forming lines of two different gradients as under

- a) 11 KV Line and LT Lines
- b) 33 KV Line and LT Lines

Where conductors forming parts of systems at different voltages are erected on the same supports, the Contractor shall make adequate provision to guard against danger to linesmen and others from the lower voltage system being charged above its normal working voltage by leakage from or contact with the higher voltage system; and the methods of construction and the clearances between the conductors of the two systems shall be as described in the specifications.

The agency shall be intimated by the IA in writing about the locations where such provisions is intended by him. At all such locations, the Contractor shall make adequate provision to guard against danger to linesmen and others from the lower voltage system being charged above its normal working voltage by leakage from or contact with the higher voltage system.

1.29. Earthing

Earthing shall generally be carried out in accordance with the requirements of latest CEA regulations (as amended from time to time) and the relevant regulations of the Electricity Supply Authority concerned and as indicated below:

- a) All metallic supports shall be earthed.
- b) For PCC poles the metal cross-arms and insulator pins shall be bonded and earthed at every pole for HT lines.
- c) All special structures on which switches, transformers, fuses, etc., are mounted / likely to mount should be earthed.
- d) The supports on either side of the road, railway or river crossing should be earthed.
- e) All supports (Steel & PCC) HT lines passing through inhabited areas, road crossings and along such other places, where Earthing of all poles is considered desirable from safety considerations should be earthed.
- f) In special locations and special structures, road crossings etc., pipe/rod Earthing should be done on either side of the construction.
- g) At other locations the coil Earthing may be adopted. The coil Earthing consists of 10 m length of 8 SWG. G.I. wire compressed into a coil 450 mm length and 50 mm dia and buried 1500 mm deep as per REC standard J-1.

Following shall be the earthing requirements:

No	Description	Type of Earthing
1	Single Pole - PCC/RS Joist/steel tubular	1 No. Coil/Spike Earthing at each SP
2	Double pole - PCC/RS Joist/steel tubular	2 Nos. Coil/Spike Earthing at each DP
3	Substation Poles structure - PCC/RS	GI Pipe/ Chemical Earthing 3 Nos

	Joist/steel tubular	
4	Road crossing	GI Pipe / Chemical earthing on either side one each
5	Telephone line crossing	GI Pipe / Chemical earthing on either side one each
6	DP with Isolating switch	Coil/Spike earthing 2 Nos and GI Pipe / Chemical earthing 1 No

1.30. Anti-Climbing Devices

In order to prevent unauthorized persons from climbing any of the supports of HT lines without the aid of a ladder or special appliance, certain anti-climbing devices are provided to the supports. Barbed wire binding is to be adopted for this purpose at a distance of 30 to 40 cm at a height of 3.5 to 4 m from ground level. The barbed wire shall conform to IS – 278 (Grade A1). The barbed wire shall be given chromatin dip as per procedure laid down in IS: 1340. At-least 3.5 kgs barbed wire is to be used per pole for the purpose.

1.31. Testing And Commissioning

When the line is ready for energisation, it should be thoroughly inspected in respect of the following:-

- Poles-Proper alignment, concerting and muffing.
- Cross-arms – Proper alignment.
- Finishing of fabricated steel items used.
- Insulators – Proper finish, cleanliness, insulation resistance.
- Binding, clamps and jumpers – To check whether these are in reach.
- Conductor and earth wire – Proper sag to check whether there are any cuts, etc.
- Guys: To check whether the Guy wire is tight and whether the Guy insulators are in tact.
- Earthing System: To check whether the earthing connections of supports and fittings are intact. Measure earth resistance with earth tester.

After the visual inspection is over and satisfied, the conductor is tested for continuity/ground, by means of megger. At the time of testing through megger person should not climb on the pole or touch the guarding, conductor, guy wire etc.

- Before charging any new line, it should be ensured that the required inspection fee for the new line is paid to the Electrical Inspector and approval obtained from him for charging the line.
- The line should be energized before the officer who has been authorized by the IA in this regard.
- Before energizing any new line, the Contractor of the line shall notify to the workmen that the line is being energized and that it will no longer be safe to work on line. Acknowledgement of all the workmen in writing should be taken in token of having intimated them.
- Wide publicity by Tom-toming should be arranged in all the localities through which the line, that is to be energized passes, intimating the time and date of energizing and warning public against the risk in meddling with the line.

- e. The Officer-in-charge of the line shall personally satisfy himself that the same is in a fit state to be energized.

1.32. River Crossing

No special structures are to be erected for this work. River crossing more than normal span of poles are not considered under the package. For small rivers etc., data for the highest flood-level should be obtained for previous years. The structures should be located at such places that they should be approached under flood condition. Normal DP structures are to be used for such crossings on approval of IA/IA Representative.

In case of river crossing with longer span, special designed structures are to be used for the purpose.

1.33. Guarding

Guarding is to be provided for the lines, so that a live conductor, when accidentally broken, is prevented to come in contact with other electric lines, telephone or telegraph lines, roads, and persons or animals and carriages moving along the road, by providing a sort of cradle below the main electric line.

Guarding is not required for crossings of 66 KV and higher voltage lines where the transmission line is protected by fast acting relay operated circuit breaker of modern design with a tripping time of the order of 0.25 sec. from occurrence of fault to its clearance. For all other crossings, guarding is essential for all telecommunication lines and major road crossing.

The guarding shall consist of GI guard cross arm of length 2.5 mtrs made out of 65x65x6 mm angle & 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 & suitable for 13 m 52 kgs/m rail pole & for 8.0 meters long RCC poles. Guarding shall be erected with ground & line clearances as per the I.E. rules. Cradle guard wire should be of 8 SWG GI Wire provided with lashing of 10 SWG GI wire at a distance of 2 m along the length of the guarding. Tension clamps, threaded eye bolts, turn buckles, thimble, tying wires and hardware are as per specified in the specifications. A sketch showing arrangement of guarding at road crossing is enclosed with tender drawing.

The minimum height between any guard wires and live crossing conductor shall not be less than 1.5 m in case of a railway crossing.

1.34. Repair 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. Repairing of the conductor surface shall be carried out 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. The Contractor shall be entirely responsible for any damage to the poles during stringing.

1.35. LT Lines and Service connection

- 1.7.1. The LT line shall be erected of single phase or three phase arrangements through AB Cable depending on site requirements. Every 6th pole of LT line shall be earthed with GI spike/GI Coil as per specifications.
- 1.7.2. In all those locations where LT AB cable is to be erected on the same support in which 11KV or 33KV line is also erected, proper isolation is to be maintained.
- 1.7.3. All single phase service connections released under the 'KONKAN DISASTER MITIGATION PROJECT' schemes shall be provided with one earth point near the energy meter. This point is connected with the proper earthing system through GI wires. 10mm diameter earth knob in form of bolt and nut is to be installed on energy meter board. This earth point is to be maintained by service providing Distribution Company after installation and energisation. In up-stream network, this earth point is to be connected with earth point.
- 1.7.4. Service connection is to be issued on proper surveying of the location so that excessive erection of LT line or 11 KV line may be avoided. The service wire is to be hanged on supportive GI wire between pole support and the house. Before installing service wires and GI wire, GI pipe on the consumer premises is to be erected using clamps/ nails/proper binding etc. In case of hut or poor structure at consumer premises, GI pipe is to clamp on wooden planks/wooden structure existing in the house. The GI pipe should be supported for neutralizing tension by means of GI tie wire support. In pukka/brickwork/cement concrete foundations, house, GI support pipe is to be clamped by means of MS clips.